SESSION

LEARNING TOOLS AND STRATEGIES

Chair(s)

TBA

Evaluation of Tools for Opinion Mining

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***Abstract*— Opinion Mining is a useful tool for gathering information about customers' opinions about products, brands or companies. Much research in this area has been done in recent years and a couple of tools and methods can be identified. However, there are still challenges related to user generated content or texts in German language. This paper proposes an approach to combine existing methods and tools for analyzing the sentiment orientation of text and evaluates these methods.**

***Index Terms*— information retrieval, text mining, sentiment analysis**

I. Introduction

Blogs, wikis and social networks have become part of our digital life and have changed the way we communicate significantly. There are 255 million of websites on the internet [1] and therefore a lot of facts and opinions are available for companies and customers. Everybody is able to publish subjective information about products, brands and companies.

The exchange of information and opinions of consumers on the Web 2.0 also means that a greater confidence in the products, brands and services are created, which e.g. in the e-commerce-sector leads to a higher purchase probability [2], [3]. Therefore it is very important that companies are able to find, extract and analyze this user generated content, because these contents contain significant "real" market relevant data. Furthermore it is an easy and cheap way to gain a current market overview to generate new strategic, tactical and operational plans and policies as well as creating relevant brand messages.

Opinion Mining deals with scientific methods in order to find, extract, and systematically analyze product, company or brand related views on the internet. The identification of sentiment orientation (positive, neutral and negative) of consumers' opinions is an essential part of the opinion mining process.

The *objectives* of this paper are to *(i)* combine existing methods and tools for analyzing the sentiment orientation of German text and *(ii)* to evaluate these methods in relation to their applicability and accuracy.

II. Related Work

Sentiment analysis has been studied by many researchers in recent years. Several main research directions can be identified:

(1) Sentiment classification based on document level: The classification shall reveal whether the complete document has a positive, negative or neutral sentiment orientation. [4], [5], [6], [7] and many others have studied classification at document level.

(2) Sentiment classification based on sentence level or on feature level try to determine the sentiment orientation of each sentence or feature; research work has been done in [8], [9], [10], [11] and many others.

Most classification methods – both at document level and sentence level –are based on identification of opinion words or phrases. Two types of approaches are usually used: corpus-based approaches (e.g. [12], [6], [13]) and dictionary-based / lexicon-based approaches (e.g. [8], [9], [14], [8], [15], [11]).

III. Problem Definition

Several research papers identified the challenges of sentiment analysis, e.g. that opinion words are domain dependent and furthermore the same word may even indicate different opinions depending on the features. In our research work we face several challenges:

(1) Complexity of the German Language
The German language is more complex (many synonyms for both verbs, nouns and negators) than e.g. the English language; therefore several widely used tools like stemmers are not applicable. [16]

(2) Mistakes in User Generated Content
Further challenges arise from the fact that many texts that were written by consumers are grammatically incorrect, contain typing mistakes or are colloquial. [16]

(3) Lack of standardized test sets
In order to review and compare the quality of the results of sentiment analysis, it is necessary to use a corpus using standardized quantities. [17], [18]

(4) Dealing with inconsistencies and spam
User generated content can contain inconsistent and contradictory arguments (e.g. the "star rating" and the textual utterances differ from each other). Furthermore the spam-problem has to be taken into consideration in the processing and analysis of texts. [19]

IV. Tools and Methods for Sentiment Analysis

The following process model describes steps, methods and tools to find, extract and analyze web data with regard to their sentiment orientation:

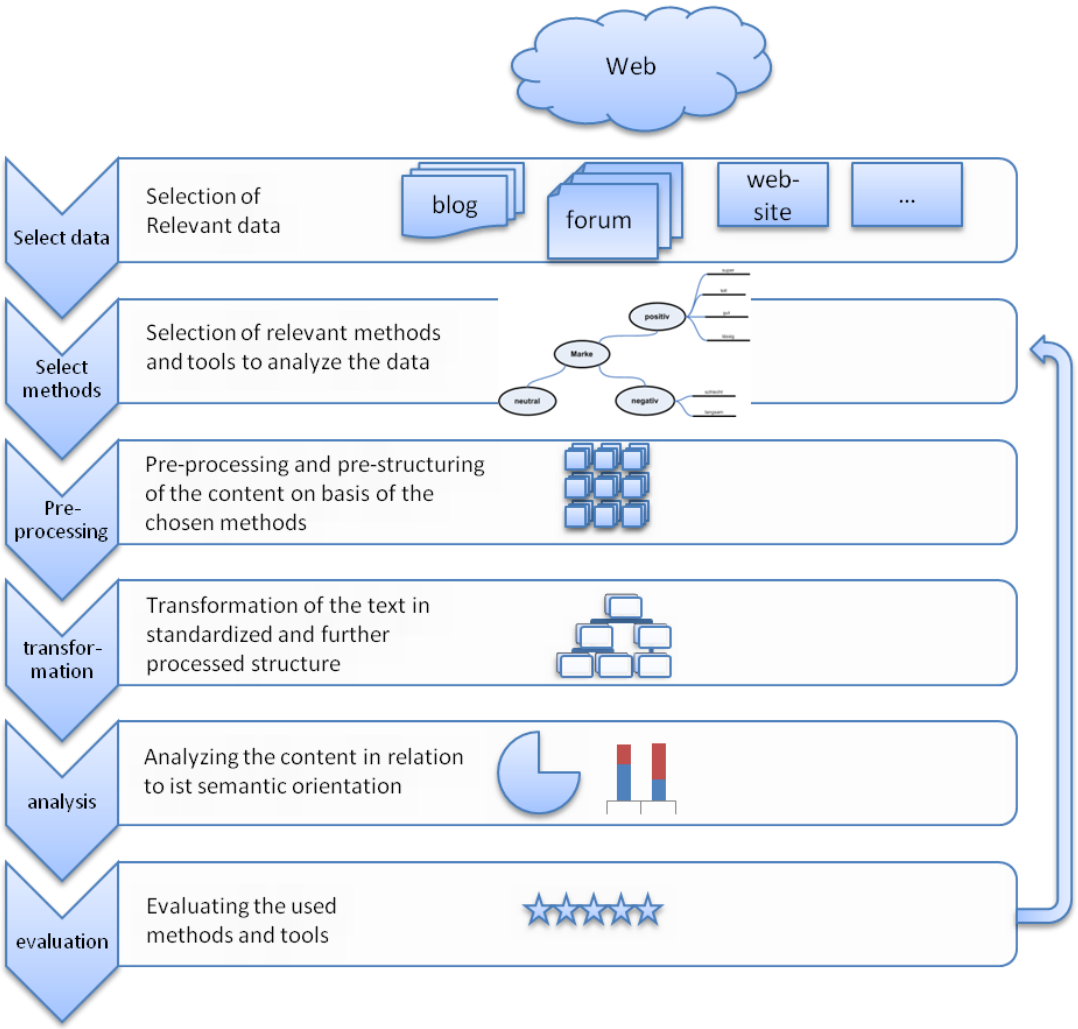

Figure 1. process model

The process model comprises the following steps:

(1) *Selection of relevant data sources*
Before content can be extracted from possible sources such as blogs, forums, social networks, micro-blogging services etc., the relevant sources have to be identified. The relevance is based on different criteria, as for example the thematic aptitude or the range of the source.

(2) Selection of relevant methods and tools to analyze the data
In the next step appropriate methods for running the different analyses has to be chosen. Examples are ontologies, thesauri as well as different methods to identify the semantic orientation of texts.

(3) Pre-processing and pre-structuring of the contents on basis of the chosen methods
Because of heterogeneity of the content and the sources as well as the varied quality of customer written texts it is important to prepare and pre-structure the extracted content. The target of this process step is to identify irrelevant parts of websites, blogs, forums, etc. like advertisements and remove these valueless elements of the extracted content.

(4) Transformation of the text in standard and further processed structure
The next process phase has its target in transforming the extracted and prepared content with the help of natural language processing and information retrieval into a processable structure.

(5) Analyzing the content in relation to its semantic orientation
Afterwards the sentiment analysis of texts to determine if a sentence is positive, neutral or negative will be performed. In the literature there are different approaches for analyzing the sentimental orientation of texts: manual, dictionary- and corpus-based approaches.

(6) Evaluation of the methods and tools
Last but not least an evaluation of the used methods and tools is done. This should verify if the used methods and tools interact satisfactorily with each other.

The following table outlines commonly used methods and tools for each process step:

Step	Methods (examples)	Tools (examples)
selection of relevant data	information retrieval on the web[20], relevance-index [3]	webcrawler [21], [22], RSS-feeds, APIs for gathering data (e.g. [23])
preprocessing	thesaurus, ontologies, tokenizer, stemmer, screenscrapper	RDF-OWL, Alchemy API[24], GATE [25], UIMA [26], GETESS [27, 28], openthesaurus.de [29], etc.
transformation	part of speech tagger, sentence splitter, orthographic co-references	TreeTagger [30], Sentence splitter, orthographic co-references
Analysis	classification methods based on document or sentence level (see Related Work)	opinion observer [31], RapidMiner [32]
evaluation	manual classification of sentiment orientation and feedback	

TABLE 1 METHODS AND TOOLS FOR PROCESSING AND ANALYZING TEXTS

V. EVALUATION

A. Build a Corpus

(1) Corpus
The first step was to create a topic related corpus of words. This corpus represents the fundamental content, in our case amazon reviews, plus different kind of ratings stored in a database. The first version of the corpus contained 130 reviews including 1443 sentences. These reviews were subdivided into four domains: beamer, hdmi cable, vacuum cleaner and razor with a rating scale from minus three for very poor to plus three for very good. There are two ratings at a time per sentence and two ratings for the entire amazon review. Every single rating was done manually by two independent people.
The creation of a corpus is useful because of the usage of self-learning algorithms in the later following sentiment analysis and due to the lack of corpuses in German language.

(2) Create Feature List
After developing the corpus it was necessary to create a feature list which contains words that represent strong positive or negative sentiments to identify the semantic orientation of the text. This list was gathered by using a tool called Treetagger [30] which tagged single words in the text and put them to their principal form. After tagging the words, a simple self-written tool was used to count each word of the content. Adjectives with the highest frequency were selected and gathered in a list. This represented the first version of the feature list.

B. Transformation and Pre-Processing

Before the first test run with an analysis tool it was necessary to convert the corpus and the feature list into proper shape. Therefore a matrix was set up that contained the id of the sentence in y direction and the features in x direction.

id	beautiful	Good	long
1	1	1	0
2	0	1	
4	0	0	2
7	1	0	1

TABLE 1 - SAMPLE OF THE MATRIX

The matrix data represents the feature frequency within a sentence; the feature is only listed if its frequency on the whole text is greater than ten times. This matrix is used as input for HeuristicLab Software Environment [33], [34]. WEKA does not use the matrix view to process the data, it uses a list of features, ratings and data in a form with a special notation. [35]

C. Testing

1) Initial Run – Results from WEKA
The initial run was done with the WEKA tool, a data set of 130 reviews and a feature list containing 115 features was tested with different algorithms.

WEKA	Correct	Incorrect
Best-First Decision Tree	49.22%	50.78%
FT tree	55.22%	44.78
J48 tree	48.88 %	51.12 %
J48graft tree	49.11 %	50.89 %
LAD-Tree	55.33 %	44.67 %
Random Forest	55%	45 %
REP-tree	47.66 %	52.34 %
CART-decision tree	48.55 %	51.45 %

TABLE 2 RESULTS INITIAL RUN

table 2 shows that the best results with the basic corpus and the first feature list are between 50% and 55% correctly classified instances.

2) Improvements - Results from HeuristicLab using a SVM

In order to improve the results, the number of reviews was elevated to 260 with 4095 sentences overall. Furthermore a function to check the words surrounding the features in a defined radius was implemented to identify negations. The number of features in this test case was reduced to 82 and the corpus was tested with different settings of the WEKA Support Vector Machine (SVM) [36] and a Logistic Model Tree (LMT).

WEKA (radius 3)	Correct	Incorrect
SVM (best result)	69.01 %	30.99 %
LMT tree	69.40 %	30.60 %

TABLE 3 WEKA RADIUS 3

WEKA (radius 5)	Correct	Incorrect
SVM (best result)	68.27 %	31.73 %
LMT tree	71.80 %	28.20 %

TABLE 4 WEKA RADIUS 5

table 3 and table 4 show the differences between the two tests and the significant improvement of the correctly classified instances. Radius 3 respectively radius 5 defines the word distance between a feature word and a negator.

In addition to the Support Vector Machine in Heuristic Lab Software Environment (HL), a linear regression was used to analyze the text. These results are shown in table 5.

HL (radius 3)	Correct	Incorrect
SVM (best result)	59,53%	40,47 %
Lin. Regression	41,58%	58,42%

TABLE 5 HL RADIUS 3

3) Further Improvements – Usage of Thesaurus

The third test stage started by reducing the features again in exchange by using a thesaurus to get a higher range of a single feature.

Thesaurus example:

- Text: This car is beautiful.
- Features: big, pretty, sharp…
- Synonyms of pretty: beautiful, cheerful, cute…
- Result: This car is pretty.

This tool recognizes that beautiful is a synonym of pretty and replaces beautiful with pretty. Before the analysis with HL or WEKA the content was aligned with the thesaurus tool. This resulted in having many more sentences and features in our matrix

.

The following SVM settings were used in HL:

- Gamma:0.9
- Cost: 0.6
- Svmtyp: nu_SVR
- Epsilon: 0.001
- Nu: 0.7

After reducing the feature list there were 42 features left in the list. The negative effect of reducing the feature list is shown in table 6. However the HL software shows an improvement in the correctly classified sentences in table 7.

WEKA (radius 3)	Correct	Incorrect
J48 tree	67.54 %	32.46 %
SVM(best result)	66,86 %	33,14 %

TABLE 6 – WEKA TEST RESULTS IN TEST RUN 3

HL (radius 3)	Correct	Incorrect
SVM(best result)	64,46%	35.54 %

TABLE 7 – HL TEST RESULTS IN TEST RUN 3

VI. CONCLUSION AND FURTHER WORK

In summarizing the above evaluation we can reason the following statements:

- The evaluated methods and tools proved to be good choices and exposed promising results.
- The enlargement of the trainings-dataset has a positive influence on the precision of the sentiment analysis.
- The optimization of the feature list has a positive effect on the sentiment analysis. The optimization of the feature list has been performed in two ways: (i) The feature-list was reduced by eliminating useless words and by specifying the words more precise with reference to the domain. (ii) The usage of a thesaurus reduces the feature list on the one hand, because synonyms can be aggregated to one expression. On the other hand more text can be analyzed and evaluated regarding the sentiment orientation. The reduction of the features has to be done carefully, because it turned out that an excessive reduction of the features has a negative influence on the results.

In order to improve the aforementioned results, this further work will be carried out:

- The corpus has to be further enlarged; in particular other domains will be added to cover more areas of interest.
- The thesaurus usage can be improved due to colloquial words and abbreviations in common use (e.g. smileys, IMHO, etc.)
- The optimization of the feature-list will be an important task: in addition to the optimization tasks mentioned above the feature-list can be adjusted to the thesaurus, thus the sentiment analysis will be able to perform better.
- The researchers will carry out some fine-tuning of the parameters used in SVM:
    - gamma: 0.1 – 1 (using 0.1 steps)
    - epsilon: 0.001, 0.005, 0.01, 0.05, 0.1, 0.5, 1
    - nu: 0.1 – 1 (using 0.1 steps)
    - cost: 0.1 – 1 (using 0.1 steps), 5, 10

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A Tool for Modeling Strategy and Aligned Portfolio Selection

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Abstract - *A company depends on the definition and implementation of a set of projects aligned with the vision established by its senior management to accomplish its strategies. To this set of projects is given the name of portfolio. This paper implements a collaborative tool to support the construction and selection of a project portfolio aligned with the corporate strategy. The tool is capable of modeling the strategy through the construction of a strategy map and also to select a good portfolio applying this map in a multi-criteria algorithm. The tool was applied in three small companies to validate its capabilities.*

Keywords: Strategic Alignment, Portfolio Management, Self-knowledge, Organizational Learning, Decision Making.

1 Introduction

An organization traces the corporate strategy seeking to achieve its vision, which reflects the market position it craves. The company's vision is based on its mission, reason for existence, which guides the implementation of the strategy [4]. The strategy describes how an organization can sustainably generate value for its shareholders, employees and customers [3]. Therefore the portfolio of a company represents the implementation of these strategies, concrete activities undertaken to achieve the goals.

A good strategy must balance conflicting efforts such as: short-term financial goals to reduce costs and increase productivity and long-term goals towards company revenues growth. During the establishment of the company's strategy it is necessary to use a methodology that addresses this difficult balance.

The Strategy Map [3] is a complete framework, broad and well accepted by the scientific community as the market for formulating and developing strategies [5]. From this Strategy Map is built a structure of goals that are associated and ranked according to certain perspectives that are able to represent the guidelines of the company. Because it is well defined, this structure can be converted into a hierarchy of criteria that supports the selection of the project portfolio of the company.

When transforming each strategic objective into a criterion for portfolio selection it's important to guarantee the alignment between accomplished projects and corporate strategy. It follows that without strategic alignment the portfolio has no legitimacy and in the opposite scenario the strategic goals become pure theory and do not add value to the company.

Thus the portfolio of the organization should be selected, managed and recognized as part of the governance structure of an organization and as a key point to successful implementation of its strategy [7]. In small and medium companies however, the portfolio selection process is often empirical and based only on the feeling of senior management.

The AHP - Analytic Hierarchy Process is a methodology of decision making based on paired comparisons of multiple criteria and multiple alternatives which can be adopted to systematize and base the selection process portfolio [2]. The AHP is a generic method for selection of alternatives based on criteria common to all elements. They may be measureable like size, budget and weight, or subjective like appearance, reliability and impact. The result of this method is the sorted list of alternatives from most to least relevant according to the criteria analyzed.

This paper presents a tool capable of recommending a portfolio of greater strategic alignment according to AHP methodology based on the company's Strategy Map. However, even with implementation of a systematic methodology for selecting portfolio, political decisions are decisive for the inclusion of projects in the portfolio, even if the method used does not display them.

As the choice differs from a previous recommended one this will reflect in a change in the strategic direction of the business, the suggested tool offers the ability to generate strategic scenarios where the approved portfolio would be the one recommended by the AHP methodology. In possession of this knowledge, management can then compare the informed theoretical strategic prioritization to these scenarios improving their understanding of themselves and estimating the impacts of the strategy that is being implemented. In other words, the use of the tool will stimulate self-knowledge and

organizational learning, preparing for the scenarios arising from its strategy.

This paper is divided as follows: Section II will examine the importance of defining strategy and selecting a portfolio aligned to it. Section III presents the developed tool as well as the guidelines that led to its development. Section IV illustrates the use of the tool through its implementation in three Brazilian small companies and results obtained. Section V presents the conclusions of this study and the tool's assessment.

2 Strategy and Portfolio Selection

Andrews [8], one of the first scholars of strategic management, defines corporate strategy as "the model of decisions of a company that determines and reveals its objectives, purposes or goals, produces the main policies and plans to achieve these goals and sets the scope of business that the company will adopt, the kind of economic and human organization it is or is intended to be and the nature of the economic and non-economic contributions that it intends to make to its shareholders, employees, customers and communities." The author points out, however, the separation between strategy formulation and implementation, although the two concepts are closely related.

In formulating its strategy, the company must estimate their ability to seize the market demands and to cope with the risks. In addition, each position requires a distinct set of activities. Products, equipment, employees, skills and management systems that are aligned with the chosen strategy are required. Activities that are tailored for specific situations tend to be ineffective if used on other cases. An organization must learn to assemble a set of activities that fit perfectly with the strategy, adding value and making it difficult for competitors to counterfeit [9]. Finally, choices involve the definition of clear priorities by senior management.

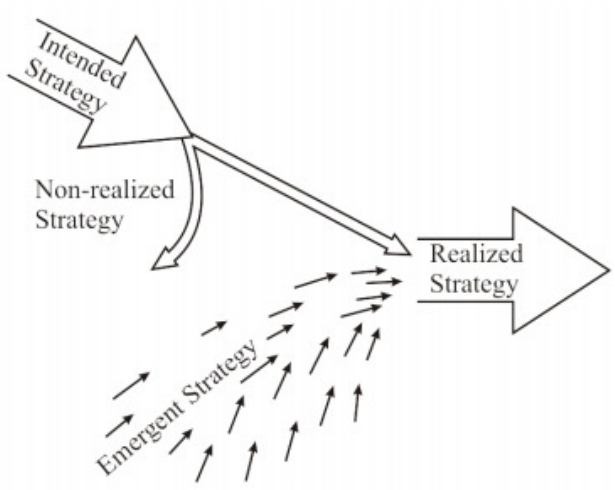

Figure 1: Realized strategy formation [10]

Mintzberg and Lampel [10] deepen the discussion on the origin of a strategy by investigating how the behavior patterns of an organization emerge. The authors elaborate two distinct concepts, emergent strategy and intended strategy. Whereas the intended strategy is the one formally planned and the emergent strategy is formed by changes arising from different contributions coming from the unintended environment or from their own internal behavior. In reality, the strategy actually carried out is a composition between these two types as illustrated in Figure 1.

Deviations between intended strategy and the undertaken one may occur for several reasons such as external impositions like new legislation or new completion, misunderstanding of the strategy on behalf of employees or political choices that cannot be based in the required strategy. Such deviations are understood as emerging strategies and can be minimized through risk analysis, good representation and dissemination of the strategy resulting in the consequential absorption of said strategy to the company's culture.

Kaplan and Norton suggested the Strategy Map is a visual representation capable of translating business objectives through cause and effect relations between results and actions that generate them [11]. The elaboration of the map also assists the strategy development, generating a diagram that is well structured and with a well defined syntax. These features contribute to both a clear understanding of the diagram and for computational processes proposed in this paper.

The model consists of strategic goals, perspectives, metrics and relationships, as illustrated by Figure 2. The goals are represented by nodes containing a succinct phrase that describes it. A strategic objective can be things such as "Increase sales of premium products to achieve greater profitability". To every strategic objective there must be an associated metric for its monitoring, which are represented by threads located below the objectives. For the previous example there could be associated metrics such as the rate of sales of premium products when compared to sales of regular products, or the company's market share in that product type.

Objectives are grouped into perspective according to their scope of action. Each perspective is associated with an area of the map, bordered by horizontal lines. Normally it is used the four perspectives of the Balanced Score Card (BSC) [12] in order to directly monitor the strategy implementation with that method. Continuing the example, the cited goal would be located in the Financial Perspective of the Strategic Map.

Finally, objectives and perspectives can connect through relations of cause and effect. There may be for example one goal "Understanding the preferences of the market segment interested in the premium product" located in Business Internal Processes perspective, which would help achieve the

goal "Increase sales of premium products to achieve greater profitability".

The best approach to define the company's strategy through the map assembling is the top-down approach [11], starting from the final objective and charting the routes to reach it. Executives should review the company's vision and mission so that once they know where to go they can then trace its outreach strategy. From this moment on the vision must be analyzed under the desired perspective, in this case the four BSC perspectives: Financial Perspective, Customer Perspective, Internal Process Perspective and Learning and Growth Perspective (given the format limits only two perspectives were included in Figure 2). The construction of the map typically begins under the Financial Perspective in order to add value for investors of the company, unless it is a state enterprise or nonprofit organization. Then the Customer Perspective is studied, where value creation is directly responsible for the success of the Financial Perspectives. Then the Internal Processes Perspective, which is able to influence both the Financial Perspective and the Customer Perspective. And finally the last observation is made to the Learning and Growth perspective, which influences the development and evolution of the internal processes [11].

As the Strategy Map sets goals and relations of cause and effect in a well-defined structure, it is possible to see the scope of each objective as a criterion for selection of company projects. If one or more objectives are achieved through a project then it is aligned with company strategy. Assessing each proposed project to the company from the viewpoint of each strategic goal, management may determine its alignment. In this scenario a characterized decision process requires consideration of multiple factors, some of which are often intangible. This is a typical scenario for the application of the AHP.

The Analytic Hierarchy Process (AHP) [13] assumes that meticulous comparisons between criteria that influence decisions allow the measure of importance of each criterion. By applying the comparison of these criteria to alternative solutions to the problem a satisfactory result is obtained.

The algorithm is inspired by the everyday decisions of human beings, that consciously or unconsciously, act from the information collected in life. To make a good decision each individual needs to take knowledge of the problem, the need for a solution, the criteria and sub-criteria of the decision and the consequences and effects of actions taken to possible stakeholders.

Ever so often the decision maker deals with criteria intangible and difficult to be compared with each other. The measurement of intangible defies human understanding; however, measurements must be mathematically modeled to be useful and meaningful in relation to tangible factors [14], since they may have the same or greater importance in decision-making. Nevertheless, the importance of one criterion cannot be determined in absolute terms, since for each given problem the criterion has a different relevance. Therefore, the importance of a criterion, whether tangible or not, is relative to other criteria.

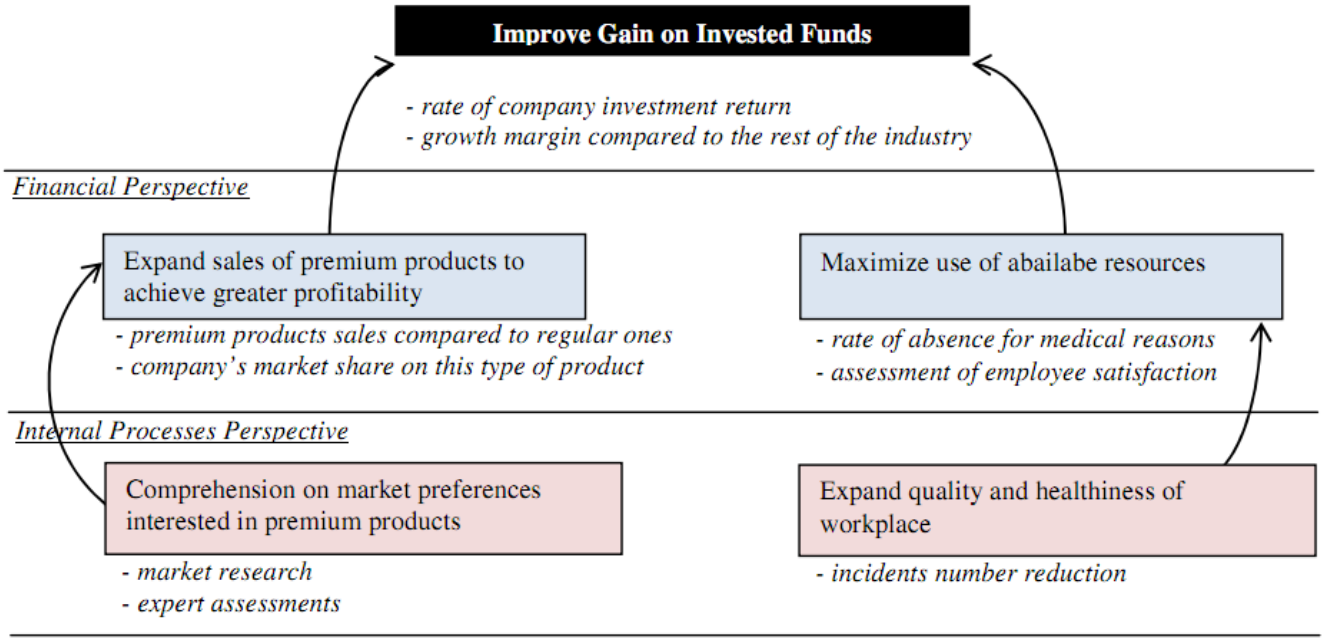

Figure 2: Fictitious example of Strategic Map

The AHP uses a series of comparisons between pairs of criteria to determine the relevance of each criterion to the problem. The method of supporting decision-making can be broken down into four steps:

1. Defining the problem and determining the type of knowledge needed for its solution.
2. Definition of a operative hierarchy where the top is the goal of the decision, followed by their criteria and finally the alternatives
3. Construction of a set of matrices of pair comparison where the elements of an operative level of the hierarchy are compared to the level immediately below.
4. Use of the priorities obtained from comparisons to continuously determine the weight of the lower levels for each element until the last level of priority is determined, the alternatives one.

Applying the methodology to select portfolio, these four steps can be mapped in the following activities:

1. Determine the company's Strategy Map, identifying a team capable of judging each project of this map.
2. Ponder the goals of the Strategy Map assigning relative proportional weights through paired comparisons. That weight must not be officiated by a PMO but come from the derived judgment of the executives [6].
3. Judging programs in relation to goals identifying how much each contributes to the achievement of each strategic goal.
4. Calculate the alignment of programs to synthesize the data obtained. It is important to highlight the rate of importance derived from the AHP has meaning and proportion, so a project that has alignment rate of 0.08 is twice as important for others that have 0.04.

At the end of this process the PMO has a list of projects associated with an alignment value. Choosing the portfolio however still depends on financial resources and personnel availability for its implementation. The set of projects to be executed must be the one that maximize the strategic alignment (the sum of the rate of alignment) within limits of budget, personnel and time. Figure 3 illustrates the complete process of selecting portfolio described in this section.

It is noteworthy that each department can offer a different availability, and each project requires a commitment of different departments [3]. Relationship between projects should also be considered. Scenarios with dependent or mutually exclusive alternatives should also be considered.

The portfolio selection process when done in a scientific and careful way is costly and complex. Therefore applying this process to small and medium enterprises may end up being impractical and selection of projects is usually done empirically [5]. To simplify this process and verify the benefits of the choice of portfolio of projects aligned with corporate strategy software capable of guiding the company through the process illustrated in Figure 3 was developed.

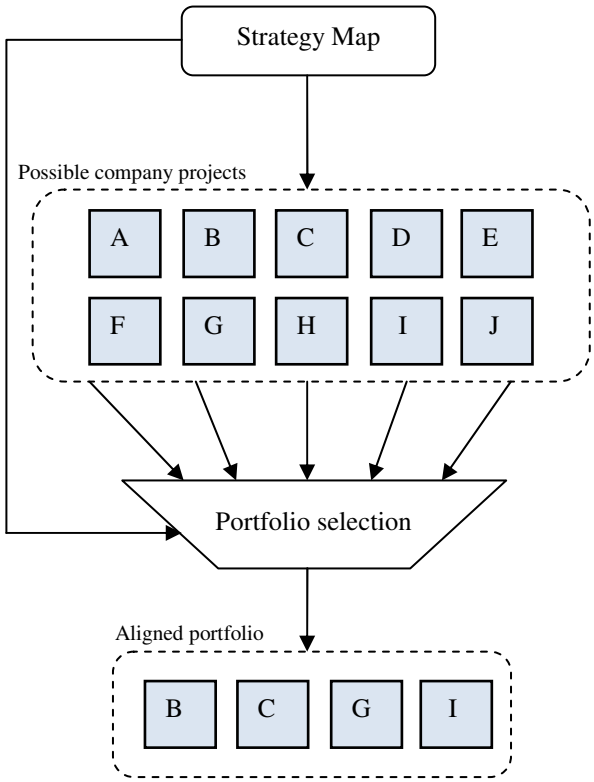

Figure 3: Process supported by the system

3 Strategic Portfolio Selection Tool

The developed tool was designed to simplify the modeling of corporate Strategy Map and support the selection of aligned portfolio according to this map. To ensure availability the tool was developed for the Web, over the Django framework [15] in Python 2.6 programming language.

The tool was divided into four interdependent modules that mirror the selection process outlined in the previous section. The first module aims to provide a tool to create and edit Strategy Maps that is both simple and visually rich. The second module aims to assist in the pairwise comparison of strategic objectives and application of AHP to determine the alignment of each listed project. The third module is responsible for applying budget and personnel constraints and submits the top three portfolios that maximize the alignment within the company's capability. The fourth module wraps the system by analyzing the behavior of users in its use, collecting feedbacks and generating administrative reports. Figure 4 illustrates the architecture of the tool.

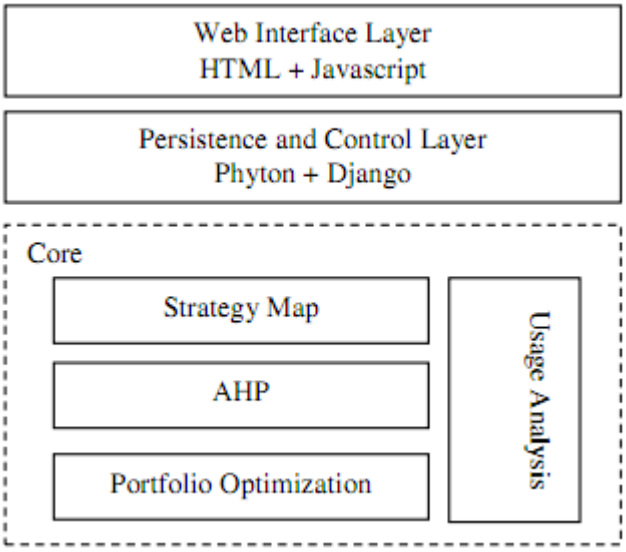

Figure 4: Architecture of the tool

A. Strategic Mapping Module:

The strategic mapping module was developed in order to support collaborative work on the Map being built. Multiple users can simultaneously view and change the map using its WYSIWYG interface.

The module supports the creation of strategic objectives represented by boxes; relationships represented by arrows and perspectives represented by regions bounded by horizontal lines. New perspectives can be created, but by default, it is suggested the use of BSC perspectives. The assign of metrics for monitoring is not supported by the module since monitoring the implementation of the strategy is beyond the scope of this paper. Figure 5 shows a screenshot of the tool being used by a company that participated in this work.

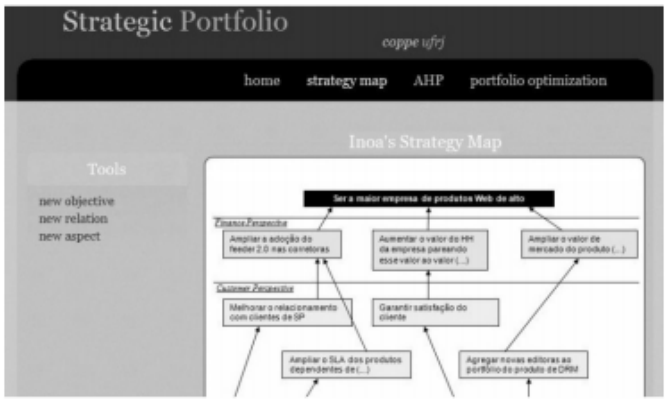

Figure 5: Building a Strategy Map

B. AHP Module:

In the second module users have to compare by pairs the strategic goals listed on the Map. For each comparison it is used the subjective scale of importance suggested by Saaty [13] and illustrated in Table I. The scale uses odd numbers from 1 to 9 mapped into degrees of importance to determine how relevant an objective is over another. For instance, if a user claims that the goal "maximize the use of resources" is more important than the goal "increase sales of premium products", the system will interpret this information as the first objective being seven times more important than the second one.

The module supports the creation of strategic objectives represented by boxes; relationships represented by arrows and perspectives represented by regions bounded by horizontal lines. New perspectives can be created, but by default, it is suggested the use of BSC perspectives. The assign of metrics for monitoring is not supported by the module since monitoring the implementation of the strategy is beyond the scope of this paper. Figure 5 shows a screenshot of the tool being used by a company that participated in this work.

TABLE I
SCALE OF IMPORTANCE

Importance Degree	Definition
1	Equal Importance
3	Moderate Importance
5	Strong Importance
7	Very Strong Importance
9	Extreme Importance
Reciprocals	If an activity *i* has a importance degree of *k* over another activity *j* is reasonable to assume that importance degree of *j* over *i* is *1/k*.

Users then must assign the importance of each project in face of each strategic objective. This evaluation process is costly and may take several days, as shown during our implementations described in Section IV. To preserve the work done, the system constantly saves the state of the comparisons if one may want to postpone the work.

Since comparisons of criteria are being dealt with and some of them are often subjective, it is common that some mathematical inconsistencies are made. Someone may like bananas better than oranges, oranges over grapes but prefer grapes over bananas. This type of inconsistency affects the alignment calculation and in order to monitor it for all comparisons, the Consistency Ratio (CR) is constantly displayed on the screen. The CR is calculated according to Equation I.

$$\begin{cases} CR = \dfrac{CI}{RI(n)}, \\ CI = \dfrac{\lambda_{max} - n}{n-1} \end{cases}$$

Equation 1: Consistency Ratio

Where CI is the consistency index, λ_{max} is the highest Eigenvalue of the comparison matrix, n is the matrix comparing the strategic goals with each other and RI(n) is a random consistency index, experimentally obtained by Saaty [5]. Therefore the rate of consistency tells us how close the assessments are to the random evaluations, keeping users alert to the quality of assessments that are being performed.

After all assessments are performed the system executes the AHP algorithm, getting the alignment of each of the projects listed. From this data the system will run the next module, combining projects to the formation of portfolios with greater alignment within the possibilities of company resources.

C. Portfolio Optimization Module:

This is the final step in determining the company's portfolio. Managers should inform which organizational units are involved in each project, their budget and staff constraints. The system will them point out the projects portfolio that is more closely aligned to the strategic goals through a combinatorial algorithm based on brute force. The use of a simple but costly algorithm is justified since performance is not a requirement to the work.

This module's result is three possible portfolios and an alignment chart shown in Figure 6. The graph shows an alignment vector that represents the company's strategy with a pair of goals as each axis. It also shows the portfolio chosen illustrated with various vectors and a resultant one, allowing the manager to compare his intended strategy to the one that would potentially be realized, reflected in the portfolio.

D. Usage Analysis Module:

The usage analysis module seeks to gather information concerning the system use. Regarding the Strategy Map, the module collects: the numbers of elements created, amount of changes, deletions and the user responsible for each one of these activities. Regarding the AHP Module, all changes are stored, seeking the understanding of the user's navigation flow. For instance, a manager may have revised their assessment of a project in a certain strategic goal just after assessing other project. It is interesting to know witch project was revised after the other. The Usage Analysis Module computes the change as a comparative rectification. A comparative rectification can be positive when the amended assessment is increased or negative, when the rectified evaluation value decreases. Lastly, within the Optimization Module the information collected tries to determine which of the objectives (axes of the graph) were preferred by managers in their analysis.

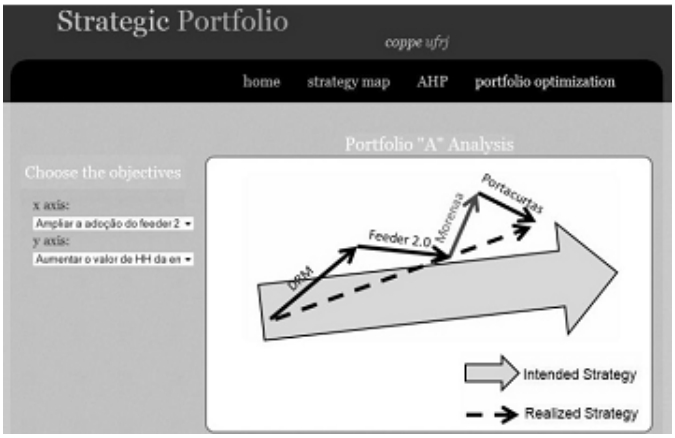

Figure 6: Analysing the alignement of a portfolio

4 Tool Application and Result

The tool was applied in three different small Brazilian companies that work in the area of information technology, have less than two years of existence and did not have any formalized strategy. For privacy and security reasons we will address those companies as Companies A, B and C. .

1. Company A: a software factory that develops stock market applications, but supplements its budget with external projects in several areas.
2. Company B: company that provides DRM services for e-book stores and publishing houses in Brazil. As the market for e-books in Brazil is still incipient inflow of investment projects were prioritized.
3. Company C: the first Brazilian e-book store. Its biggest challenge has been identify a good marketing strategy to stimulate the formation of a market for e-books in the country.

The application of the tool happened as follows: first there was a brief training course on corporate strategy and the notation used in Strategy Maps. Then, participants were invited to use the tool to map their strategies. From the map, using pairwise comparisons, each strategic goal was prioritized. Then, with a list of possible projects, they applied the AHP. Finally, the optimization module ran and the result was analyzed. The entire process was monitored by the Usage Analysis Module, and an interview was conducted with participants to obtain feedback on the outcome of the experiment. The data extracted by the Analysis Module usage are condensed in Table II.

Since none of the surveyed companies had a formalized strategy, the discussions were intense, especially in Company A that has six associates, with disparate visions for the future of the company. This can be seen on Table II through the time to construct the map and on time spent on the evaluation of projects. But, precisely at this company, the tool showed its highest value. After creating the map, the company's vision

was defined and a shattered vision converged in only one direction.

TABLE III
SCALE OF IMPORTANCE

	A	*B*	*C*
# strategic goals	14	8	22
# map revisions	32	10	7
assembling time of the map (in hours)	21	12	15
# of projects	9	6	7
# positive rectifications	13	4	3
# negative rectifications	36	17	21
evaluation time (in hours)	27	8	20
# of approved projects	5	4	6
time to approve the portfolio	6	10	4

In the case of Company A, almost half of the projects (four in a universe of nine) were discarded. This happened because some of the associates had prospected multiples small projects in order to ensure the survival of the company. But, during evaluation, the associates have concluded that to invest more in projects in their own market niche (stock market software) would be a worthwhile competitive advantage in long-term.

An opposite situation happened on Company B. Since they have a strong and cohesive administration, we saw a few revisions in both the map and in the evaluation of projects. The company also registered the lowest usage time to obtain the portfolio.

As for Company C, what we watched was a more mature relationship with their strategy. So they built the largest map with twenty two strategic goals in a relatively short time. However, because of the size of the map, the assessment time was high, given that each project had to be evaluated from the perspective of all the twenty-two goals. It is possible that fatigue and lack of stimulation contributed to the results.

In all three companies we can observe a considerably larger number of negative rectifications. We may infer that this characterizes an optimistic behavior by managers at the beginning of the evaluation, but a pessimist on the end. In other words, the first project evaluated tends to receive higher evaluations. However, during the process, projects of major importance arise and managers are forced to reduce the degree of importance assigned previously.

It was also observed that, despite the collaborative capability of the tool, the three companies have chosen to centralize the handling of it through the figure of a facilitator. During the meetings, the discussions happened, while only the facilitator operated the system.

5 Conclusion

We developed a tool to assist in structuring the Strategy Map of companies and, from this map, select its project portfolio. The tool has been applied and validated in three small Brazilian companies operating in IT and allied sectors. The usage of the software and the supported process was monitored by a Usage Analysis Module. We also performed an interview with the participants so they can evaluate the tool and process.

The multiple pairwise comparisons, inherent to the AHP were very criticized for being boring and grow exponentially with the size of the Strategy Map. However, participants were unanimous in considering the value of the tool. From the portfolio aligned, managers agreed that they can better predict the direction of their businesses, assess the risks present in their paths and identify gaps in their strategies.

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A New Virtual Hardware Laboratory for Remote FPGA Experiments on Real Hardware

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Abstract— *E-learning systems become more and more important in higher education. But a lot of e-learning courses are only based on theory or simulations, making them inefficient and also uninteresting for students. Especially in the field of computer engineering, the experience of using real hardware is very important for the understanding of it. Therefore, we propose a virtual hardware laboratory where students are taught in circuit design, can simulate and finally test their designs on real FPGA (Field Programmable Gate Array) hardware via a remote connection. In this paper, we present the requirements for such a virtual laboratory, how we built the system and how it can be used. Finally, a complete e-learning course called FPGA online with practical exercises in an online laboratory was created and is now part of the Virtual University of Bavaria (vhb).*

Keywords: e-learning; virtual laboratory; FPGA Design; Remote Experiments; Circuit Design

1. Introduction

The teaching of students in digital circuit design is a very hard and time consuming task. First of all, most students need quite a lot of time to understand the differences between a programming language and a hardware description language (HDL). Furthermore, the development and desktop environment for hardware design is very difficult for beginners. One way to get familiar with hardware development, is the usage of so-called FPGAs (Field Programmable Gate Arrays) which are a type of reconfigurable devices. They can be used to implement and test arbitrary hardware cicruits and have been used for prototyping purposes in hardware design for several years.

An e-learning course about FPGA development with only theoretical background is not sensible, first of all for FPGA beginners. Therefore, we decided to realize an e-learning course with an online laboratory, because efficient learning in the field of hardware development requires a mixture of theoretical and practical exercises [1]. The reason is that for hardware engineering it is not sufficient to simulate hardware circuits only, because the real hardware behaves different from simulation [2], [3].

There are a lot of advantages for such a course. The students can work at home with their personal computers with individual operating systems, editors and so on. They have access to the hardware of the laboratory 24 h a day. The laboratory can be realized very compact which saves a lot of space and also staff costs are reduced.

The advantages of e-learning systems are not new and e-learning in the field of engineering is used by a lot of other universities until now [4], [5], [6], [7], [8], [9].

But many of such e-learning courses are only theoretical or simulation based [10]. In order to realize a sensible e-learning course in the field of engineering and to take advantage of the reasons above, we decided to build an online FPGA laboratory for remote access, which we will present in this paper. The FPGA boards are connected to a server at the University and will be programmed by the server. The FPGA boards are monitored via cameras to see the state of the boards, e.g. blinking LEDs or information on an integrated display. To realize input signals by the user, an additional IO board is connected to each FPGA board. The advantage of such a system is that a few boards can be shared between lots of students, because not all students need a board at every time. Furthermore, the boards are protected from incorrect handling. The whole system is supported by a webportal for the lectures, exercises and tests. It is realized with the Open Source tool *Moodle* [11] used as Course Management System (CMS) and the lessons were created with eLML (eLesson Markup Language) [12] which is an Open Source XML framework for the realization of structured eLessons.

The paper is divided into five sections. In the next section we describe the requirements of such a system and how to meet them. Afterwards, the creation of the e-learning content together with the used tools are presented. Section four describes the architecture of the system in a brief form. In the fifth section, the implememtation details are discussed. Finally, a conclusion and outlook are given.

2. Requirements

For creating a new virtual hardware laboratory, it is important to fulfill some requirements. In this section, we will present the requirements which are most important for our e-learning course.

2.1 Learning Content

One of the biggest advantages of e-learning systems is that they are available 24 h a day. To realize this, the content should be provided on a webserver with the help of a CMS. The CMS should support subjects, excercises and tests. The content should be available in different output formats for presentation on the web, but also for printing a hard copy for the students. Besides, if possible, all this should be done automatically to avoid a time consuming human interaction. Finally, to build a low cost system, the used tools should be Open Source and the content must be accessible with free and common tools (for example common browsers and PDF viewers). Because circuit design is a difficult task, it is neccessary to offer a direct help from a teacher. Therefore, a consultation hour via VoIP should be arranged. Additionally, mailing lists, a forum and also a chat for discussions should be used, for an efficient interaction with the students.

2.2 Technical Requirements

As mentioned in Section 1, it is important that the students can work at home on their local computers. Hence, the tools for the practical exercises have to be installed locally by the students which has a big advantage. There is no need for a powerful server for hardware development which is also very important for the scalability of the system. But to realize this, the tools for practical exercises have to be available for the students for free and should be installable on different operating systems.

For an interaction with the FPGA boards via a remote connection, we decided to use a monitoring with a camera system. Hence, there are additional requirements, because a connection via the internet is slow and has a big latency. Therefore, we have to choose a sufficient video codec which requires a low bandwidth only, but allows a monitoring of the board in a sufficient quality.

A last important point is the access to the FPGA boards via a remote connection. The user must be able to set inputs to the FPGA board. Normally, this is realized by the push-buttons and switches of the boards. But this is not possible with a remote connection and must be emulated. Hence, an additional *IO board* is required, which is connected to a FPGA board and can be controlled via HTTP. It allows to send signals to the interface of the FPGA board for an emulation of the pushbuttons and switches.

2.3 Resources Management

For the management of the online laboratory, a server with a resource-management-tool is required. Because we have choosen a Linux server, we have implemented this tool as deamon, which we call *VHBD (Virtual University of Bavaria Deamon)*. The main challenge is to arbitrate the access from many users to a limited number of boards. Every student should get the chance to use a board and after the usage, the access to the board has to be released. It is very important, that there is no possibility to block a board for a greater amount of time. After a fixed time slot, a user should be banned for a short amount of time.

For a remote connection, the topic of security has also be attended to. The VHBD has to be secured for incorrect access and in the best case, it uses security mechanisms of the underlying OS, in our case a secure Linux system. Finally, the deamon should generate logfiles and statistics.

3. e-Learning Content

3.1 E-learning Infrastructure

The efficient creation and refurbishment of the e-learning materials plays a very decisive role in an e-learning course. Sustainability and longevity of the e-learning content and infrastructure is essential [13]. The content and infrastructure must be easily extentable, modifiable and also scalable for an arbitrary number of users. For the e-learning material it is important that different types of output formats are available, like a presentation for a website or a printable document format. It was also important for us to use Open Source software and tools to reduce the overall costs. Therefore, we decided to use the *eLesson Markup Language (eLML)* which is an open source XML framework for creating structured eLessons using XML [12] in combination with *Moodle* as a Open Source *Course Management System (CMS)* [11]. In the following, we will take a closer look at eLML, Moodle and we will give an overview of the content of our basic FPGA course.

3.2 eLML

The eLesson Markup Language (eLML) is a XML based framework and was published as an Open Source project under the GPL [14]. The pedagogical concept behind eLML is the *ECLASS* model from Gerson [15], where *ECLASS* is an acronym for *entry, clarify, look, act, self-assessment* and *summary*. This model was combined with a lot of other important elements which makes eLML very flexible for the creation of e-learning courses. The top-level elements of the eLML structure are illustrated in Figure 1 [12].

Every lesson starts with the element *entry* with a short introduction about a lesson and the element *goals* with a summerization of the learning goals for this lesson. The content of a lesson is distinguished in several *units*. The elements *entry* and *goals* are provided optionally for units. Every unit consists of *learningObjects* which are described with the elements *clarify*, *look* and *act*. The *clarify* element contains the theoretical background of a topic, the elements *look* and *act* can be used for the presentation of an example. A lesson can be finished optionally with a *selfAssessment*, *summary* and some other elements, like *glossary* or *bibliography*. All dahsed boxes of Figure 1 are optional features of eLML.

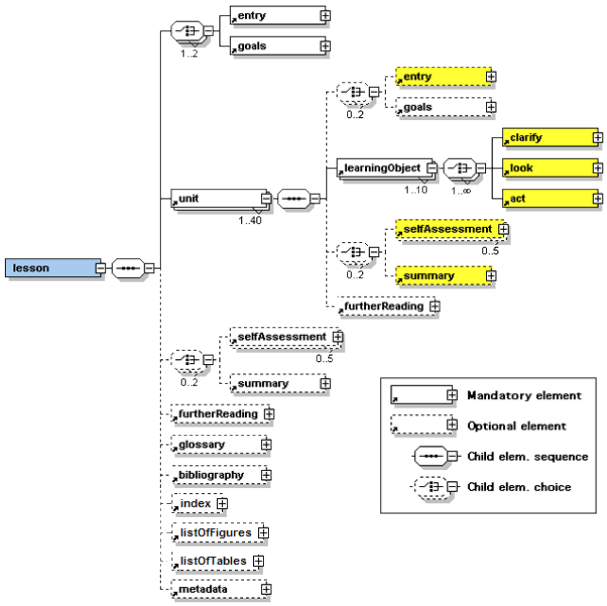

Fig. 1: Basic eLML Structure

The main reason for using an XML framework is the availability of different output formats which is mandatory for an e-learning course. By XSL Transformation, the XML description of the material can be transformed to (X)HTML for an online presentation on a webserver or to PDF as printable document. Furthermore, eLML provides the formats *SCORM* and *IMS CP* for the integration in a Course Management System (CMS) like Moodle.

3.3 Moodle Server

Moodle is an Open Source Course Management System (CMS) [11]. Nine different e-learning platforms were analyzed in detail in [16] and Moodle obtained the best results. It can be installed on a webserver and provides an interactive platform for the e-learning materials. It contains also a discussion forum, a calendar, a news section and a Wiki. Furthermore, Moodle supports a lot of additional plugins and a user can write own modules in PHP. So far, there are several thousand registered sites which are using Moodle [17] as CMS.

3.4 Extend eLML and Moodle Server

For our practical circuit design course, we required VHDL source code examples in the content of the lessons. But eLML provides only a simple *code* environment and does not support source code with syntax highlighting. Also the usage of colors, for a manually formatting of source code, is not supported. On the other side, it is not a good practice to use source code screenshots in the content because there is no possibility to mark or copy code subsets of the examples.

Therefore, we extended the standard eLML package by creating new rules in the transformation scenarios for html and pdf. A code environment was added and we implemented XML tags for colors, a non-breaking space and a line wrap. With these new features, it is possible to format the VHDL source code manually. But this is complicated and very time-consuming. Therefore, we developed a tool which transforms a given VHDL code file, into well formatted XML code. In this process, every space is converted in a non-breaking space to allow indenting. Special VHDL keywords are embedded between color tags to realize syntax highlighting which results in a clearly arranged code. The transformation tool is written very flexible and uses regular expressions and color patterns in external configuration files. This allows an easy adaption for other programming languages, like C code which is required by us for another online course. After the XML file, which contains the well formatted source code, was produced, it can be integrated in a lesson utilizing XInclude [18].

To publish a lesson on the Moodle Server, several steps are required. First, the XSL transformation and generation of so called IMS content packages from the transformation results has to be realized. After that, the package has to be uploaded to the server and, finally, the package has to be deployed via the web interface. Doing these steps manually for every lesson is a very time-consuming task. To automatize this procedure, it was necessary to write some scripts which execute the tasks above, every time the sources on our repository were changed. In this context, the big challenge was the deployment of the IMS packages, because commonly, this can be done only via the web interface. Therefore, we have written a new plugin for the Moodle Server which allows an autodeployment of changed packages.

3.5 Course Content

Our e-learning course, which will be provided by vhb, is a basic course for FPGA beginners. It is intended for bachelor students but also for employees which are interested in using FPGAs for hardware development. The course starts with an historical overview about programmable devices. After that, the basic structure of an FPGA is presented in detail. In our course, VHDL (Very-high-speed integrated circuits Hardware Description Language) is used for designing hardware circuits for FPGAs. Therefore, we integrated some compact lessons about VHDL in our course. After that, the design flow is presented together with important information about the tools and the hardware infrastructure. In the main part of our course, several important hardware circuits are presented, how they have to be described in VHDL and how they are mapped to resources of the FPGA. In the practical excercises of the course, the students have to implement some of these circuits and test their designs in the online laboratory.

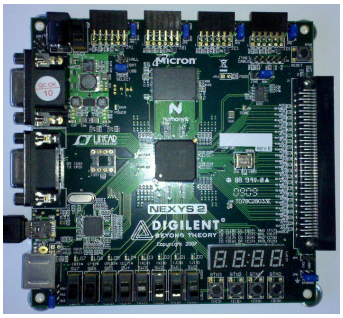

Fig. 2: Digilent Nexys2 FPGA Board

3.6 Development Tools

The FPGA board, which is used in this course, contains a FPGA from the manufacturer *Xilinx*. Xilinx provides the free tools *ISE Webpack* and *ISim Simulator* for FPGA development. Hence, the students can install these tools and implement their FPGA designs at home. Also the simulation can be performed at their local computers at home. The testing of realized hardware circuits is done via a remote connection at the online laboratory.

4. Architecture

After defining the requirements and presenting the content of our course, we will present our hardware system in more detail in this section.

4.1 FPGA Boards

For our course, we have choosen the *Nexys2* board [19] from the manufacturer *Digilent*. The Nexys2 board (see Figure 2) contains a modern and low cost *Spartan3E* FPGA [20] from Xilinx. The big advantage of the board are the visual outputs. It contains a 4-Digit 7-Segment display and 8 LEDs, which can be controlled easily by the user. Therefore, the students can get fast successes with simple hardware circuits e.g. adders and multipliers. The board contains also inputs e.g. switches and pushbuttons, but they can not be used remotely and have to be emulated, utilizing an additional IO board (later more). Normally, the board can be programmed via the JTAG interface of the board. This interface is also connected to a *Cypress FX2* [21] chip for a USB connection. This connection is used for a remote programming of the boards.

4.2 IO Boards and Connector Boards

For a user interaction with the FPGA board, the so called *IO board* (see Figure 3) is used. It is a *Celeritous PICWEB* board [22], hosting a small webserver. Through a remote connection to a webpage of this server, the user has access to a virtual interface for the FPGA board. A connection to the board is established via the onboard ethernet interface and the power for the board is provided by a USB connector. To meet our requirements, the original webserver of the IO board was adapted by us for an emulation of the pushbuttons and switches. This was accomplished by reprogramming the *PIC* microcontroller with a special *PIC Programmer*.

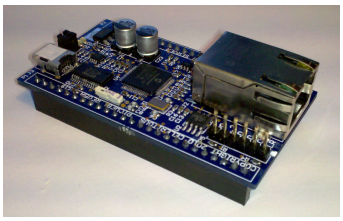

Fig. 3: Celeritous PICWEB IO Board

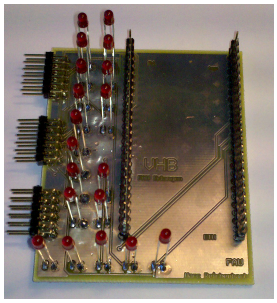

Fig. 4: Connector Board beween FPGA Board and IO Board

To connect the IO boards with the FPGA boards, a connector board was designed by us which is shown in Figure 4. This board contains no logic, it only connects the IO Pins with the FPGA pins. With integrated resistors, this connection is short circuit protected which secures the hardware in case of a incorrect handling by the students. An additional LED per wire was added, to allow the student to observe the state of a wire.

4.3 Webcams

For a monitoring of the hardware, a video stream will be sent to the user. To capture the video data, a low cost webcam from *Logitech* is used. The Logitech webcam C500 [23] has an integrated 1.3 mega pixel image sensor. With 30 frames per second at a resolution of 1280×1024, it is fast enough and the quality is sufficient for our purposes. The webcam uses an usb interface for a universal and easy use.

4.4 Server and Deamon

We require two server systems for our course. The Moodle server provides the e-learning content, as described in Section 3.3. The second one is a resource management sever (RM Server), where all FPGA boards, IO boards and webcams are connected. The VHBD is installed on this server and runs the tasks, described in Section 2.3. Additionally, it compresses the video stream to reduce the transmitting latency. Hence, a more powerful server was required which is in our case a Intel Core i7 870 @ 2.93GHz CPU with 4 GB RAM. Because several boards and webcams

Fig. 5: Overall System

are connected to this server via USB, it contains additional USB cards, providing 30 USB slots.

4.5 Physical Architecture

The physical architecture of our system is shown in Figure 5. On the top, there is the RM server with a monitor and a keyboard for simple debugging and maintenance. On the bottom, 10 FPGA boards, connected via the connector boards to the IO boards, are shown. Above the boards, the 10 webcams are mounted and every camera monitors one FPGA board. For an optimal illumination, there are two fluorescent tubes mounted in the box. Additionally, there is a switch on the left side of the box which connects the IO boards via ethernet with the RM server. The box has as small dimension of $80 \times 80 \times 150$ cm. and stand on rolls, for flexibility and an easy movement.

4.6 User Workflow

We have defined all system components and want to explain now, how a user can work with the system. Initially, he has to install all required tools on his local desktop computer. Then, he has to login on the moodle server and study the relating session content together with exercises and tests. After that, he writes VHDL code and implements a FPGA design with the tools installed on his computer. He has to generate a programming file for the Nexys2 board. The user has to login on the RM server and to upload the generated programming file. The VHBD programs the board and shows an address of a video stream and a website for the IO board input. The videostream can be watched in an arbitrary video player and the inputs can be controlled via a browser. All steps are fully OS independent and very easy to perform. As desired, all single steps could be plugged together in a common web interface.

5. Implementation

5.1 FPGA Boards

5.1.1 Programming the Boards using UrJTAG

One of our requirements was that only Open Source software and tools should be used on our servers if possible. Xilinx delivers with the ISE Webpack a programming tool called *impact* [24], as freeware but Closed Source. But this tool is only compatible with the *Parallel-JTAG-Programming-Cable* which uses a parallel port. For programming the board via USB, a special software from *Digilent*, the so called *Adept Suite* [25], is required. But this tool is also Closed Source.

An Open Source tool called *UrJTAG* [26] is available for Linux based platforms. The problem is, that no driver exists for the Nexys2 board. But by reprogramming the Cypress FX2 chip on the FPGA board, it can be adapted and programmed via UrJTAG. This problem was already identified from other Nexys2 users and they have developed a new firmware for the FX2 chip [27] which emulates a USB Blaster device from Altera [28]. In conclusion, the JTAG ports from the FPGA will be controlled by the new firmware which emulates an USB Blaster interface.

Now it is possible to program the FPGA with UrJTAG, but with one restriction. UrJTAG chooses the right driver according to the vendor and product IDs (VID/PID). After reprogramming the FX2 Chip, all FPGA boards have the same VID and PID. Hence, a distinction between the single boards is not possible. To solve this problem, we created for each FPGA board an own firmware with an unique VID/PID. This allows to set a special enviroment in UrJTAG which is able to identify the correct boards.

For the creation process of the FX2 firmwares, some scripts have been created by us which automatically replace the PID/VID from the FX2 source code and, afterwards, compile it with the *sdcc* [29]. As VID the free ID 0x2357 for the Friedrich-Alexander-University Erlangen-Nuremberg (FAU) was choosen to avoid conflicts with other devices. The PID counts up, from 1 to n.

5.1.2 Identification of the Boards

As mentioned before, the boards can not be distinguished by the server before reprogramming the FX2 chip. Also the serial number is zero at any time when new usb devices are detected. Hence, the server has no idea, which board is dedicated to a camera, respectively is connected to which IO board. To solve this problem, every FPGA is programmed, after reprogramming the FX2 chip, with an unique circuit which outputs the PID via the IO Pins to the IO board. Because the IO board has a fixed IP address, every IO board can be read out by the server to get the unique ID. In conclusion, it is possible to distinguish the boards and to determine the assignment of every board to a webcam. This problems occurs only at a startup or restart of the system

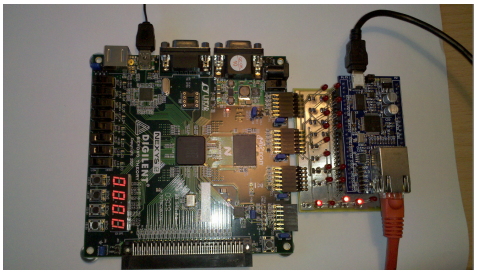

Fig. 6: FPGA-, Connector- and IO Board

and will not occur during application. The induvidual circuit generation for the FPGAs is also done fully automatically, by replacing the specific lines in the source code, afterwards, synthesizing and implementing it to a FPGA programming file.

5.2 IO Board and Connector Board

There are three features, we had to implemented to fit our requirements. First of all, it has to be possible to write and read values from specific pins of the *IO board*. As mentioned before, the webserver of the IO board had to be adapted accordingly. As described in the previous section, the board IDs can now be read via a http-request by the server. To set the values of the input pins of the FPGA, the user has to connect to the webpage on the IO board and to set the emulated switches or pushbuttons on the virtual interface of the webpage.

Secondly, a major problem is the authentication of the users. Only the inputs of the board, which is assigned to the user, should be changeable. Therefore, the concept of *Session IDs* has been introduced. A random alphanumeric sequence of characters is set as key, to control an *IO board*. Without this sequence, which can be set to an arbitrary length, the user can not access the webpage and set the inputs. When a board is assigned to a user, the daemon generates a *Session ID* and initializes the specific *IO board*. The ID is then part of the URL of the *IO board* which is send to the user. Only requests with the proper session are allowed. To set the *Session ID* of the *IO board* itself, a master password is needed as part of the URL. This master password is also required when requesting the board ID. Thus, only the daemon can assign the *Session ID* and request the board IDs and only the user, to whom the board is assigned, can control it.

A third feature are time constrained input signals. To generate inputs e.g. according to the PS/2 protocol which is required for some of the exercises, a sequences of inputs is required which is time constrained. Therefore, a sequence generator has been implemented which produces PS/2 protocol sequences out of user input characters submitted via the web interface.

For the connector board, we have developed an own PCB Layout. It was manufactured in a two-layer technology and only contains some wires and for every wire an indicator LED. Figure 6 illustrates such a board, connected on the one side to the *PMOD* connectors of the FPGA board where resistors for short circuit protection are integrated. On the other side, it is connected to the IO board. The connector board for the connection of the FPGA and the IO board contains wires for the emulation of 8 Switches, 4 Pushbuttons and 2 wires for the PS/2 protocol emulation. The board contains also 4 additional LEDs for the monitoring of the board identification and one power LED.

5.3 Server and VHBD

For using a secure and flexible system based on Open Source, the resource management server is running on *Gentoo Linux*. The VHDB is written in C and is installed on the server. Thereby, all critial system tasks, like user management, are done with the help of the operating system. This results in a very stable and secure system.

All resources come together at the VHBD. When the daemon is started, it reprograms the FX2 chips on the boards, followed by a reprogramming of the FPGAs and identification of the boards, as mentioned before. Then the server waits for user interactions. If a user wants to program a board, the server looks for the next free board, assigns this board to the user who has access to the board now. The user gets a Session ID and has a fixed amount of time for experiments. If the time is over, or the user has logged out, the board will be released and can be assigned again to a requesting user. If a user requires more time, he has the possibility to extend the current experiment session. Some other scenarios are implemented, too. For example, a user is able to allocate a board for a specific time period. If the user is logged in at this time, an allocated board will be assigned to him.

The VHBD is programmed in a very modular manner. That means, every component of the system is an own process which communicates via IPC e.g. pipes. Hence, the system can be easily extended with more boards and maybe more servers. Then, only the pipes have to be replaced by sockets. Such a system is currently developed in cooperation with the University of Passau. Additionally, such a multi-process system allows a high degree of independence between the processes. Since every user has his own process, many users can work on the system in parallel.

The Server has two network interfaces. One is connected to the internet, where the students can connect to the system to use the VHDB. The other interface is connected internally to the switch, where all IO boards are connected. If a user wants to make IOs for a special IO board, the request is always sent to the RM server. With the help of IP tables, the request is transformed and will be forwarded to the choosen IO board. By means of this feature, we are able to save public IP adresses.

5.4 Cameras

The webcams are connected via USB to the server which also has the problem to distinguish the different cameras. But this distinction is easier than the distinction of the FPGA boards, because every used webcams has a unique serial number. After plugging in a camera, a new device (/dev/videoX) is automatically created. With the help of *udev* [30] and some rules, it is possibe to create logical mappings from the physical devices /dev/videoX to logical devices /dev/vhbcamx which are now in the right order. Hence, the daemon knows for example, that /dev/vhbcam0 is always the bottommost left camera.

The devices will be controlled with *video for linux 2* (v4l2) and streamed utilizing a video lan client. We have choosen a MPEG-2 encoding with a variable bitrate of 400 kbits/sec. This leads to a low required bandwidth with a sufficient video quality.

6. Conclusion and Outlook

In this paper, we presented a new remote FPGA hardware laboratory for our e-learning course *FPGA online*. Because of the available practical exercises in the online laboratory, the students can learn important basics in circuit design more efficiently by testing their circuits on real hardware. Because of a modular structure, our system is secure, flexible and can be easily extended for a greater number of users. The initial costs for creating the course and the operating costs were greatly reduced by the consistent usage of Open Source software for the e-learning content and also for the online laboratory.

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Design and Implementation of RVLT: Rich Virtual Learning Tool

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Abstract - *The design and implementation of the e-learning system called Rich Virtual Learning System (RVLT) is presented based on the architecture of Web Services. The fundamental components of Web Services are briefly summarized. Then the prototype of RVLT is presented*

Keywords: Web Server & Client, XML, SOAP, WSDL,UDDI

1 Introduction

In a technologically oriented society, it is very common that students work full time and work on advanced degrees in the evenings. Often times they cannot make it to classes on campus due to business trips and other complications at work. Consequently online classes have been extremely popular among working professionals. They can access lectures and assignments through the internet at their own convenience. Online courses have become feasible only after internet and web services were introduced. In this paper we will present the design and implementation of the Rich Virtual Learning Tool (RVLT) which is based on the client-server model, the core of Web Services using Rich Internet Applications (RIA).

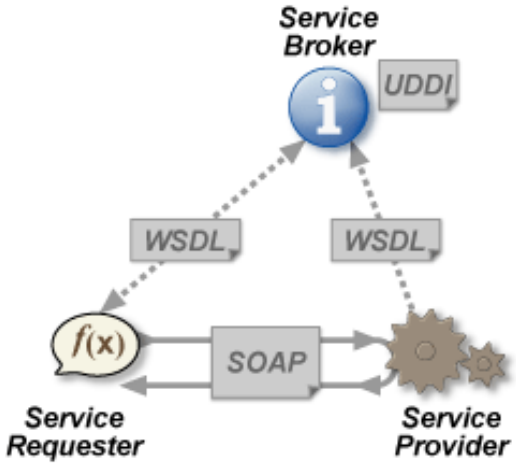

Figure 1: Web Service Components [3]

2 Web Services Architecture

As Figure 1 illustrates, Web Service architecture [1, 2, 4] consists of three major components: Service provider (server), service requester (client), and service broker (UDDI). The service provider or server registers a particular service with the service broker (UDDI) in Web Service Definition Language (WSDL). The service requester (client) looks up the broker's registry (UDDI) for the availability, location, parameters for the service. When they are available, the client sends the request for the service to the server using SOAP or other communication medium.

2.1 Web Server

The primary function of the web server is to register the service with UDDI in WSDL. Once the service is registered, it continuously listens for the request of service from a client. The communication between the server and the client is achieved through the HTTP protocol.
Therefore, it fits into the XML Messaging layer and the Transport layer since the SOAP message needs to be transported over the HTTP protocol. The WSDL (Web Services Description Language) is located on the web server. The Web Server provides a mechanism for service consumers to refer to the WSDL specification. By providing a WSDL file reference as a URL in the UDDI registry, service consumers can locate the WSDL through the URL, download the WSDL, and interpret it to determine the services supported by the organization.

2.2 Web Service Client

The web Service client is the consumer of the Web Service. Web services are platform neutral, so the client can be written in any of the mainstream programming languages such as C++, C# and Java. The first step that the client performs is to locate the service and obtains the calling information from UDDI. From the UDDI information, they retrieve the WSDL URL reference and download the WSDL document from the publicly accessible URL. Once the service consumer has obtained the WSDL file they have the appropriate information needed to invoke the Web Service. The information that will be present in the WSDL file will be the methods in the Web Service, parameters for the Web Service.

2.3 XML[5, 7]

Extensible Markup Language (XML) is an extensible, non-proprietary text-based markup language that has become the standard for data interchange on the Internet within distributed applications and web services. XML can provide the underlying content and structural standards to enable the rapid development of services and applications.

XML is superficially related to Hypertext Markup Language (HTML). Data structures are defined as means of element and attribute tags wrapped around data content. These tags are known as markup.

The main advantage of XML is the extensibility. XML is a meta language that can be used to define customized markup for numerous types of documents and data files. XML differs from HTML in that XML tags primarily identify data content and structure. XML's resemblance to HTML comes in the tag structure contained in angle brackets (<….>).

There are many reasons why XML is playing such important roles in web services and distributed applications in general.

Plain Text: Because XML is not a binary format, you can create and edit files using standard text editors to a visual IDE (integrated development environment). As mentioned above, XML content can be processed with any number of clients and tools because it is non-proprietary.

Extensible – You can extend XML technology limitlessly, defining markup and rules as need for the kinds of data and information you use.

Data Identification – XML identifies what kind of data you have, not how you display the data (like HTML). Since it focuses on delimiting the data, it can be processed programmatically

Stylability – The XSL (XML style sheet standard) lets you define how to renter your content.

Modular Reusability – XML documents can be constructed from separate external entities. This lets you modularize your documents and single source sections.

Linkability – Through implementations of the XLink specification, hyperlinks in XML documents can be far more sophisticated than those in HTML documents. Things such as two-way links, multiple target links, and "expanding" links (clicking a link will allow for the information to appear inline), and links between two existing documents that are defined in a third.

Easily Processed – By using structured consistent, well-formed markup, it is possible to design XML based structures that can be processed programmatically. You can use a wide range of XML parsers, tools and processing models since XML is vendor-neutral.

Hierarchical – The hierarchical, node-based structure of XML documents lends itself to faster processing, searching and dynamic construction and rearrangement. Parsing a well-formed XML document is mostly a matter of stepping through the branches of a tree until you get to the nodes that are required.

2.4 SOAP

As mentioned earlier in this paper, it is possible to message between systems strictly using XML. However, because of the lack of messaging standards a SOAP (Simple Object Access Protocol) protocol has been developed to transfer message content between the service requestor and service provider.

SOAP is defined as a lightweight, text-based wire protocol used to encapsulate serialized data in an XML wrapper. The SOAP standard provides the following:

- Data encoding rules
- Extensible packaging structure for messages
- Strategy for binding SOAP messages to a transport protocol

The above mentioned provides a message exchange infrastructure for the messaging gab between applications. With SOAP, data is encoded in human readable, XML format, and not binary.

2.5 SOAP Specification

A SOAP message must be bound to a transport protocol for transport across the wire. You can bind a SOAP message to any transport protocol that supports the transmission of XML based messages. HTTP is the most common protocol used. Currently SOAP specification 1.2 has been recommended by the W3C.

2.6 WSDL

One of the key advantages of Web Services is the ability of applications to communicate with each other over the internet, despite being written in different languages.

It is required that there is a way to describe the external service, such that an application can dynamically bind to a service. This needs to be done in such a way that it is independent of platform or programming language. The Web Services Definition Language (WSDL) sets out to define a system for describing services. The language specification contains an XML Schema that describes the XML structure that each WSDL document must follow.

Besides describing the offered interface, a WSDL document contains the location of the service. The WSDL defines the various components of a service that can then be reused to define different services. The components that make up a service include:

- Data Types
- Input and output parameters of a service
- Relationship between input and output parameters
- Logical grouping of operations
- Protocol to be used for accessing an object's methods
- Address of the Service

2.7 UDDI

A distributed application publishes its interface using web services standardized for use of remote clients. A business

that allows remote clients to access such services might also be interested in publicizing its services to attract new customers. Service registries allow businesses to announce their services to the public.

2.8 Architecture

A service provider publishes its service interface in a service registry. The client obtains this interface from the service registry and uses the interface to obtain the services from the service provider. A service registry essentially provides a link between the service provider and the service consumer.

Service Registries typically provide the following functions:

- Provides information about businesses
- Provides information about services offered by businesses
- Defines categories to classify services
- Provides a mechanism for publishing information on the registry
- Provides a mechanism for querying the registry for information
- Provides a mechanism for accessing registry information

2.9 What is UDDI?

UDDI stands for University Description, Discovery and Integration.

The UDDI standard defines a way to store information about businesses on the web and a mechanism for accessing this information in an efficient manner.

Businesses develop web services and publish them in the UDDI registry. In addition, businesses publish general information about themselves in the registry.

3 Design of Rich Virtual Learning Tool (RVLT)

RVLT consists of three major components (figure 2): Client, Server, and Database. The client refers to the suite of software that students will invoke to take classes online, the server represents the software that enable instructors to offer courses online, and the database which support the system. The client is equivalent to the service requester and the server is equivalent to the service provider in figure 1. It is very common that the database is included in the server side and is not explicitly listed as a single entity. RVLT is still in the process of being implemented and the connection to UDDI is not elaborated.

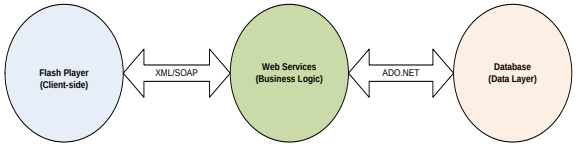

Figure 2. Three Major Components of RVLT [8]

RVLT consists of three major components (figure 2): Client, Server, and Database. The client refers to the suite of software that students will invoke to take classes online, the server represents the software that enable instructors to offer courses online, and the database which support the system. The client is equivalent to the service requester and the server is equivalent to the service provider in figure 1. It is very common that the database is included in the server side and is not explicitly listed as a single entity. RVLT is still in the process of being implemented and the connection to UDDI is not elaborated.

There are three major participants in RVLT: STUDENTS, INSTRUCTORS, AND ADMINISTRATORS. Typically the student uses the software on the client side to take a class, the instructor offers a class online using the software on the server side, and the administrator oversees and maintains the entire system. Their interactions with RVLT are summarized in the following table (figure 3 in the appendix).

The server consists of a huge number of components outlined in figure 4 in the appendix. They could be summarized as follows: authentication process, managing courses, virtual office hours, chatroom management, grade reporting, voting process, etc.

3.1 Implementation of RVLT

Figure 1 summarizes the software employed in the implementation of RVLT. The unifying backbone of the entire system is C# in .NET. .NET was designed to facilitate the communications among heterogeneous systems and has been ideal for the implementation of RVLT. As figure 1 illustrates, the GUI for the client side was implemented in terms of Flash, the server was implemented in terms of ASP.NET, the database was implemented in terms of SQL. Then the communication between clients and the server is achieved in terms of XML/SOAP, the communication between the server and the database is done through ADO.NET. The communication among these components would have been pretty difficult without C#.NET which, by design, facilitates the communication among heterogeneous applications written in different languages running on different processors. Readers are referred to [8] for further implementation details. A few sample outputs are summarized in the appendix.

4 Conclusions

Web Technologies are evolving rapidly. Web applications have been developed using HTML language . HTML-based applications are still popular choice for developing Web applications . However, in recent years, RIA (Rich Internet Applications) are becoming more popular for developing web applications. AJAX, Sun JavaFX, Microsoft Silver light and Adobe Flex are popular platforms and technologies for developing RIA applications. RIA applications aim to provide rich user interface similar to desktop applications. In addition RIA application follows MVC design pattern by completely separating user interface from the business logic. These are some novel aspects of RVLT which are not found in most existing commercial courseware.

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APPENDIX

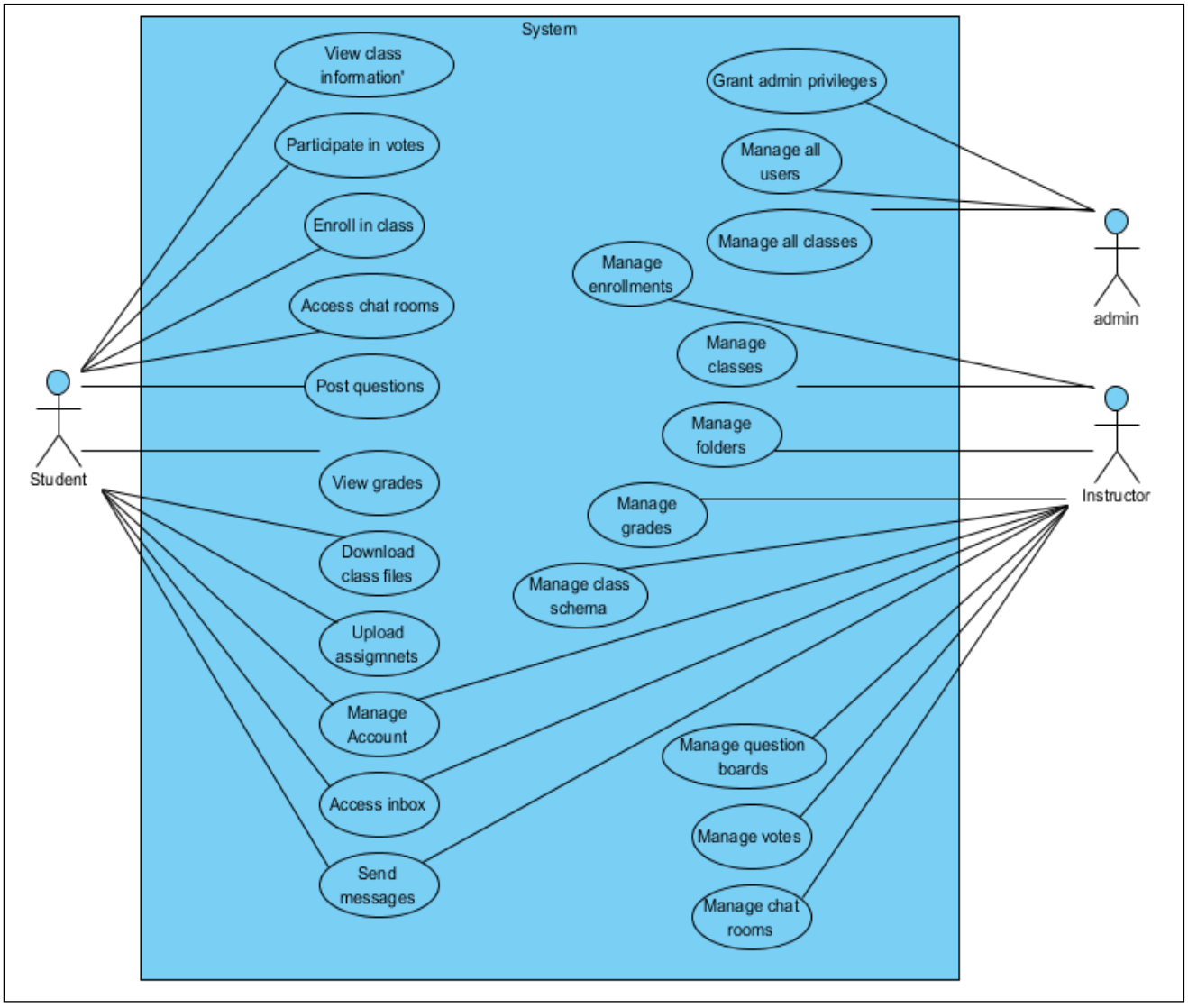

Figure 3: The interactions of the student, the instructor, and the administrator with RVLT

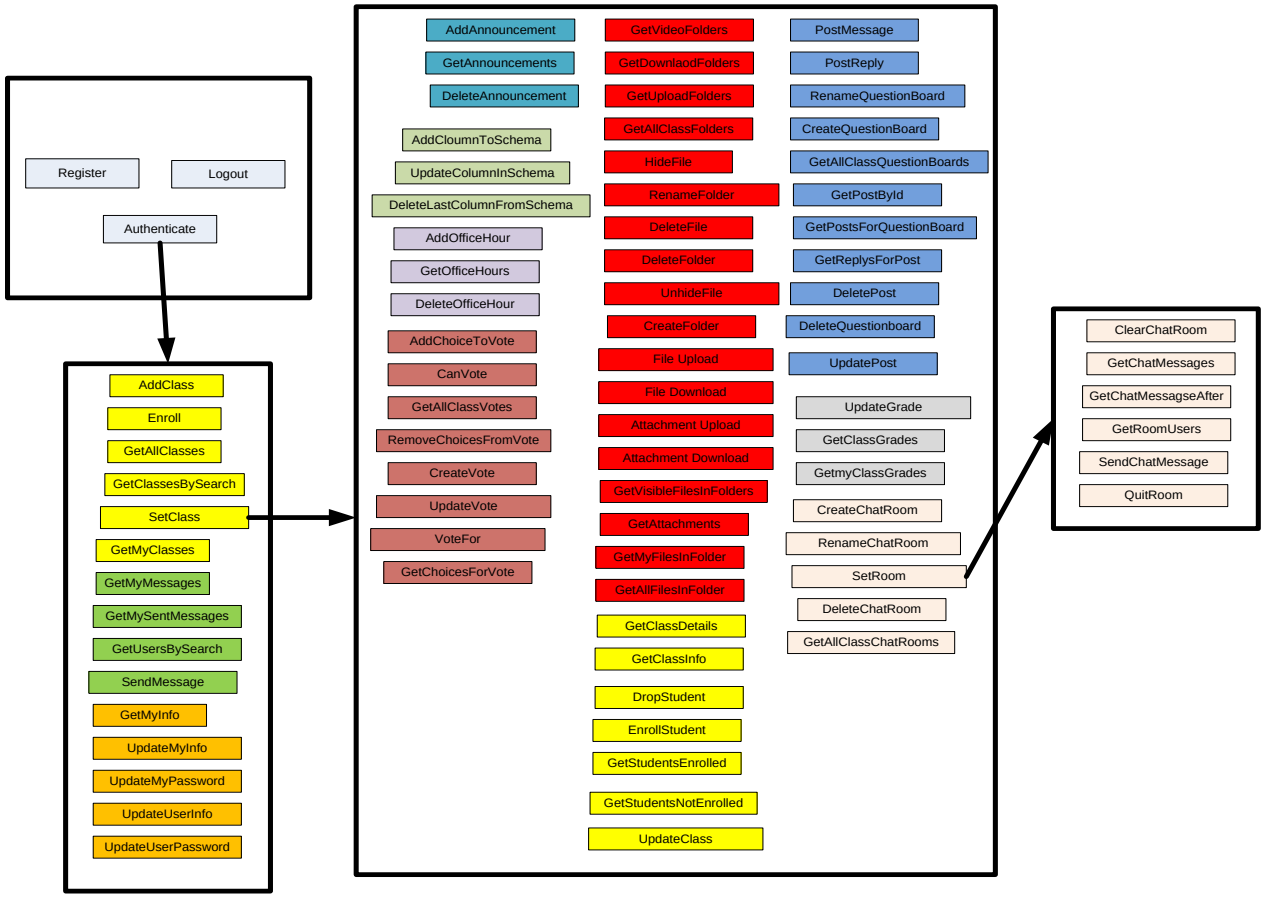

Figure 4. The components of the server

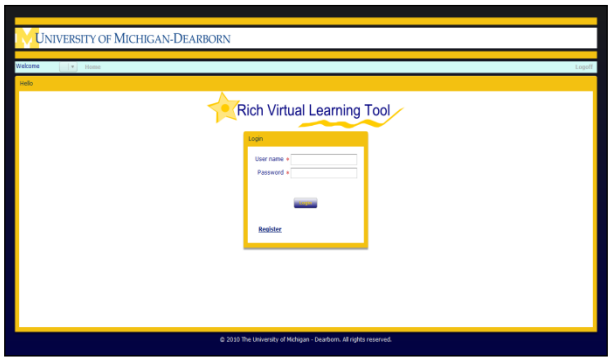

Figure 5. The login Page on the Client Side

Figure 6. Course Material Page

An Interaction Analysis System for e-Learning : Toward a web SOA tool for the improvement of learning

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Abstract:

The numerical traces generated in e-learning environments represent a significant source of information related to the activities of users. The analysis of these traces is of obvious importance, it can help on many ways to enhance the effectiveness of the support of users in their interactions within the learning system, and also to boost the quality of tutor functions as the regulation of learning and the success of the adopted methods of learning, etc. In this work we propose a trace's analysis system based on a Web services oriented architecture. The service module responsible of collection of tracks is particularly based on a standardized data model. Being limited to the activities of learning, we propose to adopt and enrich this model toward a common data model, in order to take into account the external services of communication supported by the learning management system (LMS) as the Forum, chat and other services.

Keywords: e-learning, regulation, trace analysis, SOA, web service, Data model

1. Introduction:

The advent of the learning management systems (LMS) has significantly taken part to replace the traditional paradigm of teaching by the learning one. The tutor needs continuously to improve its perception of the learners interactions during their training and to cure correctly and at the best moment the problems of training that can appear.

Among a synchronous and asynchronous formation, the mission of the tutor varies between an activity of moderation and animation during the training in the first case, to a specific and individualized follow-up of learners witch helps them to overcome their difficulties and to avoid the errors of comprehensions and frustrations which they can meet during the individual training. The effectiveness of the teaching approach adopted during the training depends heavily on the work of learning control and regulation applied by the tutor.

The overall objective of the analytical work of user interaction in a LMS addresses the need to interpret particular aspects of the learning process and to act consequently for a better control of the process.

Typically, LMS systems, often modular, are now based largely on web services and have, indeed, to integrate the evolution of web technologies. The exploitation of web service oriented architectures was thus introduced into the field of learning ([1], [2], [3] and [4]) but their use as a means of collection and management of the traces of interactions is yet only at its beginnings.

The exploitation of the SOA in this field will make it possible, in our point of view, to overcome two problems of trace analysis systems: the first, being the specificity of these types of systems to individual learning environment (individual, collaborative, synchronous or asynchronous, etc) where a standardization of data analysis is needed to make it usable simultaneously in various environments. The second is the cost of integration with the learning system caused mainly by the heterogeneous components involved in the system.

In the remainder of this paper we present, in the first section, a statement of existing works and a set of types of interactions in relation to e-learning field. We introduce, in the second section, the proposed service-oriented approach for the collection and management of traces and give a detailed description of the functional architecture of the proposed system yielding to trace analysis.

2. Trace analysis in a distance learning environment: a state of the art

Different approaches to trace analysis of interactions in the learning process tend to have specific objectives related mainly to the principle actors of learning: learner, tutor and pedagogical content. These objectives can be classified into three main categories, according to [5]: Optimizing the quality of educational resources available on the system designed by teachers and the learning scenarios, Improving methodologies of making knowledge to learners, And finally, designing tools for tutors and observers, for supporting learners.

The tutor being the cornerstone in the learning process, he uses these tools to assess, in one hand, the

performance of learners in the learning activities and come to their aid when necessary, and in the second hand he assess the quality of teaching resources being used.

In this section, we introduce some types of interactions that exist in learning management systems and a state of the art of some existing traces analysis works in this area.

2.1. Interactions in e-learning environments :

In each learning management system a considerable amount of data are produced by interactions of users. These data is a rich source of information which reflects the health of the learning process. Several proposals have identified the valuable learning interactions involving the most relevant point of interest: learner, tutor or the learning resources used during the learning activity.

In [6] we find the best known model based on communication theory and defining the receiver and transmitter, thus giving the three basic interactions: learner - learner, learner - teacher and learner – content. [7] add a fourth class of interactions that is learning - environment, where the environment is the interface that exists between the learner and content. Other categorizations were developed and focused on learning objectives ([8], [9], [10], [11]). Explicitly, the various interactions found in most management systems for distance learning can be summarized as follows:

Tutor-Learner interactions that affect the communication between the tutor and student in a given learning activity. These interactions help define the type of the relationships being created between the tutor and learners.

Learner-content interactions. They are, pedagogically, the richest and the more significant sources for the evaluation of the learning process. These are basically the user actions within a learning object. We find for example the results of assessments by the learner, product reviews on the content or duration of use of the resource, etc.

Learner-environment interactions include all actions taken by the learner through the interface that is available in the learning system.

Learner-learner interactions occur in the footsteps of communications established between learners

Learner's Actions regardless of learning system that can be launched in third party applications as browsing the web, etc.

Depending on the used technologic platforms and the nature of the process of learning itself, e-learning interactions generate traces in real time in different formats.

2.2. Trace analysis systems:

To achieve their ends, the first task of user interactions analysis systems in a LMS is the collection and aggregation of traces data of interactions on a comprehensive format. According to the objectives laid, these traces can be qualitative related to concepts such as cognitive, and collected through a survey or a test, etc. it can be also quantitative, collected directly from the various sources of data system such logfiles or the LMS database. Data (binary or text) not being all directly usable, a second role is required, that of transforming these traces to an understandable, readable and useful information through a method of analysis of data to be viewed or to measure a predefined indicators.

View the vast volume of work produced in this sense, it is not possible to provide a complete exam of all works achieved on systems of trace analysis. Nevertheless we cite in the following some referenced works.

An approach directed by models is proposed in [12], based on the WEBM architecture associated to the CIM model (Content Information Model) for the management of traces. This approach permits a fast Integration of new components, but considering the nature of the CIM model that has a canonical format of objects, an initial mastery of the whole semantics of the domain is necessary (that is in this case the e-learning feild) in unified way, which proposes a considerable maintenance effort and significant updates in case of changes needs. In [13], a specific language UTL (Usage Tracking Language) is defined. It permits to describe according to a specific model the traces independently from the e-learning operation allowing a structured exploitation of traces.

Moreover, [14] proposes a formal model of a trace-based system which defines several levels of treatment from collecting, processing till the semantization of log files data present on the e-learning platform. More recently, [15] was based on the system proposed by [14] and presents an application to restructure the raw data from data archives (Moodle LMS) to facilitate the use of their footsteps and help data semantization by using anthologies. Also in more recent works, [16] build a system for trace analysis for a collaborative learning environment.

Other works has focused on standards of learning: [17] proposes a boosting of the LMS API so it can support the advanced features specially tracking. In the same way [18] have proposed extensions for the runtime data model in order to integrate communication activities via e-mail within the SCORM based learning objects, while the mail communications are usually deployed outside of the learning process.

The work around trace-analysis systems of e-learning environments aims to implement a specific solution in order to resolve specific problems and the deployed solutions are often based on software agents whose connections are point to point, which increases the

number of connections required to implement solutions and can rises then multiple update and maintenance issues. On the other hand, log files are the main sources of data used in such systems, they are certainly inexpensive sources and can be technically implemented easily, but instead, the data processing log is an expensive operation [19].

3. A service-oriented architecture for interactions analysis:

Emerging learning management systems are essentially based on Web services, as well the free software that those commercials. With the prospect of integrating a web service based solution for the interactions analysis in the learning management system, we propose a service oriented architecture (SOA) based system. The proposed system is meant to be independent from the technology used for learning and interoperable with most standards and specifications adopted in the field.

The approach implements a standardized data model which is enriched by an extension that can handle other types of interactions which are not supported natively. We give, in the following, a functional view of our proposal by describing the various components and showing the architecture of the proposition.

3.1. Intercept, collect and aggregate data:

In order to establish a data analysis tool independent from e-learning platform and technology on which the internal components would be based, using web services based architecture remains the most feasible and more practical. The adoption of such architecture enables integration of functionalities in a modular way. A more complex system can be designed from the restructuring of existing web services that use web interfaces and standardized data stream. This easy handling permits the definition of new systems for new needs only by declarations that are immediately usable. Thus, the cost of integrating new components into an existing system is visibly decreased.

Figure 1 shows a synthetic scheme of the context of our proposal. Our work is based on a web-service based e-learning framework already proposed by [20]. The platform models a universal learning management system integrating various elements of both management and analysis of learning.

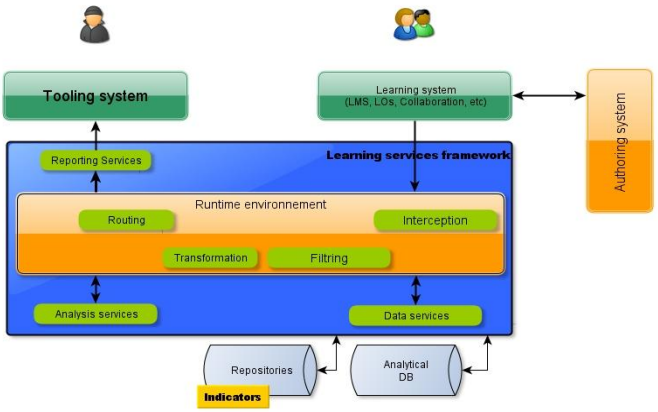

Fig. 1: Integration of traces management system on the a global Framework

The basic component introduces a virtualization layer that intermediate between the LMS supporting the learning activities and the tooling system designed for tutors and observers. This layer consists of a data bus whose main task is the preprocessing of data exchanged between services and their aggregation traces consumed by the analysis service. The main functions of this layer of virtualization are:

- Interception and filtering of messages in real time and querying further data sources in case of need (DBMS log files, etc..).
- Merging data into a common data model suitable for trace analysis needs.
- Routing and saving the results of analysis for viewing or archiving.

This simple SOA based vision enables rapid implementation and reuse of services. The flow of data between the LMS and the service bus is validated against a common data model, integrating the learning activities and communication subjects' analysis (see section 3).

The collection of data is an essential step of the interactions analysis; it is an intrinsic task to the core of the system. Since, in SOA architectures, the messaging patterns are handled between services, exploring the data bus for collecting data in real time is our first step to a system witch concerns the eventual needs to real time learning interventions (adaptation of learning scenarios, resources, other possible services, etc).

3.2. Indicators for the interactions analysis:

Indicators are one of the important elements of the proposed system. They play a decisive role in what will be collected and in the results of analysis. The collection of traces relating to user interactions is an elementary step that is completed by a preprocessing step yielding to semantization and aggregation of collected data. The final results are then measures of interactions indicators that can be exploited by

different actors in the system: Learners, group of learners, tutors, researchers, administrators, etc.

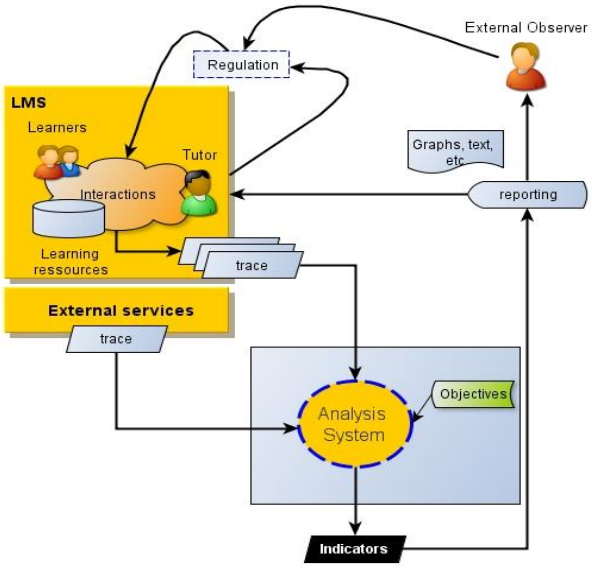

Fig. 2: functional architecture of the proposed system

The most crucial responsibility in the learning process is assigned to the tutor who is involved in regulating the learning next to the observer. Figure 2 shows the supporting role played by the control system of trace analysis which is mainly exploited by the tutor or external observers. Indicators, which define in a way the role of the system analysis, give rise to observations and decisions adopted by the tutor. In this scope, we identify an indicator as a variable that has several attributes which can be *cognitive* measuring the quality of the activity in question (awareness, Understanding, Judgment, opinion, etc.) or simply the result of the interaction (i.e. score evaluation,etc), and can be also *social*: reflecting the status and quality of collaboration between target users.

Based on the work of [21], we adopt an extended structure indicator that meet a wide spectrum of needs. The following table shows some attributes that we consider most useful for the interactions indicator:

Attributes	Signification
Concept	Indicator signification
Dependencies	Time, subject of learning, etc
Level of interpretation	High, intermediate, low
Value	Numeric, text, graphic
type (objective)	Cognitive, social, collaborative aspects, etc.
Target users	student, group of students, tutor, researcher, etc
Users of results	student, group of students, tutor, researcher, etc
Time of validity	In the fly (during the interaction), after the interaction (short, medium, long term)
Field of validity	Environnent type, learner profile, learning resources, indicator's users, etc.
Learning environment	- Individual use, - Collaborative (synchrone), - Collaborative, text production (asynchrone), etc.

Table 1: proposed attributes for the interaction analysis indicator

Indicators can also be classified by their levels of interpretation, we distinguish three levels: high level which has an interpretable value requiring treatment more or less complex, Intermediate level developed on the activities of a low level of cognition as the quality of discussions in a forum or of argumentation in a given subject, and low level whose values are extracted directly from collected raw data. Nevertheless, the results related to the extracted information from the indicators can be mainly "positive" or "negative" or simply indications on what to do in a given situation.

4. Implementation and future work:

The adoption of LMS has aroused increasing interest among e-learning policy makers to the concerns of standardization, interoperability and reusability of learning resources. These problems have set up several research areas of global standardization entities. Among these efforts we find the work on the data model for communication between content and learning system commonly called CMI (Computer Managed Instruction). Historicaly, The CMI model has been mounted by the AICC (Aviation Industry CBT Committee) before becoming a standard in the IEEE [22]. Thus, The CMI is a standardized data model that describes the data exchanged between the learning resources and the LMS environment, usually via an API. These data cover information on learners, learners' interactions with learning objects, the status of activities (successes, completeness,…), etc. the data model plot also the performance of learners in relation to learning objectives. Data being architected according to the IEEE 1484.11.1 keeps a high level of semantics and so allow easier analysis of learners interactions within the learning system.

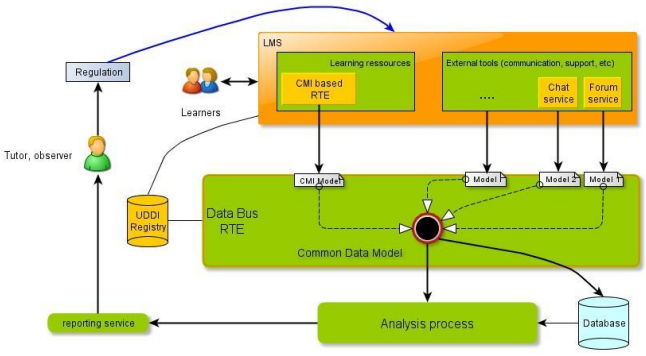

Fig.3 The component diagram of the proposed architecture

The traditional use of the CMI model is within the Runtime environment (RTE) of the learning resource. As shown in figure 3, The RTE manages information about user interactions within the learning management system and use the CMI for validation of data streams generated by interactions. Data is merged in a common data model on the bus, which is an extended version of the CMI format, before being archived and analysed according to the needs. The major utility of the CMI model, is the fact that it is extensible as well to describe other activities handled within the learning environment and involving both the client and server side [23], as for archiving information generated in a standard format for analysis and reporting. In this sense, the proposal we make is to reuse the standard as a base for the common data model handled in the data bus RTE.

5. Conclusion :

The development of a prototype of the proposed architecture is currently underway. in this paper, We have proposed the SOA based trace analysis system. The core of the system is composed of a data bus which is responsible of data collection. The used common data model is based on an extended version of the standardized CMI data model. the defined extension is composed of other communication services used in the learning platform as the forum, chat and further services which can be in a learning point of view an integral part of the learning process (especially in the case of collaborative learning approaches).

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The e-Commerce Sandbox: An Interactive Learning Tool With Real-Time Feedback

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Abstract— *The e-Commerce Sandbox is an interactive learning tool developed to supplement a course on the technology and business aspects of e-commerce taught at the University of Virginia. The sandbox is spatio-temporally independent, allowing students to complete modules outside of the classroom on their own schedules. Essential to the success of the sandbox are the real-time feedback system and the logging system. In addition to evaluating submissions for correctness, the real-time feedback system can guide students toward the correct solution, alleviating the workload on the course staff. The logging system handles grading automatically, but also provides feedback to improve the sandbox. Preliminary results indicate that the sandbox is a beneficial adjunct to the e-commerce course, generating a net improvement in student knowledge.*

Keywords: e-commerce, real-time feedback, lecture adjunct, interactive learning, security

1. Introduction

As the requirements of industry evolve, a traditional fundamentals approach for the design of e-commerce curricula is no longer sufficient to prepare students for the challenges they will face when solving real-world problems. Under the traditional approach, graduating students typically have a strong background in classical computer science problems, but little to no hands-on experience with current e-commerce problems. In addition to under-preparing students for industry, this approach makes it difficult for companies to differentiate potential employees within the applicant pool[1].

In response, we developed an e-commerce sandbox to supplement a course teaching the technology and business aspects of e-commerce. The system consists of a collection of relevant course materials and a sandbox environment in which students perform guided modules and receive useful automated feedback. The primary goal of the sandbox is to allow students to safely practice real-world e-commerce skills while promoting a self-guided learning approach. The system currently provides 22 modules covering topics in PHP and MySql (e.g., Complete the PHP script below to add a user to the authorized users table), and also provides an interface for creating arbitrary modules.

The rest of the paper is organized as follows: In section two, we discuss previous work related to e-commerce curricula and provide motivation for our work. Section three discusses recent public security breaches that have demonstrated a need for graduates capable of developing secure e-commerce applications. In section four, we enumerate our design goals with an emphasis on the lifetime and usefulness of the sandbox. A system overview is provided in section five with each component discussed independently. Section six discusses our initial system evaluation and our plans for future quantitative studies. We conclude the paper by re-capping what we have accomplished and what we have learned.

2. Previous Work

Over the last decade, many universities have struggled to incorporate e-commerce courses into their Computer Science curricula, although the necessity has been recognized[2]. Despite the dot-com bust, e-commerce remains an in-demand field. However, according to Adreinne Bloss, it is unclear how to best incorporate e-commerce into non-business related computer science curricula[3]. Conversely, business-focused e-commerce courses tend to minimize their emphasis on the development of technical programming skills[3].

The traditional approach to incorporate e-commerce into a computer science curriculum is to use a team-based or project model[4]. The problem with this approach is that the projects typically need to be completely re-designed to reflect changes in industry technologies. Team-based approaches typically involve combining a computer science course with a business course. It is difficult to balance the project goals evenly as each class has unique learning objectives. Either approach will generate a large workload for the course staff.

E-commerce has evolved from a novelty to a multi-hundred billion dollar industry. Not surprisingly, this industry has become increasingly focused on security due to the amount of money and personal information involved. This demand for security has increased the need for computer scientists in e-commerce[5]. Currently, however, our Internet security policies and technologies fail to meet the needs of the consumer[6]. Due to this lack of security, consumers tend to do repeat business with companies they trust, but are generally hesitant to do business with an unknown company.

It is unclear exactly how to incorporate e-commerce courses into a computer science curriculum; however, there

is an important distinction between the state of the art and the state of the practice[7], [8], [9]. The state of the art is typically geared toward solving fundamental problems in the field of computer science while the state of the practice generally focuses on how to optimize e-commerce operations. It is important that an e-commerce course address both.

3. Security

An unfortunate reality of e-commerce is that security breaches are not a thing of the past. History has taught us that security can not be an afterthought. Rather, security must be a priority during design, implementation, and production. Once in production, a site's security must remain a top priority. It is a higher priority to protect the parties involved in an e-commerce transaction than the transaction itself[10].

In June 2010, Goatse Security revealed a security flaw in AT&T's 3G service sign-up form on the Apple iPad[11]. For convenience, AT&T would automatically populate the email field in the form by reading the Integrated Circuit Card ID (ICC-ID) from the iPad's SIM card. AT&T hosted a script that would return the email address associated with a given ICC-ID number. Since the ICC-ID number and email address were sent in cleartext, Goatse Security was able to retrieve approximately 114,000 email addresses belonging to iPad owners by submitting randomly generated ICC-ID numbers to the script and recording the responses.

In December 2009, RockYou suffered a security breach that resulted in the exposure of over 32 million user accounts. Perhaps more surprising than the fact that the company did not notify affected users of the breach immediately is the nature of the breach. The SQL vulnerability used in the attack had been documented for over a decade. The most serious violation, however, was the fact that passwords were stored in cleartext within the database.

In December 2009, an SQL injection attack on 7-Eleven's site allowed attackers access to the company's servers that manage their ATM terminals. This allowed the attackers to record customer's PIN numbers when they were entered during a transaction. As a result, $180,000 in fraudulent withdrawals occurred in only three days.

4. Design Goals

Our system was designed to supplement a lecture on e-commerce fundamentals and security. Based on previous work by other authors as well as personal experience, we elected to develop an interactive system with a hands-on approach. Since students have varying schedules and can't always attend office hours, we wanted to provide real-time feedback and evaluation. Additionally, we designed the system to be dynamic so that it can evolve as the requirements of industry change.

Experience has shown that lecture alone is not sufficient for most technical courses, regardless of the topic. Attention spans vary among students, but it is generally accepted that most students lose focus after approximately twenty minutes[12]. Interactive modules can give the effect of holding a student's attention longer since there are inherent breaks between submissions. In addition to becoming distracted, students tend to retain less information from lecture compared to interactive learning activities. This is because lectures do not typically encourage students to analyze topics or solve problems. Interactive modules help resolve this problem with lectures. Having students perform a series of increasingly difficult modules that build on skills learned in previous modules can encourage students to think critically.

We wanted to remove the temporal and spatial dependencies associated with lectures and in-class labs. By providing real-time feedback and evaluation, students can complete the modules on their own time. It was essential to create a system that can evolve at the rate of industry requirements, thus our system allows for the creation of arbitrary modules. This allows the course staff to evaluate and update the relevant course materials each semester.

5. System Overview

This section describes the design of the system. From a high level perspective, the system consists of three main components: the lecture materials, the sandbox environment, and the administrative interface. Since the sandbox environment and administrative interface are the primary contributions of this work, they are described in greater detail with each sub-component further discussed.

5.1 Lecture Materials

In order for the system to accommodate a self-learning approach, it was necessary to provide a collection of relevant lecture materials in the form of technical tutorials. The tutorials range from prerequisite topics such as PHP, MySql, JavaScript, etc. to general secure e-commerce topics which include secure transmission, non-repudiation, certification authorities, SSL, etc.

The primary goal of the online lecture materials is to act as a referential adjunct to the course lectures. These tutorials can be used by the students to re-enforce topics discussed in lecture, extend topics that could not be fully covered in lecture, or even learn a topic independently.

5.2 Sandbox Environment

In addition to the lecture materials described above, the system provides an interactive sandbox environment for students to safely practice real-world e-commerce skills while promoting a self-guided learning approach. The sandbox provides

- an interface for students to navigate available modules,
- a submission environment for students to upload code to be tested for correctness,

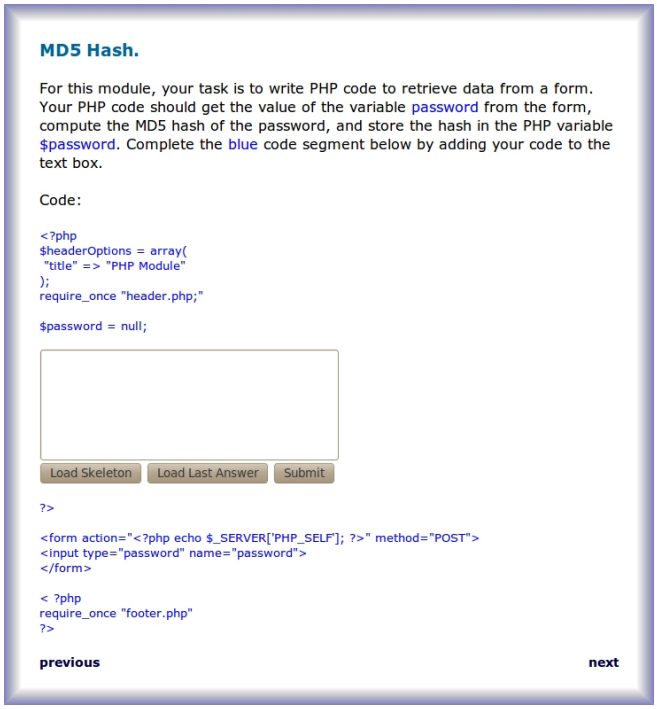

Figure 1: A sample module on password hashing.

- an execution environment where student code is run safely,
- real-time feedback to help students identify and resolve coding errors, and
- a logging system to track student progress as well as analyze the use of the sandbox.

These components are now described in more detail.

5.2.1 Interface

The sandbox interface allows students to navigate within the sandbox. Students can browse the lecture materials, perform modules, and view their statistics. While the interface is fairly straightforward, it provides the only portal for students to interact with the sandbox. All other aspects of the sandbox execute as a black box, hidden from the view of the student. Figure 1 shows a sample module on password hashing.

5.2.2 Submission Environment

Every module in the sandbox requires the student to submit code. The submission environment acts as a middleman between the sandbox interface and the execution environment. This is primarily to separate the execution of student code from the user interface. If a student's submission causes adverse side-effects, the execution environment can be restarted without interfering with other students' activities.

When a student submits code to be tested for correctness, the submission environment first receives the student code as a POST submission from a form within the module. The module-specific initialization, test, and cleanup code is retrieved from the database. This dataset is then sent to the execution environment via a cURL call. The code is then run within the execution environment and the output is returned to the submission environment. The output is then parsed, but not executed, and compared to the expected output. Feedback is then provided to the student.

5.2.3 Execution Environment

The execution environment is responsible for running the submitted student code. While not complicated, the execution environment separates code execution from the user interface. The execution environment receives an array consisting of code segments to be executed in a specified order. A typical execution flow begins with some amount of initialization code being executed. This can include setting cookies and sessions, populating the GET and POST arrays, setting PHP variables, or populating a MySql table. Next, the student code is executed. Finally, some amount of cleanup code is executed. This can include deleting MySql tables, or producing output to be parsed by the submission environment.

It is worth noting that the output produced by the execution environment can be generated by the student code, the cleanup code, or both. This provides flexibility for the course staff when creating modules. For example, if a module instructs a student to print the value of a PHP variable enclosed in a specific HTML tag, the output does not have to be generated by the cleanup code. Alternatively, if a module instructs a student to set the value of a cookie to a value stored in a PHP variable, it makes sense to generate the output in the cleanup code since the output is not the focus of the module.

To avoid running untrusted code within the user interface, the execution environment resides on a set of virtual machines. If the submitted code causes adverse side effects to a virtual machine, that instance can be restarted. Providing multiple virtual machines reduces the chance that a corrupt virtual machine will disrupt other students. It can also provide load balancing as the number of users increases. Our experience has shown that one commodity server was sufficient for a class of 48 students working simultaneously.

5.2.4 Real-Time Feedback

To reduce the reliance of students on the instructor and teaching assistants, a real-time feedback system was essential. This system provides three forms of feedback. First, it displays whether a submission was correct, incorrect, or caused an exception. If a submission was incorrect, hints can be provided by matching student submissions to regular expressions. Additionally, if an exception was raised, the system can provide information about the exception.

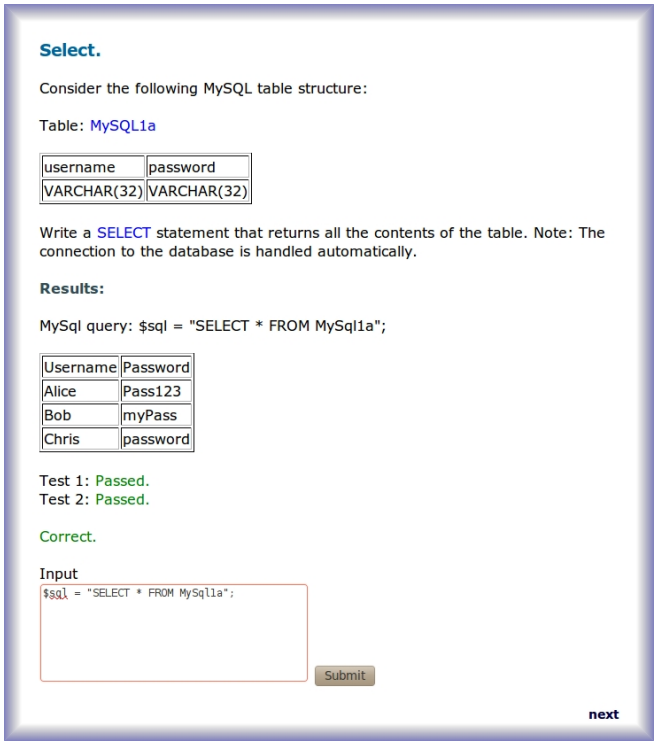

Figure 2: A correct submission for a MySql question.

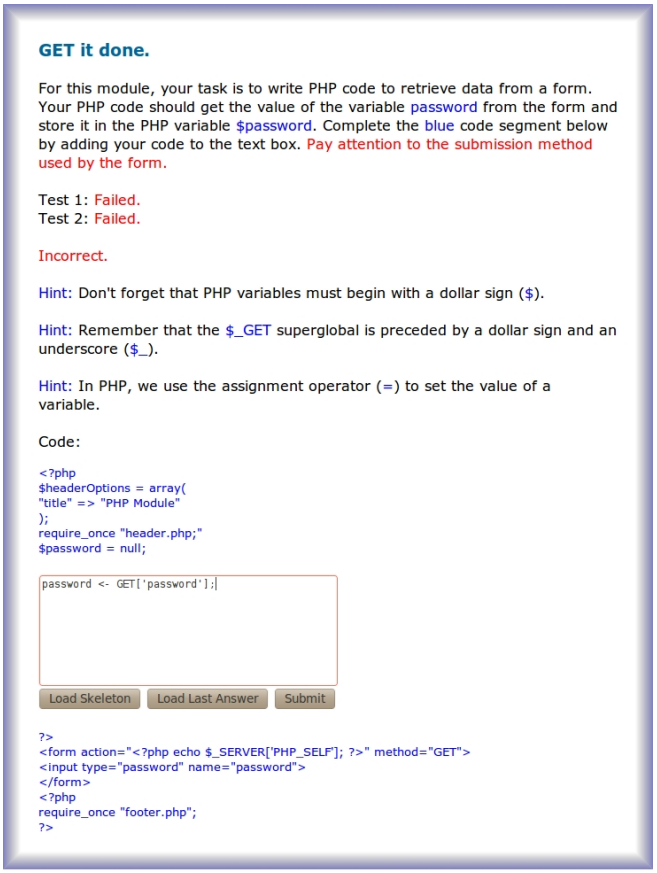

Figure 3: An incorrect submission displaying hints.

Since the feedback is generated within the submission environment, for security purposes only regular expressions are used to check for correctness, provide hints, and debug exceptions. To check for correctness, the module must produce some output during execution. This output can be generated by the module itself, the student, or both. Using multiple test cases prevents students from simply printing the expected output explicitly. Additionally, a module can require that no additional output be generated by the submission. This can also be enforced using regular expressions. A submission is correct only if it passes all test cases. The feedback provided for a correct submission is shown in figure 2.

The hinting system is relatively straightforward. Solutions to the modules typically require using specific PHP functions, operators, or operands. The absence of a required token can indicate that the student is getting off-track. A typical hint may give a brief description of why the token is needed or useful and provide a link to the PHP documentation for that token. This allows the system to assist the students to work through the modules without giving them the exact answer. Figure 3 shows a sample of hints for a question that instructs students to retrieve a value from the PHP GET superglobal and store it in a PHP variable.

Handling exceptions is a bit more difficult than the hinting system and currently only provides basic help. The system can report the type of exception that was raised and perform a lexical analysis of the submission. This feedback is limited by the fact that even displaying the results of the execution would be a security risk.

5.2.5 Logging System

The system provides a logging system to track student performance. Every time a submission is made, it is logged along with the execution results as well as a timestamp. In addition to keeping track of which modules a student has completed, the logging system provides some useful feedback to the course staff.

The course staff can evaluate the difficulty of modules based on the average number of submissions required to complete them. By analyzing the submissions, it can be determined if a module is in fact difficult, or simply confusing. In addition to evaluating the modules, the logging system can help to identify struggling students who could benefit from extra help. Timestamps can also be used to evaluate how much time students are devoting to complete the modules.

5.3 Administrative Interface

The administrative interface of the sandbox contains many general tools to allow the course staff to maintain and im-

prove the sandbox including user management and database backup. However, the features of interest for this paper are the module creation and test suite tools. The module creation tools allow the course staff to create new modules and update existing modules to reflect the state of the art as well as the state of the practice. The test suite is used to ensure that created modules do not contain errors and ensure that the virtual servers are functional.

5.3.1 Module Creation

To ease the module creation process, we have abstracted the modules into their core components: title, description, general initialization, test-specific initialization, submission form, test-specific cleanup, general cleanup, and test case. The title field is simply a descriptive name to be used to identify the module. The instructions explaining the goals for the module reside in the description field.

We may wish to initialize some variables or database tables for the student to manipulate. The general initialization code is executed for every test case, whereas the test-specific initialization is run on a per-test basis. For example, if the question involves manipulating a database, the table is created in the general initialization code while the data is populated in the test-specific initialization code. This allows code to be re-used for multiple test cases.

The submission form is where the students develop and submit their solutions. The default form consists of a single input field where code can be entered. This default is sufficient for most of the modules we have created. However, the flexibility to modify the submission form is necessary for the sandbox to support arbitrary module creation.

The general cleanup and test-specific cleanup fields are similar to the general initialization and test-specific initialization fields. Since the initialization data is populated prior to code execution, there is no reason to keep it after the student code has been tested. The test-specific cleanup code can be used to empty a database table to prepare for the next test. The general cleanup code may then delete the database table as it is no longer needed.

5.3.2 Test Suite

For each question, it is necessary to create test cases to validate the students' code. This is typically achieved by populating some amount of data for the students to manipulate. The state of the data after code execution is then compared to the expected result. If they match, the test passes. Otherwise, it fails. The three components of a test case are initialization code, cleanup code, and expected result.

One complicating aspect of the sandbox is that we can not execute any code submitted by the student or produced by the virtual servers when checking the validity of the results. This is because all code execution must occur on the virtual servers. Therefore, we only allow regular expressions to be used when analyzing the result of a test.

This means that the test-specific and general cleanup code must generate the output such that it can be validated by the regular expression. For example, if the student is instructed to copy a value from a first PHP variable to a second one, then the cleanup code must print the value of the second variable. However, this is not sufficient since a student could simply print the value of the first variable and receive a correct response.

Resolving this problem can require some creativity by the course staff. One method is to place the output inside tags unknown to the student. Then, the regular expression only inspects the output contained within the tags. As long as the tags are unknown to the student, this method is sufficient. Using randomized tags for each test case ensures that tags can't be discovered over time using brute force techniques.

While creating questions is relatively simple and straightforward, generating good test cases can require a bit of thought. It is always possible that an incorrect submission can be marked correct and vice versa. Actual use of the sandbox tends to be the easiest way to identify anomalous behavior, such as an empty submission being marked correct. Reviewing the logged submissions allows us to identify problematic test cases.

6. System Evaluation

Our evaluation of an early version of the e-commerce sandbox indicates that interactive modules are a promising method for students to supplement the lecture portion of our course. In our qualitative study, a class of 48 students was instructed to complete a set of 11 sandbox modules (the sandbox has subsequently grown to 22 modules). Students then filled out a survey containing the following five questions (responses from the 34 received submissions are shown below):

1) How would you rate the difficulty of the sandbox assignment?

Very Easy	Moderately Easy	Average	Moderately Difficult	Very Difficult
2	8	18	6	0

2) How would you rate your PHP/MySql knowledge prior to completing the sandbox assignment?

No Knowledge	Below Average	Average	Advanced	Expert
4	11	14	5	0

3) How would you rate your PHP/MySQL knowledge now?

No Knowledge	Below Average	Average	Advanced	Expert
0	5	21	8	0

4) How would you rate the effectiveness of the sandbox assignment as a teaching tool?

Very Ineffective	Moderately Ineffective	Average	Moderately Effective	Very Effective
2	2	7	19	3

5) What would you change about the sandbox assignment for future use? *(Selected responses)*
   - While I am sure it is difficult to implement, possibly give hints when a response isn't quite right.
   - Provide links that lead to hints specific to each question. these hints should guide the student to complete the question without relying on asking the TA as the first option for help.
   - Add many more problems and make it a homework assignment.

The average response received for question one (difficulty) fell between moderately easy and average. The responses received for question two (prior knowledge) were predominantly below average and average. On question three (post-assignment knowledge), nearly a third of the class reported an overall improvement of PHP and MySql knowledge after completing the modules. The general opinion from question four (effectiveness) was that the sandbox was moderately effective as a learning tool. The responses received from question five (suggested changes) indicated a desire for more modules. Additionally, the feedback from question five led to the addition of hints in the sandbox due to multiple such requests from students.

From our results, we have been able to make some general observations about the current implementation of the sandbox as well as its potential to improve as a learning tool. A major goal of the sandbox was to provide self-learning. This requires that the modules contribute to the students' knowledge without being so difficult that they cannot complete them. The answers to questions 1-4 suggest that this goal is being achieved. As stated previously, question five indicated that the students wanted more modules and better automated guidance. We have responded by developing the module creation functions and adding a hinting system to the sandbox. We expect that qualitative results from the next class will improve as a result of improvements made to the sandbox based on student feedback.

Another important addition to the sandbox is the logging feature. All submissions are now logged and classified for later analysis. This will allow us to perform a quantitative study based on actual sandbox usage next time the class is offered. Some useful information that we will be able to extract from this study includes: number of attempts per question, number of attempts per student, and total time spent on the modules. Retrieving this information will allow us to measure the difficulty of questions and identify struggling students. Additionally, analyzing how many hours students spend completing the modules will allow us to develop a balanced assignment schedule.

The modules are designed such that they increase in difficulty while building on previous topics. By looking at a student's responses over the set of questions he or she has answered, we can evaluate the effectiveness of the sandbox as a learning tool. If the mistakes that the student makes are changing from question to question then the sandbox is working as expected. For example, if the first question focuses on writing and reading PHP variables and the second question instructs the student to print the value of a variable, then the student should not miss question two because they didn't put a dollar sign in front of the variable name.

7. Conclusion

In this paper we presented an e-commerce sandbox, developed to supplement a course on e-commerce technology and security at the University of Virginia. Post-usage survey results have shown the sandbox to be a viable adjunct to lecture. Additionally, providing real-time feedback, hints, and usage logs reduces the workload on the teaching assistants. The flexibility of the module creation features allows the course staff to keep up with both the state of the art and the state of the practice. This helps ensure that the sandbox will remain a beneficial resource and stay relevant for future course offerings.

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Impacts of Computer-Mediated Communications on Social Behaviors of MSN and Facebook Users

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Abstract *- Internet has changed how people communicate with the others; however, few studies have investigated the relationship between people's new communication behaviors and their innermost feelings. Therefore, this study aims to how people choose communication tool to interact with the others under the impacts of Computer-Mediated-Communication (CMC). This study refers theories of communication and social psychology to explore the impacts of Computer-Mediated-Communication (CMC) on Facebook/MSN's users' social behaviors in terms of MSN Messenger and Facebook are the most popular online communication tools worldwide. The following facts were found:*

1. Users start using Facebook mainly effected by peers and environment.

2. Users tend to choose MSN as a tool to communicate with others when the message is positive; however, they prefer to use Facebook to deal with messages which is negative.

3. Facebook's function such as "share", allowing users to share real-time restaurants or attractions etc., which makes online world associate to real life, increasing social interactions among people.

4. Most users change their "MSN nickname - Personal status" seldom, as most users get friends' latest status via Facebook. Besides, interviewees said that the messages they posted on the "MSN nickname - Personal status" is simply for their self-awareness, not for friends, so that many words presented in short.

Keywords: Social Networking websites, MSN, Facebook, CMC, Social Interaction, Self-disclosure

1 Introduction

Nowadays, with the rise of technology, the ways of Internet communication have changed. Before, users utilized BBS, ICQ or E-mail to interact with each other. Later, Microsoft MSN Messenger was integrated into Windows XP systems with multi-functions. Therefore, MSN finally defeated many different online communication softwares and became the leader of Instant Messenger applications.

In recent years, the appearance of Social Networking Sites which stands for the values of the inter-relationships which is consist of features in dating websites and blogs, explaining the differences between social networks, dating websites, virtual communities, blogs and personal space [1]. Social networking websites, such as Facebook, Twitter, Plurk, and YouTube have become more and more popular. Particularly, Facebook represent the trends of all. People use it to get information, build relationships or receive entertainments, and the way of it has gradually become a life style, and rooted in people's daily life.

However, the earlier research shows the Computer-Mediated-Communication (CMC) is less personal, less emotional and lack of sociability, compared to Face-to-Face communication [2]. That is because CMC is a kind of communication way without nonverbal clues, such as facial expressions, gestures, postures, and expletives. The information senders and receivers cannot be aware of each other like in reality because of less social presence [3-4]. Besides, CMC makes people feel less personal characteristics and social interaction, and fewer exchange of social emotions [2].

MSN Messenger and Facebook have their own positions among Internet users. Although these two applications have different functions and purposes, they act a complementary role with each other. For instance, MSN is more about interpersonal communication, it emphasizes private chat and also the strict permission in establishing the relationships, contrasts to Facebook, messages can be caught by a social group such as friend, friend's friend, etc. On Facebook, although there is no friendship in reality, people still can indirect interaction between each other. This weak tie relationship does affect users' communication behaviors. In terms of the observations above, this study looks forward to understanding the differences of people's usage of MSN and Facebook. For what reasons they choose to use one or another, and how the CMC affect people's communication behaviors between MSN and Facebook.

Therefore, the study selected MSN and Facebook as the research field, and tried to explore the peoples' motivations to use one and another. In addition, the relations between CMC behaviors, and social presence, social interaction, disinhibition and self-disclosure were also discovered. The researchers collected and analyzed qualitative data, and relative literatures, providing a specific direction to consult. The research questions of this study are:

1. What are the users' social behaviors in activities on MSN Messenger and Facebook?

2. What are the degree of differences among social presence, social interaction, disinhibition and self-disclosure of users' social behaviors on MSN Messenger and Facebook?

2 Literature Review

According to the research purpose and questions, this study reviewed and analyzed literatures on the aspects of social presence, social interaction, disinhibition and self-disclosure, in order to have more understandings of users' online communication behaviors. Some important findings are as follows.

2.1 Social presence

The social presence means both communicators become aware of each other in a particular media context [5]. They feel each other while exchanging messages like in reality [4]. However, CMC was classified as-- low social presence media because of less language and non-verbal communication (character, image and sound) than the way of face-to-face communication.

Rice [6], according to the social presence theory, found that the low social presence media tend to be serious- and mission-oriented. However, the positive correlation was not shown between social presence and communicate affects. The different levels of social presence depends on different communicate goals [7]. In other words, the effective communication should be recognized while considering the applicability of media; for example, in a complicated and subjective communication circumstances, people use rich media to in assistant of communication. Nevertheless, the lean media should be used when the communication is consensus and objective [8].

It can be seen the impact element of social presence is mainly determined on the amount of the clues in communication, while the choice of media ought to coordinate with the users' purpose, it is said, not all the communicate motivations can be applicable in high social presence media.

2.2 Social interaction and self-disclosure

Most of the CMC in the past was based on text, compared with the interaction in face-to-face, it was much less of social essence, personal feature and the exchange of social emotion because of the lack of clues in sight and hearing. However, because of the limitations of personal expression and social clues in CMC, the pressure of social rules to people had been weaken as well as lower the personal clues of responsibility and social control. It finally emerged the phenomenon of deindividuation [2]. Deindividuation makes people feel free and more unrestrained while on the internet, thus, it is called disinhibition.

In this situation, whether if CMC reduces social interaction isn't clear. Nowadays, with internet technology highly developed, pictures, video, animation are used around. Thus, the information people shared through computer isn't less than face-to-face anymore. According to the research from Boyd and Ellison [9], social networking website is a type of web-based platform with three features as follows:

1. A public or semi-public file can be established in platform individually.
2. Users and members in a community can share things between each other.
3. Users can check and browse their friend lists.

As above, the main feature of social networking websites is to improve contact quality among users. Users share more and more emotions on those social networking websites [9]. Ellison et al [10] found that Facebook users use social searching more than social browsing which means making friends with strangers is not the purpose of using social networking website. In addition, in order to keep the interesting conversations and interactions on the Facebook, students in the same class and sit side-by-side preferred to use Facebook to communicate instead of talking to each other face-to-face [11].

In other words, social networking website, as a communication tool allows users maintain their real-life social network. Furthermore, social network take individual as the center spread outward, from family members, relatives, and unfamiliar friends, colleagues, neighbors even strangers. Pempek et al. [12] also pointed out that Facebook will help non-student groups connect with professionals and provide students to expand their real life interrelationships.

Also, non-student groups can build the links of same region or work group so that they can expand their social network from internet to real life. Previous researches need to be reconsidered. In addition, anonymous on the internet reduce the individual identity clues, so that the behaviors people doesn't do or not that intense in the real life have become very prominent, resulting in disinhibition, may increase the degree of user's self-disclosure, making the disclosures or interactions on the Internet more than in the real world.

2.3 Self-disclosure

Self-disclosure was proposed by Jourard [13] a psychological therapist, he pointed out that, through self-disclosure, individual was understood more by others. In other words, self-disclosure is to leak things about themselves through words, for example, thoughts, feelings and experiences [14]. Although some scholars considered that face-to-face communication delivers much more emotional messages than CMC does[15], anonymous and disinhibition on the process of CMC makes people expose their secrets or privacies more relieved. Nevertheless, there are many factors that affect the degree of user's self-disclosure, such as numbers of people, genders, cultural differences, mutual relations, topics and positive/negative messages[16].

Moreover, Brehm [17] and Fehr [18] considered that female's intimate behaviors such as self-disclosures, emotional expressions and daily conversations are much more than male's. Males are not good at expression. Generally speaking,

individuals are more willing to conduct the depth and intimacy of self-disclosure with whom they are familiar with, however they only discuss general issues with common friends or strangers [14, 19].

Although the relationship between communicators is an important factor of self-disclosure, Burnard and Morrison [20] pointed out that it doesn't mean self-disclosure won't be happened in distant relationships, such as consultants and experts in a formal relationship elicit certain self-disclosure behaviors of people they meet.

With modern technology has been associated more and more with human life, restructuring the social context, social structure and message passage changes society a lot. Especially the growth of Internet technology, it makes people to communicate by many kinds of media. In certain cases, communication effects through CMC are even better than face-to-face. Above, the process of psychological factors when users choose communication media would be very worth to further investigate.

3 Research Design

This study lean to the qualitative approach that was conducted as participation observation and in-depth interview to gather research data of user's choice of communication tool based on five participants who have both long-term MSN and Facebook users.

3.1 Research participants

The Dunbar's number, proposed by anthropologist Robin Dunbar, is a theoretical cognitive limit to the number of people with who can maintain stable social relationships. It has been proposed to lie between 100 and 230, with a commonly number of 150 [21]. However, the understanding of the interaction between new friend and old friend is the purpose of this study. Researchers finally selected the participants who should have over 200 friends in both their Facebook and MSN's friend list.

3.2 Sampling method

The participants in this research must be Facebook and MSN heavy users. For example, they have to exchange information on Facebook's wall, and talk to friends in MSN's chat room etc. The study took Facebook users as the primary filter method of selecting participants because the social behaviors on Facebook are more public and easy to observed than MSN. In order to examine participants' social behavior on the Facebook, this study took participation observation as one of the research methods. Once confirming the primary group of participants (who has over 200 friends on Facebook), researchers used snowball sampling to gain the final group of participants (who also has over 200 friends on MSN) for in-depth interviews. The interviewees' profile is shown in table 1.

Table 1 Interviewees' Profile

Code	Occupation	Age	Gender	number of Friends on Facebook/MSN'
A01	Graduate student	23	Female	440/253
A02	Graduate student	23	Female	745/350
A03	Graduate student	24	Female	220/398
A04	Graduate student	25	Female	230/350
B01	Graduate student	23	Male	762/645

Since most qualitative studies use more than one way to collect data, this study took participation observation as the primary method to observe interviewees' social behaviors on Facebook and MSN. Then, the researchers obtained rich information through in-depth interviews. The details of each strategy are as below.

3.2.1 Participation observation

Interviewees' Facebook are being scanned by researchers in order to observe whether if the interaction is continuous or not from time to time[22]. Interaction, for example, post messages on the wall, post pictures, use chat room to talk to others etc. Furthermore, researchers confirmed that whether if the Facebook and MSN's friends of the interviewees are more than 200.

3.2.2 In-depth interview

Malhotra [23] thought that the in-depth interview is a way which can contact interviewees directly with semi-structured interview, and this individual interactive way can discover interviewee's basic motivation, belief and attitude. According to Wen's definition, through in-depth interview the researcher can discover some important factors that are difficult to find through face-to-face talk [24]. By In-depth interview, opinions can be exchanged from each other, that makes answers and questions unconsciously occur.

On the other hand, this study adopted semi-structured interviews to make interviews more flexible that the questions and answers can be form in the period. Researchers read literatures which help to form the semi-structured interview questions according to the theoretical concepts. The interview questions are shown in Table 2:

Table2 Interview questions

The main research questions	Interview questions
1.What are the users' social behaviors in activities on MSN Messenger and Facebook?	※What are the things you always do on Facebook/MSN?
2. What are the degree of differences among social presence, social interaction, disinhibition and self-disclosure of users' social behaviors on MSN Messenger and Facebook?	(1) To investigate the differences in social presence between Facebook and MSN： ※For you, which one is more emotional/warm/users-friendly/close/expression/keen when you communicate with the others? (2)To investigate the differences in social interaction between Facebook and MSN： ※Experiences from using Facebook/MSN to communicate with others. For examples, something makes you laugh, sad or angry; feel sleepy or boring when using Facebook/MSN. (3)To investigate the differences in disinhibition between Facebook and MSN： ※Have you ever used words or pictures to express emotions when communicating with friends? For Examples, to express angry, jealousy, even use the dirty words etc. (4)To investigate the differences in self-disclosure between Facebook and MSN： ※Could you tell me the things that you share with others on Facebook／MSN? For examples, your habits or the relationships with others.

4 Results

This section analyzed the results of collected qualitative data, mainly to explore what the impacts of Computer-Mediated Communications on social behaviors of MSN and Facebook users.

4.1 Social behaviors on MSN/Facebook

4.1.1 The primary factors of people using new communication tool are peers and environment

Fulk [25] proposed social influence model, which explains people choose communication tool not only with objective, rational reasons, but also be influenced by some emotional factors such as organizations, peer groups, positions, and social networks. Interviewees A01, A02, B01 said that their registrations on Facebook was wanted to contact with friends in foreign countries, but not often used until the Facebook's bloom in Taiwan recent years. A03 also said that she applied for Facebook account was because work demands, so she rarely used. However, later on when she found out that her friends were all in use, made she use it every day because she wanted to follow friends' status.

4.1.2 Technology Acceptation Model (TAM)

On the other hand, Davis (1986) [26] proposed Technology Acceptance Model(TAM) which illustrates users would have more confidence on self-control and self-efficacy when they perceive more the easy of using technology systems. If users perceived a technology would help their work and future more, they take positive attitude more. B01 said, because Facebook has gradually replaced MSN's features, her friends now become less time on MSN, so even if just talk about where to eat, she would choose to use Facebook chat room but not MSN. B01 also referred to as smart phones and other electronic devices, such as iPad, emergence and spread, the probability of choosing to use Facebook will also be increased because Facebook automatically updates post messages and notifies users.

4.1.3 Facebook replace MSN gradually

All interviewees said that they still log in MSN every day even though Facebook has included more and more MSN features. B01 said, he is a foreign student, so he logs in MSN every day to allow his families to know his current situations through "personal information (nickname)" or talk to him immediately. A03 said that she logs in every day for checking new emails. In addition, all interviewees log in MSN everyday because of the habit.

In terms of functions of use, all interviewees said that they use Facebook's wall and the private message frequently, while MSN is only for chatting. A01 said that she uses MSN to transfer files or instant communications because she doesn't need to open another window to send messages, and usually can get replies faster. However, A01 pointed out that if both must show her online status, she would choose to use Facebook; because she considers that if anyone on the MSN

sends a message to her, she has to respond it immediately, otherwise the person may feel rude while Facebook can wait until they want to response.

4.2 Social presence

Previous studies showed that, according to media richness criteria [8, 27-29], instant messenger obviously belongs to high rich media, is only inferior to Face to Face and video conferencing. Although Facebook appears as late and past research has not put it in comparison, Facebook should belong to a high degree of social presence and rich media, according to social presence.

As A02 pointed out, Facebook is more surviving than MSN, she and all her friends share their current status, photos anytime they want on Facebook. If someone has a smart phone, he or she can use "check-in" to let friends know which restaurant he or she just in. In addition to use pictures, videos and other ways to increase social presence, People share things and update their current status frequently and those are also link to real-life.

4.3 Social interaction and disinhibition

A02 said, once her friend confessed his love expression to her on MSN, she felt very embarrassed, because she knew that the friend was waiting for reply in front of the screen just like face to face interaction. A02 also mentioned that her experience on argue with a friend. She said that the friend rarely uses MSN, both of them had no contact with each other for a long time. Using MSN may make she feel worse, just like quarrel on face to face, while using Facebook allows her to think thoroughly then reply. According to above disccuions, communicators choose different media to communicate due to following factors: topics, relationships, objects, and positive/negative messages. People tend to choose MSN as a media when receive positive messages in order to gain immediateness and reality. Negative emotions caused negative message, so people choose the low social presence media, Facebook, as a media of communication. Because when people lowered the social presence, they involved relatively low emotions; so that they can reduce the sense of discomfort and gain more time for responding.

Although there are many features of MSN and Facebook to make up for what computer mediated communication lost, most people still use text to communicate. When lacking facial expressions and non-verbal clues, deindividualism and disinhibition emerged, which make people more unrestrained compared to their real-life. A03 said her friend C has an experience of anger on using Facebook. She said that her friend B often reply impolitely to C's wall post, and resulted in a quarrel between C and B, later B was listed as blacklist and they no longer contact with each other.

4.4 Self-disclosure

Individuals have different degrees of self-disclosure to different objects. Generally speaking, individuals are more willing to do the deep and intimate self-disclosure with whom they are familiar with. However, they only talk about general issues with common friends or strangers [14]. Nonetheless, there are minor differences on MSN and Facebook in terms of self-disclosure. A03 said, she felt that MSN's "nickname - status" is to "her own" to know, while what she post on the Facebook's wall is to "everyone " to see. When she shares things on the wall, she describes clearly to make sure every friend could understand. But, if she wants to talk about her intimacy relationships with others, she will choose to use MSN chat room. A03 also mentioned, the things related to her own privacy, would have told to her better friends, and there is no reason for post on the wall and shares with everyone.

Although the degree of relationship between both sides of communicators is an important factor of self-disclosure, Burnard and Morrison [17] pointed out that it doesn't mean self-disclosure won't happen in remote relationships, such as consultants and experts in a formal relationship which elicits certain self-disclosure behaviors of whom they met. A01 said, she won't care strangers or unfamiliar friends to see what she posts on the wall, even if it relates to her own privacy. However, she might consider whether if this message influences her friends or not. As above, when people have less time to interact with strangers, then the burden is reduced, resulting in high self-disclosure.

Besides, B01 mentioned that there maybe some things that only want friends to know, and others may just want to share with family, so he registered for two Facebook accounts to separate friends and family. It can solve the problem that people select different things to be revealed depend on different circumstances.

4.5 Summary

According to the results, user's media behaviors can be influenced by colleagues and the environment. It matches the thought of social influence model, which emphasizes on organization, team, work position, social networks as well as the objective factors.

With the growth of smart phones and other mobile devices, people feel more conveniently of using Facebook, so most of MSN users switch their time to Facebook as communication platform. It matches the Technology Acceptance Model proposed by Davis. Technology Acceptance Model pointed out users have more confidence on self-control and self-efficacy when they perceive the technology systems more easy to use. They take positive attitude when they perceived the technology would help both of his work and future.

According to previous researches, both Facebook and MSN belong to high social presence media, they increase social situation clues by pictures, emotions, and videos. In most cases, people tend to choose Facebook as a social platform, because it combines with social networking features and MSN's functions, as well as offers many free games and social applications. However, according to the results, we found that users choose media as a communication tool depend on different communicative situations. Users tend to choose MSN as a tool to communicate with others when the

message is positive, such as confess own feelings; however, they prefer to use Facebook to deal with negative messages.

In addition, interviewees considered that using Facebook had less privacy, as everyone can see the messages on your wall, and your personal pictures can also be accessed free by people you recognized as friends. On the other hand, people use MSN mostly for talking about deeper feeling, such as lovelorn or intimacy relationships with others. There is another situation, people sometimes communicate with each other on Facebook in the beginning, then switch to the MSN window, because MSN doesn't need to open another window that make users grasp the content of conversation easily.

5 Conclusion

The reasons from the research discovered that users start using Facebook mainly effected by peers and environment. The users found that Facebook possesses all the functions of MSN, which including some social gadgets – communication tools, pictures, personal information (nickname) and games, may push users to make a distraction. In addition, the one-to-many and non-active features of Facebook let users not to concern about the communication objects' statuses but update easily and share the their current ones. At the same time, the communication objects also can interact with the communicator according to the personal statuses.

On the other hand, with the growth of the smart phones and e-book readers, people get more opportunities to use Facebook. For example, connecting to Facebook by mobile phone not only getting more convenient but achieving to maintain relationships rather than reading a book at commuting time. However, the study shows when users transfer files or view the messages, they still choose MSN as an intermediary medium. Researchers guess those situations appearing because Facebook doesn't offer file transferring capabilities in current and Hotmail appeared earlier. In order to avoid leakage of information or broken links with others, people does not like to replace their mail accounts and phone number, so users choose MSN as an intermediary.

In most cases, people maybe choose MSN to conduct depth conversation to get a quick response or problems solved. However, in this research found if the depth conversation is negative for the purpose of communication, users prefer to choose Facebook messages which lower social presence to conduct conversation to reduce the emotional involvement and decrease the discomfort from the negative dialogue by arguing. On the contrary, people heighten their social presence by choosing MSN to convey a positive message.

According to the criteria of social presence, Facebook and MSN are both high presence and high-rich media – using pictures, emoticons, audio-visual video and other ways to increase situational clues. In addition, Facebook has developed a number of features, such as "Check-in", allowing people to use the GPS on their mobile phones to let their friends know exactly and immediately where the restaurants or spots they are at. This feature is able to closely link the virtual cyberspace to the real life, increasing social interaction among people and to keep following friends' recent statuses.

In self-disclosure, because most users catching up with friends' statuses by Facebook, the study indicates that they rarely change their nicknames or personal statuses on MSN. Some interviewees even think "nickname/personal status" is a self-viewing behavior, not an informing one. Therefore, it's often presented with short sentences. On the contrary, there are many unfamiliar friends or strangers on Facebook, users tend to describe events in detail in order to show friends. Generally speaking, using of "nickname/personal status" on MSN has had some changes after the occurrence of Facebook. Close-remote relationship is a key factor to self-disclosure, some individuals are more willing to show their innermost feelings on Facebook with their acquainted friends and consider if the message has an effect on them, although there might be more barely-known people on their friend list, according to the research.

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Online Appointment Management System

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Abstract - *Booking an appointment online has grown in popularity over the past few years. Many different types of businesses use some type of Web-based online appointment management system to help make the appointments setting process more streamlined. An online appointment management system allows students to register and book appointments with their advisers. This paper gives details of the development process of an online appointment Web-based management system to be used within a higher education Institution. We have conducted some experimentation to show the effectiveness of our system.*

Keywords: Web 2.0, Web Technology, Appointment management system, Web based application.

1 Introduction

Web applications have helped in streamlining many of the tasks we perform on a daily basis, and have made our lives easier. These applications are widely used to assist us in overcoming problems with student learning and scheduling appointments. In the past, these appointment processes were done manually and, because of this, there were many instances of overbooking or forgetting to cancel an appointment which could free up the space to schedule another in its place. To eliminate human error due to setting appointments manually, a web application will be developed to make the scheduling process easier. Also, given the busy lives that many of us lead today, an online appointments management system within a university makes perfect sense as it frees up valuable time, not only for students, but also for lecturers and university staff members.

The purpose of this paper is to develop and evaluate an online lecturer appointment system for students' projects, where all processes of appointments are verified. Most aspects of appointment management, such as reservations, confirmations and cancellations, are controlled automatically. Our online appointment management system for students' projects should be able to facilitate the task of booking an appointment with lecturers.

Nations defines web application as any application which can use a web browser as a client. The application can be simple such as a message panel or a visitor sign-in book on a website, or complex like a word processor or a spreadsheet [5].

In the proposed paper, a new web application will be developed. It will be programmed by ASP.NET with code behind visual basic [9]. An online appointment management system will allow students and lecturers to interact with each other in real time. This web application allows students and lecturers to administer the appointment and registration process in an easy and efficient way. The application will also be set up on a multi-platform network which will allow those still using Windows XP or Windows Vista to be able to print reports generated by new systems [7]. Since not all computers within the college have Windows 7, this will aid in terms of compatibility issues [4].

The instructors, students and lecturers who are using the system will receive information in real-time. With some applications, the system needs to run overnight in order to display any changes. With our system, however, once the information is entered and has gone through the verification processes, the end users will be able to view it automatically. This means that if the day and time of an appointment are changed, once that information is put into the system, it will be available for all users to see. As such, once lecturers update their calendars, since everything is done in real time, students will be able to schedule appointments immediately with no waiting time involved.

To eliminate the mistakes caused by human error, it is felt that this new system should be used instead of a manual one which involves having a person schedule and cancel appointments. The current way that the scheduling process works is as follows:

- A student goes to the office to request an appointment.
- A staff member takes down the information on a Scheduling Form. A copy of this form is placed in the lecturer's mailbox.
- The information is then entered into the lecturer's calendar whenever the staff gets around to do it. This means that even though a student may have requested the earliest appointment, it may not be entered into the system until the staff member gets around doing it. There is the potential for another staff member filling the slot with a different student's request, thus causing the first student's

appointment to be rescheduled at a time that is inconvenient.
- If rescheduling is necessary for the first student, the staff member must contact the student, explain the mishap and try to reschedule. This process takes up valuable time that could be used to make the student, the staff member, and the lecturer more productive.

The paper is organized as follows: section 2 presents the related works, section 3 considers Requirements and Design, section 4 also discusses the implementation and testing, and section 5 presents the system evaluation.

2 Related Works

2.1 Web Application

Lately there have been many different trends in web application development. Web application development is a fast and ever growing field. Jazayeri said "Web applications have a user interface based on the browser that interacts with the user and can manage large amounts of data" [2]. They are popular because a new version of the application can be released without the necessity of installing the new version on the client computers. This is very different from desktop applications where either a new version has to be installed, or there must be the installation of a patch [2].

Web applications of an online appointment management system within a college or a university setting is an area of rapid growth because it is a more efficient way of handling administrative issues [3].

Online appointments management systems have been around for a few years. They are used extensively in hospitals and healthcare settings in order to keep track of patient records as well as for scheduling appointments. Although this system will be developed for an educational institution, it is helpful to obtain ideas on how other areas of business have used such systems. UCLA developed a web-based data management system that is used in hospitals across the country, and although the system does have its limitations, it is still performing quite well [8].

Lu and Ab Hamid (2007) have developed an appointment management system called WBAMS which uses Web Modelling Language (WEBML) and -.Net four-tier architecture. According to them, their system will allow appointment scheduling to be more efficient and effective.

The authors used six functional requirements to develop their online appointments management system:
- User Access Module - Allows access to the systems as well as online registration.
- User Maintenance Module - Used to manage and maintain the user groups.
- Consultation Module - Allows the lecturer to manage his/her appointments. The lecturer may schedule and cancel appointments as well as block some students from scheduling.
- Appointment Module - This is where the students schedule their appointments.
- Setup Calendar Module - This is used by the administrator to customize calendars.

There are also non-functional requirements that were used:
- Usability - The intuitive interface provided by the system.
- Performance - Deals with the response time of the system.
- Maintainability - The ability to modify a component without affecting other components.

The authors developed different views for the students, lecturers and administrators using the system:
- Student Site View - This consists of an appointment area and a student area.
- Lecturer Site View - Consists of the lecturer and appointment view.
- Administrator Site View - This is the default page users see when they log into the system.

2.2 Web 2.0 Technologies

A website programming language, Web 2.0 was named as a result of a meeting between Tim O'Reilly and Media Live International. O'Reilly said that Web 2.0 had become more interesting than before because it had some new features which increased the functionality of web sites, such as YouTube, Facebook and Bloglines [6].

2.2.1 Web 2.0 Concept

Web 2.0 is a term that refers to a group of new technologies and web applications that led to changes in the behaviour of the global network "Internet". O'Reilly defines Web 2.0 as embracing the business on the Internet as a platform and using its power [6].

Web 2.0 consists of applications based on the World Wide Web which carries a number of features that distinguish it from Web 1.0. For example, it allows users to use applications that rely on the browser. Therefore, these users can obtain their own database on the site, and can also control this database. In addition, Web 2.0 allows users to add values to the applications which are based on the browser [6].

3 Requirements and Design

3.1 Descriptions of Data Requirements

A lot of data requires being stored in a database. This includes the details of each user, and appointments. Data requirements provide a detailed description of the data model which the system must use to accomplish its functional

requirements. In this section, we provide details about the required data, as well as any security issues surrounding access to that data.

- The system needs to keep details of lecturers, students, projects and appointments.
- Information about each lecturer and student is recorded at registration. These are ID, name, user name, password, email and activation.
- Every user has activation and blocking fields.
- Each user name is unique.
- Each user has a privilege stored in field roles that manage the security.
- The availability of the lecturer is stored in lecturer available, while student unavailable stores the student unavailability.
- Each student may register his project with a lecturer. This includes project ID, lecturer ID, student ID, project name and description.
- Each student chooses only one project.
- The acceptance of a student by a lecturer is recorded in the field acceptance in the table student project.
- Information recorded for each appointment includes appointment ID, project ID, lecturer ID, student ID, start time, end time, duration and date.
- Each appointment should contain points which include points ID, appointment ID and point's title.
- Each appointment should also contain results which include results ID, appointment ID and results title.

3.2 System Architecture

The OAMS allowed students to schedule their own appointments, cancel and register. The newly developed online appointment registration system also allowed students to avoid the hassles and mistakes that can occur as a result of using paper registration. Since everything is done in real-time, the registration process will be fair and done on a first come, first registered basis. Allowing students to book their appointment with lecturers online has several benefits.

- The system will be available twenty-four hours/seven days a week allowing for scheduling at a time that best suits the student.
- Students will be able to view the lecturer's availability for appointments and schedule accordingly.
- Lecturers can add results after finishing the appointment.
- All processes are performed in real-time which cuts down drastically on mistakes and errors.

Figure 1: The users' abilities and privileges, and functionality of the web application.

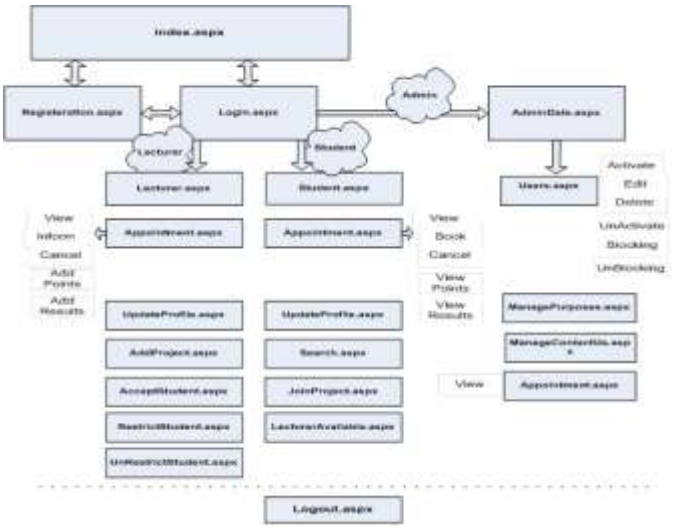

Figure1 Diagram of the research

The creation of database tables is based on the ERD. Each entity converts to a table in the relational database. Figure 2 demonstrates the database relationship for our online appointment management system. The diagram will show that each entity is converted into a relational table. In addition, the attributes are also converted to fields of table.

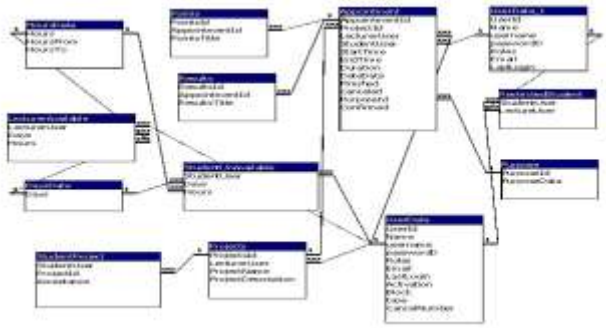

Figure2 Database Relationship Diagram

4 Implementation and Testing

In this section, the implemented pages as can be seen during the browsing on the online appointments management system are displayed

4.1 Implementation in General

The implementation and development of an online system to manage appointments between lecturers and students is the main goal of this research. The content of this system should adapt to the users' requirements. For instance, reservations, confirmations and cancellations have to be implemented in this system.

In this system, students can register in and join a project which has been added by a lecturer. They can also reserve appointments with lecturers. In addition, they can manage

these appointments. For example, they can cancel or change these appointments.

On the other hand, lecturers can sign up and add new projects for students. They can also view their available time and accept students' appointments. Moreover, they can write results at the end of each appointment. If any student cancels an appointment more than five times, lecturers can prevent this student from making another appointment.

4.2 Description of Implemented Pages

In this part, the main pages in the website will be described.

4.2.1 Registration Page

In order to let students book appointments with lecturers, they have to complete the registration forms which include:

- Personal and contact information: Name and Email.
- Login information: User name and Password.
- Available time: Available time for lecturers and lecture schedule for the student.

Lecturers can add projects for students by adding the project name and description. In addition, students can select a lecturer's name, and then choose a project from a list of projects which can be added by the lecturer.

After a student joins a project, the lecturer has to accept that student's decision in order to allow the student to book an appointment with them.

4.2.2 Booking Page

Students can reserve appointments with their lecturers after viewing the lecturer's availability. They can choose the date and time of each appointment. In addition, they can add this appointment to the Google calendar by entering the user name and password as provided in Figure 3. However, the lecturer can restrict students from booking any appointment with them for any reason.

Figure3 Booking Page

4.3 System Testing

The implemented system has been tested as follows:

- Navigation between pages was tested.
- Registration for lecturer and student was tested.
- All of the users have to be activated by the administrator to allow them to access the online appointment management system.
- Add project by lecturer, join project by student and accept student's project by lecturer were tested.
- Reservation, cancellation and confirmation were checked.
- Appointments enter to Google calendar worked very well.
- Sending an email when the student reserves or cancels an appointment was tested.
- Sending an email when the lecturer confirmed and cancelled an appointment was tested.
- The email reminder worked well.
- The ability of the lecturers to add points for appointments before confirmation and add results after finished worked well.
- Student can view points and results of appointments.
- Restrict/unrestrict student by lecturer was tested.
- User blocking and activation worked well.
- Managing purpose and managing contact us worked well.

5 System Evaluation

Evaluation took place after the system had been used for several weeks. A field study was carried out to observe the system's features and users' usage. Furthermore, the online appointment management system has been compared with another static appointment system.

5.1 System Testing

Some students were asked individually to use the online appointment management system and fill in the questionnaire in order to obtain feedback and to assess the whole system.

Each student was asked to read the following scenario and fill in the questionnaire:
"Assume that you have to reserve an appointment with a lecturer. You are visiting our online appointment management system. Please execute the following tasks:

- Register.
- Login to the website.
- Navigate throughout the website.
- Add your project.
- Reserve an appointment with a lecturer.
- Cancel this appointment.
- Check your email.
- Logout."

5.1.1 Results from Questionnaire

A survey was carried out among 28 students. Most of them were studying for a Master's degree, while 43% were

studying for a Bachelor degree as shown in Figure 4. Table 1 also shows the demographic information about the participants.

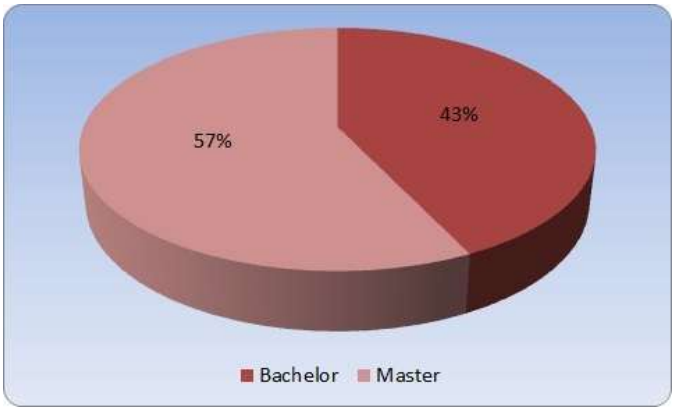

Figure4 Percentage of Participants' Courses

	19 - 20	21 - 22	23 - 24	25 - 26	27 - 28	Total
Female	1	3	7	3	1	15
Male	5	1	4	1	2	13
Total	6	4	11	4	3	28

Table1 Participants' Demographic Information

The second and third questions in the questionnaire were about features which have been built into the system. All of the participants said that they could join projects with lecturers as shown in Figure 5.

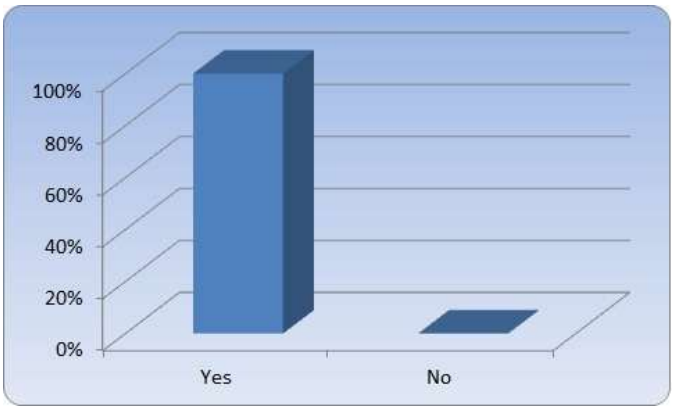

Figure5 I can join a project created by a lecturer

In addition, the participants were asked if the e-mail reminders related to scheduled appointments were one of the most important features in this system. 43% of them strongly agreed while around 39% agreed as indicated in Figure 6.

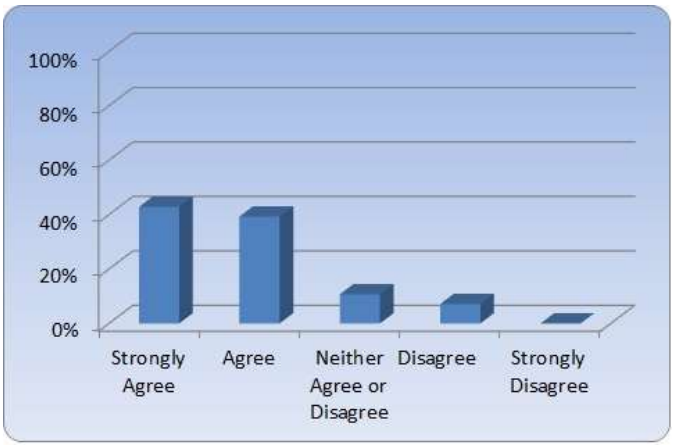

Figure6 E-mail reminders of scheduled appointments are one of the most important features of this system

6 Conclusion

We felt that the development of an online appointment management system was necessary because of the antiquated way in which many schools register and schedule student appointments. In order to keep up with growing technology, we must seek ways to make certain processes less time consuming, more error free and more user friendly. We have built the system using ASP.NET 2008. A field study has been carried out to observe the features of our system and stakeholders' usage. Furthermore, our online appointment management system has been compared with another static appointments system.

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A study on adaptive learning of scratch programming language

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Abstract - *Scratch is a visual programming language software. Learners for the past had to write long string of text instructions to learn programming. But scratch changes the condition. This software helps learners through graphical drag and drop scripts for beginners to learn programming language effectively reducing the learning threshold. Therefore, scratch software teaching in junior high school IT curriculum would help students to learn programming in the future. In this article, we apart seven grade students from genders to analyze their learning achievements, and try from a cognitive style perspective to study the adaptive scratch software instruction.*

Keywords: Scratch, Visual learning, Cognitive style

1 Introduction

In the junior high school IT courses, the lectures are not almost graphics software to use and network capabilities of the teaching. Enhance creativity, logical reasoning and problem solving ability of the IT curriculum is lacking. Many studies have pointed out: Scratch software at this level can provide specific capacity building to enable children to think more systematically, and improve problem solving and logic skills.

In addition, during the scratch learning, not every learner will be able to obtain good learning results, on the cognitive point of view, the individual learner is different.

Whether the students of different cognitive styles have different learning achievement, as well as learning how to scratch the feelings, the results will show the students what kind of cognitive style in which learning mode for learning. It will provide a reference direction in adaptive computer teaching.

2 Research purpose and questions

The main purpose of this study was focused on genders and cognitive styles of seventh grade students in scratch learning. In which the students were divided into two groups according to genders. And the evaluation of the students' works was implemented through peer assessment, and its performance evaluation standards in the six dimensions of comparison. An additional facility SOP scale test, the students classified in different cognitive styles, exploring the difference of the students in learning experience and interaction with each other.

To achieve the above purpose, the main research questions of this study are as follows:

1. Is there any scratch learning effective difference between genders in seventh grade students?

2. Is there any scratch learning effective difference between cognitive styles in seventh grade students?

3. What does the experience access by peer assessment?

3 Literature Review

3.1 Cognitive Style

Cognitive style is usually described as a stable personality which influences attitudes, values, and social interaction. It is also how the individual acquires knowledge and how an individual processes information. It is a characteristic of cognitive processing which is particular to a certain individual or class of individuals.

Cognitive styles include variables within a single dichotomy such as visual-oriented vs. verbal-oriented, field-dependent vs. field-independent, and global-holistic vs. focused-detailed.

Richardson in 1977 divided cognitive style into "visual-oriented person"(Visualizer) and "verbal-oriented person"(Verbalizer) by the Style of Processing (SOP) scale. In this study, in order to identify the cognitive learning style of individual learners, SOP scale was employed to divide all participants into the cognitive learning styles of visualizer and verbalizer. The characteristics between the two styles are as follows:

Table 1 Visual-oriented/Verbal-oriented characteristics.

Visual-oriented	Verbal-oriented
Image-oriented	Text-oriented
Efficient use of the ability of the image	The ability to efficiently use the text

Context clearly fantasy	Few fantasy
Entities tend to get through the specific message	Tend to get the message through the text
Interesting puzzle game	Like nature of the game with the word
More subjective, self-oriented	More objective, task-oriented
Rhythm of the left eye	Rhythm of the right eye
Easy to understand the visual nature of the message	Easy understanding of complex semantic information
Flexibility in image manipulation and transformation of messages	The flexibility of manipulation and transformation of semantic symbols

3.2 Visual Learning

Programming language learning requires learners to have a certain logic capacity. However, writing code, abstract logical thinking often causes difficulties for the learners. Learners cannot be other than dynamic external representation to interpret the concept of abstract. But scratch provides a dynamic image method to program, like toy bricks.

4 Research Tools

The research tools include:

1. Scratch Software
   Scratch software used in this study developed by Massachusetts Institute of Technology known as visual programming language software, version 1.4.
2. MOODLE learning management system
   In this study, the learning management system built for the open source learning management system of MOODEL, version 1.9.5
3. Scratch software teaching content design
   The contents of teaching in this study, designed primarily for researchers to design, theme or presentation, learners are familiar with the software through the completion of the project and to construct their own work.
4. Student peer assessment work sheet
   Rating the content is divided into six dimensions, namely content, composition, color, creativity, skills and attitudes, in each dimension and then divided into animation and game their way to score two performances.

Fig.1. Scratch screenshot.

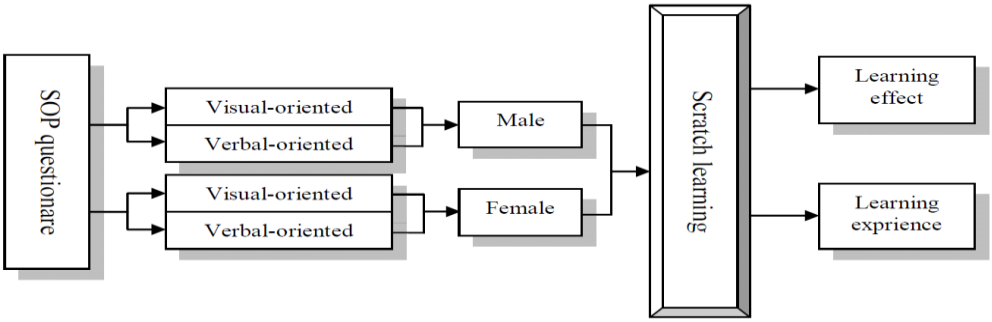
5. Style of Processing Scale, SOP
   We adopt the SOP scale which was developed by Childers, Houston, & Heckler（1985） in this study.
6. Learning experience questionnaire
   The "learning experience questionnaire" is divided into three parts: motivation' learning and evaluation.

5 Research design

A quasi experimental design, the experimental group divided by sex and girls, boys. 15 boys and 14 girls are totaled. The experimental teaching time is 16 lessons, 2 classes per week, continuously for 8 weeks.

Research flowchart as follow:

Fig.2 The research flowchart.



6 Result

General purpose of this study to be answer questions, research results and analysis are discussed below:

6.1 The scratch learning effect in difference genders by online peer assessment

The study had students engage in mutually evaluating each other's animation works based on 6 dimensions of evaluative criteria through peer assessment on line. Their works were divided into animations and games. Each student must embark on evaluating another two students' works which were allocated at random. The highest level of each evaluative dimension's criteria was 3, and the lowest was 1. The total grade of the student's dimensions was gained from the evaluations of other classmates and teachers. It would be discussed one by one as follows:

6.1.1 Different situation of capitalizing on peer mutual evaluation to engage in evaluating Scratch motion picture works among different gender students

In order to understand whether there were any difference of evaluating results on motion picture works among students of different gender, the grades given by students and teachers were statisticized and analyzed by T test, the results were as follows:

Table 2. T test summary of total grades on Scratch motion picture works by peer mutual evaluation among students of different gender.

	sex	num	M	SD	t
Total	M	15	64.32	10.73	-.637
	F	14	74.20	9.26	

*p<.05 **p<.01

According table 2., it showed that after analyzed by t test, t=-.637, p=.859>.05 which did not reach significant level, it meant students of different gender did not show significant difference in total grades of motion pictures.

Then, the different dimensions of students' evaluative criteria were statisticized, there were 6 dimensions altogether engaged in t test. The results were depicted on the table as follows:

Table 3 T test summary of 6 evaluative dimensions of peer mutual evaluation on the Scratch motion picture works among students of different gender.

Dimensions	sex	num	M	SD	t
Contents	M	15	13.20	3.76	-1.256
	F	14	15.12	2.47	
Compositions	M	15	11.30	3.51	-1.102
	F	14	14.25	2.77	
Colors	M	15	12.55	3.36	-2.285*
	F	14	14.54	1.84	
Creation	M	15	14.40	2.79	-1.261
	F	14	15.29	2.16	
Skills	M	15	6.20	1.89	-1.484
	F	14	7.43	1.21	
Attitudes	M	15	6.67	1.15	-1.350
	F	14	7.57	1.47	

*p<.05 **p<.01

According to table 3., it could be found that there was only one of the 6 dimensions on evaluating the motion picture works reach significant level, i.e. the dimension of "color" (t=-2.285, p=.022<.05), while the fifth dimension did not reach significant difference, it meant that during the process of producing Scratch motion picture, different gender has yielded influence on the application of colors for motion picture works. Based on the average (14.54) of girl students was higher than that (12.55) of boy students, we knew girls were more excellent at applying colors than boys.

6.1.2 Different situation of capitalizing on peer mutual evaluation to engage in evaluating Scratch game works among students of different gender

In order to understand whether the evaluative results of game works taken by peer mutual evaluative method among students of different gender would be different or not, the grades given by students and teachers were statisticized and analyzed by T test, and the results were as follows:

Table 4 T test summary of total grades on Scratch game works by peer mutual evaluation among students of different gender.

	Sex	num	M	SD	t
Total	M	15	64.88	10.94	-1.130
	F	14	69.51	8.31	

*p<.05 **p<.01

From table 4., it showed that after the total grades of game works were analyzed by t test, t=-1.130, p=.612>.05 which did not reach significant level. It meant that students of different gender didn't show difference in total grades of game works,.

Then, the different dimensions of students' evaluative criteria were statisticized, and there were 6 dimensions altogether engaged in t test. The results were depicted on the table as follows:

Table 5 T test summary of 6 evaluative dimensions on the Scratch game works in peer mutual evaluation by students of different gender.

Dimensions	sex	num	M	SD	t
Contents	M	15	11.88	2.81	-1.271
	F	14	12.79	2.31	
Compositions	M	15	12.92	2.54	-1.353
	F	14	14.41	2.09	
Colors	M	15	11.89	2.89	-2.534*
	F	14	14.33	1.56	
Creation	M	15	14.92	1.42	2.047*
	F	14	13.05	2.77	
Skills	M	15	6.42	1.30	-.995
	F	14	7.51	1.28	
Attitudes	M	15	6.85	1.19	-1.259
	F	14	7.42	1.45	

*p<.05 **p<.01

From table 5, we could see that among the 6 dimensions of evaluating game works, the dimension of "color" (t=-.2.534, p=.034<.05) and "creation" (t=2.047, p=.012<.05) reached significant level, while the other 4 dimensions didn't show significant difference. In previous t test of motion picture works, there was also significant difference in the dimension of "color", it indicated that girls really did better in learning and producing scratch motion pictures and games than boys. Besides, in the dimension of "creation" , the average (14.92) of boys was higher than that (13.05) of girls which reached significant level in statistics, it meant that while producing Scratch games, boys obviously surpassed girls in creational level.

6.2 Difference of evaluation performing among students with different cognitive styles who learned Scratch software to engage in mutual evaluating on line

The study used SOP scale as the classification basis of cognitive styles, the total grade was 88, and there were 29 student subjects altogether that were divided into two groups as "visual-oriented" and "verbal-oriented". And those who got grades above 59 belonged to "visual-oriented", while those under 59 were "verbal-oriented oriented". The detail allocation of subjects in each item was depicted on table 6 as follows:

Table 6 Classification of learning groups and cognitive-style groups.

Visual-oriented	Verbal-oriented	Total
15	14	29

6.2.1 Different situation of peer mutual evaluation on Scratch motion picture works by students with different cognitive styles

In order to understand whether students with different cognitive styles would make different evaluation results on motion picture works while applying peer mutual evaluation method, the grades evaluated by students and teachers were statisticized and analyzed by t test, the results were as follows:

Table 7 T test summary of total grades on the Scratch motion picture works by peer mutual evaluation among students with different cognitive styles.

	Cognitive style	num	M	SD	t
Total	Visual-oriented	15	74.68	9.82	-1.219
	Verbal-oriented	14	63.57	11.77	

*p<.05 **p<.01

According to table 7., it was found that after the total grades of motion picture works were analyzed in t test, t=-1.219, p=.513>.05, which did not reach significant level, it meant that in the total grades of motion picture works, students of different gender did not show difference.

Then, the 6 different dimensions of students' evaluative criteria were statisticized and analyzed by t test, the results were depicted on the table as follows:

Table 8 T test summary of 6 evaluative dimensions in peer mutual evaluation for Scratch motion picture works by students with different cognitive styles.

Dimensions	Cognitive style	num	M	SD	t
Contents	Visual-oriented	15	15.05	2.55	-1.522.
	Verbal-oriented	14	12.18	3.49	
Compositions	Visual-oriented	15	14.99	2.06	-2.265*
	Verbal-oriented	14	11.75	3.54	
Colors	Visual-oriented	15	13.94	2.88	-1.478
	Verbal-oriented	14	12.41	3.41	
Creation	Visual-oriented	15	15.34	2.49	-1.285
	Verbal-oriented	14	14.55	1.75	
Skills	Visual-oriented	15	7.88	1.37	-1.252
	Verbal-oriented	14	6.56	1.24	
Attitudes	Visual-oriented	15	7.48	1.45	-1.153
	Verbal-oriented	14	6.12	1.21	

*p<.05 **p<.01

According to table 8., it showed that among the 6 evaluative dimensions on mutual assessing works of motion picture, only one of the dimensions "composition" (t=-3.405, p=p.046<.05) reached significant level, while the fifth dimension didn't reach significant difference. It illustrated that during the process of producing the motion picture Scratch, different cognitive style on such composition design has influenced the output of motion picture works. As to the average (15.00) of visual-oriented students was higher than that (12.40) of verbal-oriented oriented students, we could know that the design of motion picture composing by visual-oriented students were better than that by verbal-oriented oriented students.

6.2.2 Different situation of capitalizing on peer mutual evaluation to engage in evaluating Scratch game works by students with different cognitive styles

In order to understand whether students with different cognitive styles would make different evaluation results on game works while applying peer mutual evaluation method, the grades evaluated by students and teachers were statisticzed and analyzed by t test, the results were as follows:

Table 9 T test summary of total grades on Scratch game works by peer mutual evaluation among students with different cognitive styles.

	Cognitive style	num	M	SD	t
Total	Visual-oriented	15	73.42	9.06	-1.114
	Verbal-oriented	14	62.93	11.29	

*p<.05 **p<.01

From table 9., it illustrated that after the total grades of game works were analyzed by t test, t=-1.114, p=.621>.05, which did not reach significant level, it meant that in total grades of game works, students with different cognitive styles showed no difference.

Then, the 6 different dimensions of students' evaluative criteria were statisticzed and analyzed by t test, the results were depicted on the table as follows:

Table 10 T test summary of 6 evaluative dimensions on Scratch game works by peer mutual evaluation among students with different cognitive styles.

Dimension	Cognitive style	num	M	SD	t
Contents	Visual-oriented	15	14.78	1.79	-1.228
	Verbal-oriented	14	12.22	2.26	
Compositions	Visual-oriented	15	14.82	1.95	-2.413*
	Verbal-oriented	14	12.19	3.47	
Colors	Visual-oriented	15	14.72	1.78	-1.253
	Verbal-oriented	14	10.95	2.51	
Creation	Visual-oriented	15	13.77	2.44	1.514
	Verbal-oriented	14	14.71	1.64	
Skills	Visual-oriented	15	7.59	2.88	-1.289
	Verbal-oriented	14	6.71	1.85	
Attitudes	Visual-oriented	15	7.74	1.65	-.997
	Verbal-oriented	14	6.15	1.32	

*p<.05 **p<.01

From table 10, it was found that in the 6 dimensions of evaluating game works, the dimension of "composition" (t=-2.413, p=.037<.05) reached significant level, but the other five dimensions did not show significant difference. Such situation was similar to the results of motion picture works. It indicated that during producing Scratch works, no matter in motion picture or game, the results evaluated by visual-oriented students were higher than that by verbal-oriented oriented students in the dimension of composition.

6.3 Scratch learning experience

This study used Kirkpatrick's four levels of evaluation model questionnaire. The questionnaire is divided into three dimensions "course experience", "interactive experience" and "feedback and learning conditions". The questionnaire shown in table 11:

Table 11 Learning experience questionnaire.

dimension	question
Motivation	1. The scratch software is very easy to learn.
	2. I am very interested in learning scratch course.
	3. I will open the computer to use scratch at home.
	1. Learning Scratch let me learn more about programming language.
Learning	5. I like to discuss with the students and teachers the use of Scratch software.
	6. I feel with most of the features of Scratch software is easy to use.
	7. I feel that using Scratch software to make a animation or game is not difficult.
	8. I like the way of Scratch software operation.
Evaluation	9. I think that the students can work for my scratch, give me a positive recommendation
	10. It is useful for me to manufacture scratch work after reviewing others works.
	11. After reviewing others works, I get more creative idea.
	12. I would like to spend more time to discuss scratch programming.

Based on interviews with students and analyze the status of respondents Content:

1. 83% of students felt Scratch software is easy to learn, but in the interview process in which there are too many students in response to instructions, not easy to remember.
2. For 53% of the students are interested in learning the course content, 34% and 12% said no opinion was not interested in the experiences of students also mentioned in the report is designed to provide more interactive

games on the course content.

3. Up to 78% of students in the extra time to Scratch software, which has been very popular with the home computer has the absolute relationship.
4. 82% of the students answered operating Scratch software programming language that allows a better understanding of myself, and that Scratch can increase interest in learning.
5. 50% of the students will use online or otherwise, to discuss with the teacher or the students the use of Scratch software.
6. 70% of the students Scratch software is very easy to use, in the interview process. The students are satisfied with the way drag and drop commands.
7. 81% of students agree with Scratch software to make a movie or game is very easy.
8. 67% of students agree with Scratch software operation, particularly in the color configuration of various instructions for students learning to understand more clearly.
9. 56% of the students recognized by the peer assessment score, interview score standards for students that is clear, so we know how to assess students, but also believe that students are given assessment results.
10. 71% of the students watch other people's work helps to create or design their own Scratch works
11. 64% of students agreed that work can be inspired from someone else, and then used in his work on.
12. 81% of the students agreed to spend more time with students to discuss the various roles Scratch software programming scripts design.

7 Conclusions

1. The learning characteristics of scratch learning in different genders.

Students of different gender have different results on scratch learning. It is specific clear that the male learners have more creative ability demonstrated than the female learners. But the female learners in the use of color showing on the merits. These features provide a excellent reference in scratch course materials design.

2. The learning characteristics of scratch learning in different cognitive styles.

The results from the study we could found that the visual-oriented cognitive style learners show a relatively high level in composition than the verbal-oriented cognitive style learners on the scratch motion picture and game works. These reveal some adventage of visual-oriented learners, and the way to take adaptive teaching strategy.

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Use of Internet for Educational Research in West-Africa; Abuja-Nigeria a Case Study

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Abstract –*This study, Use of Internet for Educational Research in West-Africa; Abuja-Nigeria a Case Study, appraised the role of the Internet and its level of acceptability as tool for Educational Research in West-Africa in the last two decades.*

Statistical analysis of the research data showed that the use of Internet made it easier to conduct educational researches and that in the last decade most researchers in West-Africa used the Internet for their research work.

This study recommends that, Educational researchers should willingly use the Internet for their research, that governments should endeavor to improve on the availability of Internet facilities and that further research should be carried out on this topic periodically in other parts of the country or in other developing countries.

The findings of this research enlighten researchers on the importance and advantage of using the Internet to significantly improve the quality of their research.

1 Introduction

This study was undertaken out of curiosity and desire to know to what extent the Internet technology has helped Educational Researchers in carrying out their research. A desire to further studies on the subject of Internet use has also been a motivating factor for this study. There has been a similar study in a paper by Sanni et al [2009] which focused on the potentials of the internet in facilitating research in Nigerian universities. Adogbeji and Toyo [2006] reported that most of their sample (lecturers) indicated that the internet has added value to their academic pursuits in terms of quick access to research materials, including online journals. Salaam and Adegbore [2010] also carried out a related study on Internet Access and Use by Students of Private Universities in Ogun State, Nigeria.

The major question that this research addresses is; has the use of the Internet made it easier for Educational researchers in West-Africa to conduct their Research? This question is important because it helps us to understand some factors that motivate researchers to use the Internet for their research. In order to properly test the research question, the following research hypothesis were put forward:

1.1 Research Hypothesis (Ha)

i. The use of the Internet has significantly made it easier for Educational Researchers to access research materials.
ii. The use of the Internet has significantly reduced Educational Research time.
iii. The use of the Internet has significantly reduced the financial burden of Educational Research on educational Researchers.

The research hypothesis above was tested against the following null hypothesis using the Independent Samples T-Test to obtain the research results.

1.2 The Null Hypothesis (H0)

i. The use of the Internet has *not* significantly made it easier for Educational Researchers to access research materials.
ii. The use of the Internet has *not* significantly reduced Educational Research time.
iii. The use of the Internet has *not* significantly reduced the financial burden of Educational Research on educational Researchers.

The tests were run using SPSS (Statistical Package for the Social Sciences) which is a computer program used for statistical analysis.

2 Methodology

In this study, a survey research design was used by administering questionnaires to the participants. It is a study that measure people's attitudes and activities by asking the people themselves (World Bank Encyclopedia 1992).The population of the study involved researchers from four selected Institutions in Abuja. 125 participants were drawn from the population size; they constitute the sample size of this research work. 4 participants failed to return their questionnaires while 15 questionnaires were wrongly filled leaving 106 for the analysis. The participating respondents were selected randomly and the Institutions selected for this research were chosen based on the fact that their populations come from various parts of the country.

In order to be able to elicit valid conclusions from the study, the data obtained were used to test validity of the null hypothesis (H0) and the alternate hypothesis (Ha) using the unpaired (Independent-samples) t-test.

2.1 How Hypothesis Tests Work: The Null Hypothesis

If the mean of the Sample group1 is $\mu 1$ and the mean of the Sample group2 is $\mu 2$, then interest may focus on the difference between these quantities. The challenge is how to make inferences about these essentially unknown quantities.

The first stage in the formulation of a hypothesis test is to be precise about what is meant by a difference 'being due to chance'. The approach is to assume that the populations are identical and see what follows. This assumption is known as the null hypothesis.

What ought to follow if the assumption is justified is that the two samples should be similar and should only differ by sampling error. The technicalities of hypothesis testing centre on how to measure the difference between the samples and how to decide when a difference is surprisingly large. The procedure yields a probability, the P-value, which measures how likely it is that a difference as large as that observed could occur if the null hypothesis were true.

The strength of this evidence is often measured by the size of the P-value: a value of $P<0.05$ is conventionally held to be reasonable evidence against the null hypothesis, with $P<0.01$ being strong evidence and $P<0.001$ being very strong evidence.

2.2 The Unpaired (Independent-Samples) T-Test

In this version of the t-test two quite unrelated sample groups each comprising distinct sample sizes that are quite separate are taken as the basis of the comparison.
In these circumstances the t-test assumes:
i. That each sample is drawn from a Normal population;
ii. These populations have a common standard deviation, σ
The null hypothesis that is most usually tested is that the means of these populations are the same.

3 Result and Discussion

Table 1: Group Statistics

Used Internet	N	Mean	Std. Deviation	Std. Error Mean
1=No	26	1.12	.431	.085
2=Yes	80	2.92	.348	.039

Table 2: Use of internet for research

Year	**Number that used Internet**
1990-1999	4
2000-2010	76

From table 2 above, it is easily observed that most researchers who conducted their researches before year 2000 did not use the internet. It is also clear that as from the year 2000 most researchers involved the Internet in one form or the other during the course of their research work. This trend may likely suggest an increase in availability of Internet facilities and more awareness on the part of the researchers.

Table 3: Independent Samples T-Test: Easier Material Access

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Easier Material Access	Equal variances assumed	.041	.840	-15.778	104	.000	-1.696	.108	-1.909	-1.483
	Equal variances not assumed			-14.374	36.958	.000	-1.696	.118	-1.935	-1.457

Table 4: Independent Samples T-Test: Faster Research Completion

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Faster Research Completion	Equal variances assumed	.890	.348	-21.691	104	.000	-1.810	.083	-1.975	-1.644
	Equal variances not assumed			-19.434	36.156	.000	-1.810	.093	-1.998	-1.621

Table 5: Independent Samples T-Test: Reduced Cost of Research

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Reduced Cost of Research	Equal variances assumed	.304	.582	-16.133	104	.000	-1.659	.103	-1.863	-1.455
	Equal variances not assumed			-15.927	41.591	.000	-1.659	.104	-1.869	-1.448

From the results in tables 3, 4 and 5 above, it can be seen that the Sig. value in the Levene's test for equality of variances >0.05 for each of these three tables, thus there is a strong reason as earlier explained to go ahead and read the sig. (2-tailed) value used to determine whether or not to accept the Null (H0). The Null (H0) is rejected if sig. (2-tailed) ≤0.05.

It is also easily observable that the Sig. (2-tailed) value =0.000 for the three tables (3, 4 & 5) implying that:

i.) The use of the Internet has significantly made it easier for Educational Researchers to access research materials.

ii.) The use of the Internet has significantly reduced Educational Research time.

iii.) The use of the Internet has significantly reduced the financial burden of Educational Research on educational Researchers.

Rosemary Wake [1998], in a paper "Educational Research and the Internet: Sleepers Awake!" examined where educational researchers stand in relation to use of the Internet as an information medium and suggests that concern about the quality of materials published on the Internet is relevant to relying on the Internet as an information source but this paper on the other hand did not consider the quality of the information gotten from the Internet but rather the use only.

Other researchers could carry out further research on this topic using Institutions cited in typical rural environments to ascertain the consistency and reliability of the result of this research.

4 Conclusion and Recommendation

From the information obtained from this study, the following conclusions were made:

i) That most Educational researchers in West-Africa now make use of the Internet for their research work.

ii) That the use of the Internet has made it easier for Educational researchers in West-Africa to conduct their Research.

It is however recommended that:

i) Educational researchers should always be willing to use the Internet for their research work as it has been found to make research work easier in most cases.

ii) Governments and Agencies should endeavor to make Internet facilities available not only in the urban but also in the rural areas in order to assist

those researchers who may need to conduct one research or the other in such localities.

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SESSION

E-LEARNING

Chair(s)

TBA

Software Architecture for Intelligent e-Learning Decision Support System

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Abstract - *The intelligent character of a decision support system is one of the most appreciated issues in current e-Learning trends. This paper presents a software architecture design for e-Learning domain. The design has as main goal usage of reusable components such that the application may be easily configured. The proposed software architecture ensures characteristics such as prediction, optimization and adaptation. These aims should be achievable by custom configuration of the application representing the container in which the components are deployed.*

Keywords: eLearning; decision support system; software architecture

1 Introduction

Domain specific software architectures (DSAA) [1,2,3] is a software engineering methodology that makes sure that a custom software architecture is obtained for a specific class of applications. In order to create a DSAA a reference architecture is needed. This architecture must describe the general data flow of the employed business logic. Within the reference architecture there are defined necessary components that will make up the system and is not dependent of the application domain. The defined components are domain specific and that is why they need a domain expert to define and interconnect them. The application configuration procedure is the step in which components are interconnected and the logical and functional dependencies are described. The container need to offer the possibility of setting all necessary dependencies.

Once the software architecture has been created the intelligent character needs to be offered. This means the software architecture needs to become a complex environment which works with goals set up by users. The system will manages performed actions by users and also user's priorities and deadlines. The main goal of the system is to emulate user's behavior in a predictable manner. In this way, suggestions may be offered to users, thus being obtained an intelligent decision support system.

The proposed architecture is described by a general reference specification where computational requirements for the intelligent decision support system are presented. The components that make up the system are presented in an abstract manner such that they may become reusable components in a domain specific library of implemented components. The components that were previously described according with a certain domain are instantiated and managed by an application configuration tool. This tool makes possible to be defined application-specific requirements, custom data sources, custom knowledge flows, custom business logic controllers or even custom data/results viewers.

There are five types of decision support systems: communication driven [4], data driven, document driven, knowledge driven [5], and model driven[6]. The presented approach from this paper is a hybrid approach between data and knowledge driven approaches. Data driven approach is due to the fact that time series data representing performed actions by learners are taken into consideration each time data model is being created or a decision is derived. The knowledge driven approach is employed because the data management is accomplished using data mining/machine learning algorithms. Since the software architecture design is abstract virtually any machine learning algorithms (e.g. clustering, classification, etc.) may be accommodated.

The main domains in which intelligent systems may be found are clinical decision support systems for medical diagnosis [7,8], business and management [9], agricultural production [10]. In e-Learning, building decision support systems has been associated with educational data mining. Educational data mining (EDM) is an emergent discipline concerned with developing methods for exploring the unique types of data that come from the educational context [11]. In short, EDM is the application of the data mining techniques in the area of education, with the aim of obtaining a better comprehension of the students' learning process and of how they participate in it, in order to improve the quality of the educational system.

2 Description of the architecture

The proposed reference architecture is a heterogeneous mixture of common architectural styles [12]. It is divided hierarchically into layers for different sets of computational tasks. In our approach there are defined two layers: a physical data layer and a knowledge representation layer. The knowledge representation level is a mirror of the physical data layer where knowledge regarding data has been extracted and custom business logic may be found.

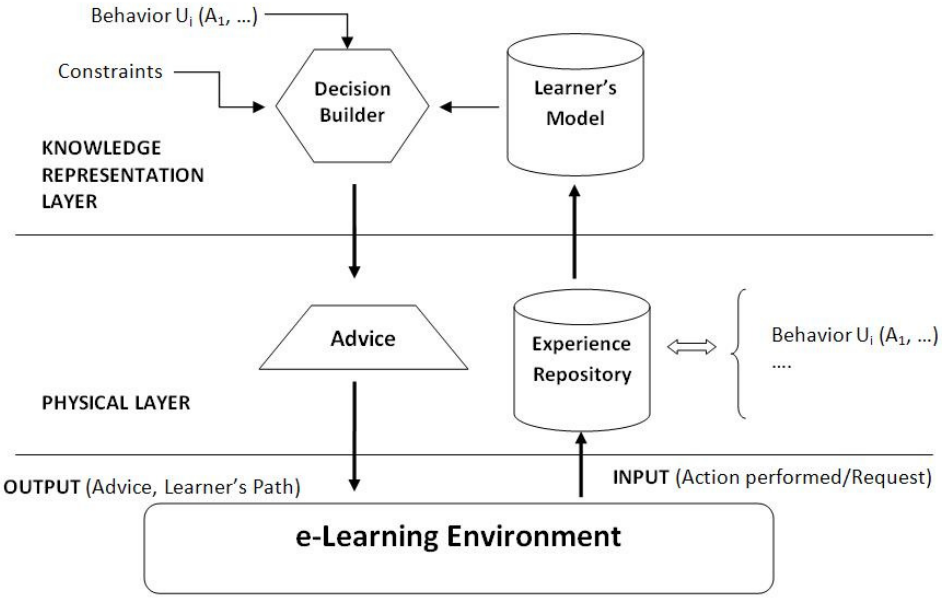

Figure 1. Reference Architecture

Each layer is organized into components that are custom designed for fulfilling certain functions. The physical layer mainly consists of the experience repository offered by the e-Learning environment. It is made of behaviors performed by users presented as a series of performed actions.

The Experience Repository from the Physical Layer takes shape of a learner's model in the Knowledge Representation Layer. The Learner's Model is highly dependent on the employed data mining algorithm used for data representation.

The Decision Builder represents the main business logic component from the knowledge representation layer. It takes as input the current Learner's Model, the current state of the learner (his behavior), a set of constraints from all involved parties and the learner's request. The current state of the learner is represented by all the actions performed by the learner up to the moment when he requests advice. The constraints are of different types. There are constraints set by the manager of the e-Learning environment, by the course manager and by the student.

The physical output of the decision builder module is represented by the advice. It may be represented by a chapter that needs more attention from the learner, a set of test questions that need to be answered by learner, a set o concepts that need more attention from the learner or a suggested learning path. A learning path may represent a timetable with activities (study of materials and/or test questions) that is advisable to be followed in order to meet constraints set by administrator, course manager and learner himself.

The core of the reference architecture is represented by the learner's model. The learner's model may be represented by an embedded machine learning algorithm. The process of embedding a standard and abstract machine learning algorithm into an e-Learning environment represents the main mechanism for building intelligent decision support systems.

The main outcomes that may be obtained by machine learning integration are:

Classification - The goal of classification is to build a set of models that can correctly predict the class of the different objects. The input to these methods is a set of objects (i.e., training data), the classes which these objects belong to (i.e., dependent variables), and a set of variables describing different characteristics of the objects (i.e., independent variables). Once such a predictive model is built, it can be used to predict the class of the objects for which class information is not known a priori. The key advantage of supervised learning methods over unsupervised methods (for example, clustering) is that by having an explicit knowledge of the classes the different objects belong to, these algorithms can perform an effective feature selection if that leads to

better prediction accuracy. Classification arranges the data into predefined groups. For example, an e-learning environment might attempt to classify an e-Learning resource (e.g. document, exercise, etc..) as required or not. Common algorithms include decision tree learning, nearest neighbor, naive Bayesian classification and neural networks.

Clustering - Is like classification but the groups are not predefined, so the algorithm will try to group similar items together. Clustering is considered the most important unsupervised learning problem; so, as every other problem of this kind, it deals with finding a structure in a collection of unlabeled data. A loose definition of clustering could be "the process of organizing objects into groups whose members are similar in some way". A cluster is therefore a collection of objects which are "similar" between them and are "dissimilar" to the objects belonging to other clusters.

Regression – Regression attempts to find a function which models the data with the least error. Regression is the oldest and most well-known statistical technique that the data mining community utilizes. Basically, regression takes a numerical dataset and develops a mathematical formula that fits the data. When you're ready to use the results to predict future behavior, you simply take your new data, plug it into the developed formula and you've got a prediction! The major limitation of this technique is that it only works well with continuous quantitative data (like weight, speed or age). If you're working with categorical data where order is not significant (like color, name or gender) you're better off choosing another technique.

3 Application Configuration

Application configuration is concerned with custom setting up of the defined components. The experience repository has the physical shape of an XML file that is regularly updated with actions received from the e-Learning environment. Although the data source is always an e-Learning environment there has been defined a general mechanism for specifying the way action data is structured. Firstly, the parameter set that defines the activity of a learner is described. For each parameter there is defined a type (usually integer of float) such that each instance (learner) is described by a set of values. Secondly, there is defined the effective data source which may be a txt file, an xml file or even a database.

The configuration of the Learner's Model regards the employed machine learning algorithms. A set of machine learning algorithms (e.g. clustering, decision trees, classification rules) may be used for extracting knowledge from the experience repository. Besides setting up the used algorithm there are also specified what parameters and in what way they are used. Some of the constraints already set by involved parties may be used in building the learner's model. The constraints are related with the quality of the obtained learner's model. The quality is of critical importance since the decision builder component relies on it.

The Decision Builder represents the most important component within the architecture. It represents the main controller of the business logic. It has input from three sources: the learner's model, the learner's behavior for which advice is obtained and the constraints from system, course manager or learner himself. The output of this module has the a representation in physical layer and is abstractly called advice. The advice may be represented by a list of chapters that need more study, a list of concepts that need more study or even quiz questions that learner is invited to answer. A more elaborate advice may be obtained in the form of a recommended learner's path. This is represented by a set of activities that need to be performed is a certain order and with a certain amount of time assigned for each specific activity.

The application configuration phase regards building a knowledge flow represented by all the necessary steps until results are obtained. The main steps are:

Define Data Sources and Data Sinks. Data sources are used to indicate where data is coming from. It may be represented by various file types and sources and may be configurable for a custom file name of data source or even dataset.

Define and Setup Filters. Filters are used to preprocess data prior to classification or learning. There may be set up both supervised and unsupervised filters and they may be configurable depending on filter type.

Define Modeling Technique. A classification, clustering or association algorithm may be used. The parameters are configurable depending on classification algorithm or clustering algorithm.

Use an Evaluation Methodology. This procedure is used to configure both inputs to and outputs from algorithms. There may be used various algorithm performance evaluators. This step is of great importance because is measures the confidence in the obtained recommendations.

Use a Visualization Procedure. This is the final step. It is used to visually display outputs. It supports performance and summaries of the results.

4 Sample Setup

The setup of such a system requires certain specific setup phases. The first setup phase regards the client e-Learning platform and the way context and activity data are represented. These two components are regarded as Context Representation and Activity Data Representation. The context representation regards all data that resides within the client e-Learning environment.

Table 1. Sample context representation

Context variable	Description
nModules	Number of modules managed by the e-Learning platform
disciplines	The disciplines studied at each module
chapters	The chapters associated to each discipline
concepts	The concepts associated to each chapter
quizzes	The quizzes associated with each concept

All this data is gathered into an XML file and is loaded by the decision support system. Table 1 presents the main fields in the context representation.

The second phase regards the activity data representation. The activity data regards data that may be obtained from the actions that were performed by learners.

Table 2. Sample activity data representation

Context variable	Description
positiveCount	The number of correctly answered questions.
correctPercent	The percentage of correctly answered questions from the total number of questions.
totalTries	The total number of tries (answered questions)
avgTries	Medium number of tries per question
avgQuestionTime	On average, how long (in minutes) it takes for a student to answer a question
totalTime	Total time spent on testing

All this data is gathered into an XML file and is generated by the decision support system from the available data. Table 2 presents the main fields in the activity data representation. When a learner requests advice the decision support system computes the values for each field from table 2. All the fields are regarded as features (or parameters) for the learner that needs advice. The values are computed at runtime when the request for advice command is issued by the learner. These values represent a digest of the activity performed by the learner.

Another setup phase regards the constraints representation. There are three setup protocols, one for each type of user involved in the platform: administrator, course manager and learner. From the learner's point of view, one constraint may regard the time that is needed for study. The student may want to minimize the time in which a certain level of knowledge is reached. This is accomplished by specifying a desired grade or even a certain percent of knowledge coverage for a concept, chapter or even discipline. A more restrictive constraint may be set by a learner regarding the certainty with which a certain goal is to be achieved. The learner my need one hundred percent certainty that he passes the exam or he may need a lower certainty level. On the other hand, the learner may specify a certain degree of certainty for the goal of being the best. Other custom situations may occur when learners have specific goals.

From the course manager point of view, the constraints are specified in a different way. These constraints regard the policy of the course manager regarding the desired amount of knowledge learners need to have. One possible setup of constraints is to enforce a certain accuracy level for learner's classification. The course manager is offered the environment and the needed tools and mechanisms with which he can scale up or down the metrics associated the knowledge level measurements.

Let us suppose a course manager decides that the general results are too good and thus future learners need to have harder tests. This may be accomplished by modifying (increasing) the value of the parameter that represents the knowledge weight of a test or exam. Thus, harder questions will be part of the test or exam. During study period the recommender system will provide tests that have higher difficulty level and thus the advice regarding the time spent and the resources (concepts, chapters, quizzes) that need more study will be dynamically and automatically adapted.

Another setup phase regards the way learner's model is built. The outcome of this step may be regarded as a custom built knowledge flow that integrates different machine learning algorithms. A first step may be represented by a k-means clustering which may be used for outlier detection. The instances that are far way from the obtained centroids are pruned and thus more representative data is obtained.

A second step in the knowledge flow mat be represented by a classification tier. Different classifications may be obtained using Decision Tree inductions mechanism or a Bayesian classifier. Each classifier may be used of parts of the dataset obtained after clustering or on whole dataset after pruning the outliers.

The final step of the setup regards the Decision Builder. At this level there are specified the parameters that configure the knowledge flow regarding the constraints that were already setup and the current behavior of the learner that requested advice. The setup is performed by customizing certain values in xml type properties files. The properties files are the ones that generate the custom behavior of the decision support system.

The manager of the system needs to be a data analyst with good knowledge of e-Learning, data analysis and information retrieval techniques. The configuration of the knowledge flow and of all parameters that trigger the functionality of the Decision Builder module will have direct

influence over the quality of the obtained advice and thus of the entire system.

5 Conclusions and Future Works

This paper presents a domain specific software architecture that can be used for building an intelligent decision support system.

The architecture is built on two levels. One is a physical level where all necessary data representation is accomplished. This regards e-Learning platform's context data and activity data representation as input. The physical representation of the output is represented by the obtained advice which may take different shapes.

The knowledge representation level is composed of two main building blocks: a learner's model and a decision builder. These two modules describe a knowledge flow whose functionality is managed by constraints.

The software architecture is scalable in the way that machine learning algorithms may be easily added within the knowledge flow. The data sources may be easily integrated by specifying the location and the structure of the input data. The knowledge flow is designed to accept parameters (constraints) such that the different learning goals may be achieved.

As future works, there is a need to define a procedure for measuring the quality of the obtained advice. Further experiments need to be accomplished with different context representations and different constraints. Other machine-learning/data mining algorithms need to be integrated along with their corresponding constraints. The experience repository needs to have implemented more elaborate mechanisms for data management since it store huge amounts of data.

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An Intelligent Online Autonomous Learning Platform for EFL Learners

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Abstract - *English language learners need individualized guidance and high efficiency in their autonomous learning. This paper discusses the design of an intelligent online autonomous learning platform for Chinese EFL learners from the perspectives of the principles applied, the materials chosen and the technology involved. Taking the Website of Shanghai Jiao Tong University English Learning Center as an example, the author exemplifies the individualized guidance for students' autonomous learning by intelligent management, content categorization and feedback automation.*

Keywords: intelligent, online, autonomous learning, EFL learners

1 Introduction

Learning a foreign language only in classroom is not adequate enough for college students whose majors are not English. They need extra guidance after class as well. However, heavily burdened with teaching and research, teachers could not afford much time to provide each student with personalized guidance due to the number of students in each class. On the other hand, non-English majors have to spend a lot of time on learning their majors, therefore, they cannot spare much time on English learning either. An investigation done at Shanghai Jiao Tong University in 2009 showed that the average time spent on English learning after class is only 24 minutes daily. Moreover, 39% of the students do not learn English every day. Therefore, investigation into the ways to help students to improve their English learning efficiency by truly individualized guidance and automatic monitoring is very urgent.

In order to improve college students' English learning efficiency in China, Chinese Education Commission issued "College English Curriculum Requirements" [1] (hereinafter referred to as "Requirements") in 2007, in which the integration of information and communication technology into college English teaching and learning is emphasized. It also repeatedly emphasizes individualized instruction and autonomous learning. Soon after, four Chinese publishing houses published four electronic college English textbooks along with the online learning platforms. Many universities also developed or purchased some online English instructing platforms. However, none of the current online platforms is fully automated, which means teachers have to spend more time on supervising their students' online study after class. This makes the burden of teachers even heavier. Therefore, it is very necessary to design and develop an intelligent, fully automatic online platform to provide individualized guidance to students, to monitor their online autonomous study and to give them timely feedback of their online study.

In this paper, the author discusses the design principles, materials arrangements and technology implementation of an intelligent online autonomous learning platform for Chinese EFL learners by introducing the English Learning Center Website (http://english.sjtu.edu.cn) of Shanghai Jiao Tong University. The author exemplifies, first, the obtaining of the initial status of a learner by a "Learning Style Test", a "Motivation Test" and a series of Proficiency Tests, such as listening, reading, writing and translation tests, with which the system would provide the learner with the overall recommendations of his/her online study plans and content arrangements. Then, the author demonstrates the automatic provision of the guidance to the learner according to his/her learning style, his/her motivation and his/her language proficiency by intelligent management and classification of learning materials. Finally, the author explains the presentation of automatic feedback, of email reminders to learners by regular email, and of the contents to be covered and the tests to be taken before deadlines.

2 Literature Review

Since the invention of computer, people have been striving to reduce their workload both physically and mentally. The first intelligent system ELIZA, the first personal dialogue system, was successfully

developed in 1966 by the American scientists. Based on the principle of "patient-centered psychotherapy" proposed by American psychologist Rogers (Rogers, CR), it questions the patient by the dialogues between the patients and the system to diagnose the mental problems for doctors so that the rehabilitation of patients with mental illness could be achieved. The successful development of ELIZA as well as its wide use greatly inspired the researchers. After that, the artificial intelligence systems rapidly emerged in various fields, so did many intelligent learning systems. For example: Why2/Atlas [2], an intelligent system to help students learn physics, raises questions which usually require the students to explain some physical phenomena. So students have to write a paragraph to explain the reason. After that, the system repeats the dialogue with the students to allow the system to correct errors in students' answers which enable students to eventually master the physical concepts or principles. CIRCSIM Tutor [3], [4], another intelligent system to help medical students learn cardiovascular physiology, in particular, the various factors that affect blood pressure, adopts hints to stimulate students' thinking, and to achieve one-to-one teaching. PACO [5], an intelligence system with a simulation environment, which helps students learn the operating steps, is not limited to a particular subject. It can help students complete the procedure step by step through dialogues between students and the system. Currently, the most intelligent system AutoTutor [6], developed by scientists in the Intelligent Systems Research Institute at The University of Memphis, can synthesize speech, tone, facial expressions and gestures. It can also have dialogues with learners in natural language, helping students learn "Newtonian Physics", "Computer Science", "Scientific Reasoning" and other courses. Amazingly, the input can be both natural language text and voice input. In addition, the system is sensitive to the mood of students' because it can perceive their facial expressions, track their voice parameters and notice their body posture to obtain their learning conditions. Unfortunately, in the field of foreign language learning and technology in China, online intelligent systems of foreign language learning are rarely found.

3 Design Principles

An online intelligent system of foreign language learning should be able to provide personalized guidance for learners according to their individual characteristics, such as learning styles, motivation and initial levels of specific language skills. It should also be able to give suggestions on learning materials and learning speed based on their periodic progresses. Therefore, the design should abide by the following four principles.

3.1 Intelligent Management

Many researchers have demonstrated that students cannot succeed in their study without effective guidance. This is also true for their after-class independent study. In fact, effective learning depends on two aspects, the students' efforts and, the effective individualized guidance and support [7]. Thus, investigation into the ways in which information and communication technology can help to provide individualized guidance and support to foreign language learners is worth the time and efforts.

Intelligent management system is part of intelligent tutoring system (Intelligent Tutoring Systems, referred to as ITSs) [8]. Here, the intelligent management system should not only supervise students' online study, but also provide individualized guidance and support to students according to their overall learning behavior. It should send students automatic feedback and reminders via emails. Furthermore, if students ignore repeated reminders, the system should automatically terminate their online learning.

3.2 Content Categorization

In order to achieve individualized learning and to enhance learning efficiency, all the online learning materials, exercises, and tests should be classified according to difficulty levels. In other words, all the learning and testing materials should be tagged with difficulty markers in the database to help students select the appropriate ones when learning online. Standards of categorization adopted in this research are the standards in "Requirements" which embrace three levels: the basic, the intermediate and the advanced, each with the quantitative indicators for the respective language skills of listening, speaking, reading, writing, and translating. Therefore, the online presentation of learning and testing materials should be in accordance with "Requirements".

3.3 Learning Autonomy

Both the classroom learning and after-class learning form a complete learning process. In order to implement learner-centered philosophy of education, learners should be encouraged to conduct their own online curricular with the help of the information given by the system concerning their learning styles, motivation and their language proficiency. At the same

time, they should be helped to realize that they are responsible for their progress during the whole learning process [9]. In the past, great emphasis was put on the reform of classroom instruction in China. Therefore, the focus was often on the improvement of classroom teaching with the aid of computer and the Internet, neglecting effective guidance for students' after-class learning. Actually, letting students take the responsibility for their after-class learning, rather than relying solely on teachers' arrangements, will make after-class learning a more interesting and student-centered one, which would enhance their enthusiasm for learning. Therefore, in designing the system, a full consideration should be given to the needs of students to make it a student-centered one [10]. That is to say, such decisions as the choice of learning contents, the arrangement of learning speed and the time to take the test should be made by the students themselves. The system is only to provide students with some advice according to their learning styles, motivation and initial language proficiency rather than force them to learn certain materials, converting passive learning to active learning. In fact, students' autonomous learning ability can only be acquired by active learning.

3.4 Feedback Automation

Learning without evaluation is not a complete process of learning. Thus, in the design of student-centered curriculum, testing is essential [11]. The author believes that the most helpful feedback in learning is a timely and accurate one, which means that the keys to the exercises and the scores of the tests should be provided as soon as the students finish doing the exercises and taking the tests online because usually students are eager to know their performances. Therefore, an intelligent learning website should be able to present real-time automated feedback, which not only helps students to learn about their own learning progress, but also motivates them to continue their online learning.

4 Content Arrangement

The contents in this research refer to four kinds of contents which are learners' status, learning materials, testing materials and feedback.

4.1 Learners' Status

In order to provide learners with appropriate learning materials, suitable exercises and individualized guidance, the automatic identification of the characteristics of learners is what the system should achieve at the outset. In this research, in order to better help students understand themselves, particularly some of the factors affecting their online independent study, Learning Style Test and Motivation Test are provided.

4.1.1 Learning Style Test

Learning style refers to the specific manners of a person when obtaining, maintaining and retrieving information [12]. Many researches indicate that if the teaching styles and learning styles match well, significant academic progress could be achieved, especially in the foreign language learning at tertiary level [13]. Therefore, an online learning platform should be able to help students learn their learning styles so that they are able to choose their learning materials, learning sequence and learning speed.

This research adopts Felder - Silverman Learning Style Model (Felder-Silverman Learning Style Model, referred to FSLSM) [14]. There are a total of 44 questions in the questionnaire. And each question has two options, of which only one choice is permitted. It provides five dimensions of evaluation, namely, Perception, Processing, Input, Organization and Understanding. Corresponding to the Perception dimension, there are Sensing and Intuitive; corresponding to the Processing dimension, there are Active and Reflective; corresponding to Input, there are Visual and Verbal; corresponding to Organization, there are Inductive and Deductive; and corresponding to Understanding, there are Sequential and Global. When learners finish the questionnaire, the system would calculate their choices and then the tendency of their learning style would be presented, followed by suggestions on what materials to choose and how much time to spend on, etc..

4.1.2 Motivation Test

Motivation test is to help students learn their degree of online self-learning eagerness. Motivation plays a very important role in language learning [15]. The results show that students with strong motivation in computer-assisted language learning programs have higher motivation to learn [16].

With reference to Motivation Strategy Questionnaire (The Motivated Strategies for Learning Questionnaire, MSLQ) [17], the Motivation Test in this research involves the purpose of learning English, the time available each week, the future careers, etc. . The degree of motivation is divided into three levels: "strong", "average" and "not strong". After students finish the test, the system would give them their motivation levels, along with advice on their online learning pace.

4.2 Learning Materials

With reference to "Requirements", the skills of English language are classified into listening, speaking, reading, writing and translating. This platform thereby has corresponding sections. They are Listening & Speaking, Reading & Writing and Translating. In each section, there are Basic Knowledge which introduces basic relevant knowledge concerning certain language skills and Specific Skills which provides examples of the skills required to master. The skills explained are also divided into three difficulty levels: Primary, Intermediate and Advanced, so as to meet the needs of students at different levels and to provide personalized services. In addition, each section provides not only word files, but also a large number of audio and video materials.

4.3 Testing Materials

Testing materials are divided into Proficiency Test for some language skills and Skill Practice Test. The former is a standardized test which is used both as the pretest and the posttest to evaluate students' initial language skills before online learning as well as their improved language skills after online learning. Proficiency Test also has three levels which are Primary, Intermediate and Advanced corresponding to "Requirements". It has domain options and time limit as well.

Skill Practice Test is intended to evaluate whether students have mastered certain language skills after their autonomous learning of each unit. With the belief that individualized learning should be supported by individualized testing, the tests are given in the form of unit tests. In order to increase testing efficiency, Skills Practice Test adopts Adaptive Test (or Adaptive Measurement, also known as Computer Adaptive Test) [18] in which the test duration is not fixed , instead, it is decided by the correct rate of students' answers during the process of testing. In addition, the test papers are not prepared in advance, but generated dynamically according to the students' correct performances on the test. Therefore, in the test item bank, all items are tagged with degrees of difficulty, and stored in accordance with the difficulty levels. The system is able to calculate the student's scores, then presents the questions adapting to their skill levels. When the system confirms that students' skill levels have been tested, it would immediately terminate the testing. Adaptive testing is developed with the development of computer technology, which can significantly increase test efficiency.

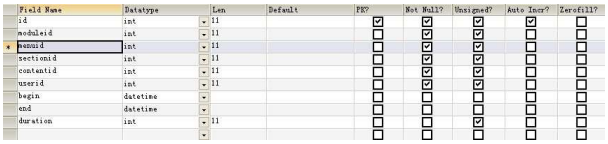
4.4 Feedback

Feedback refers to the Feedback of Learning Style Test, Motivation Test, Pretests & Posttests, and Skill Practice Test.

The feedback of Learning Style Test includes students' learning styles, along with suggestions on independent learning of certain language skills, focusing on the sequence of learning and testing. Similarly, the feedback of Motivation Test not only informs students their degree of motivation, but also provides recommendations on the arrangements of learning speed and the frequencies that the tests should be taken. In addition to the test scores, the feedback of Pretests & Posttests gives suggestions on next step learning, focusing on the choice of learning level. The feedback of Skill Practice Tests gives scores as well as suggestions on next learning phase, focusing on specific language skills, such as the need for repetition of learning a unit, and the need for moving forward, and so on.

5 Technology

The implementation of an intelligent online autonomous learning platform for EFL learners involves personalized information retrieval, natural language processing (NLP), data-driven corpus technology and network technology. The framework of this research adopts Joomla and adapted Moodle, together with personalized information retrieval and data-driven corpus technology. For recording students' online learning, the system uses "sections" and "categories" of Joomla, plus "contents" to correspond to language skill sections, so that students' online traces can be recorded, such as the sections visited and the amount of time spent, etc.. The structure of the database is displayed in Fig. 1.



Field Name	Datatype	Len	Default	PK?	Not Null?	Unsigned?	Auto Incr?	Zerofill?
id	int	11		☐	☑	☑	☐	☐
moduleid	int	11		☐	☑	☑	☐	☐
menuid	int	11		☐	☑	☑	☐	☐
sectionid	int	11		☐	☑	☑	☐	☐
contentid	int	11		☐	☑	☑	☐	☐
userid	int	11		☐	☑	☑	☐	☐
begin	datetime			☐	☐	☐	☐	☐
end	datetime			☐	☐	☐	☐	☐
duration	int	11		☐	☐	☑	☐	☐
				☐	☐	☐	☐	☐

Fig. 1 Structure of database to record students' online learning

Here, two lines of JavaScript, window.onunload and window.onload are added which can record the time when a student visits the webpage and the time when he/she leaves it. When a student visits a certain page, the window.onload event is triggered. Using the AJAX request, JS stores the current starting time, the student number, the article number, and memorizes the

record number. When the student leaves the page, the window.onunload event is triggered. Again, using AJAX request, JS gets the record number and modifies the record time as the ending time. In this way, a complete record of a student's online learning is taken. Fig.2 presents the results obtained in this way.

sid	cname	module	section	content	initialtime	endtime	duration
5101090110	郭浩楠	读和写	读和写	Skill 1 Reading for Previewing	2010/11/19 12:17	2010/11/19 12:17	0
5101090111	郭浩楠		视听说	中级视听	2010/11/19 12:17	2010/11/19 15:05	168
5103090233	耿浩翔	读和写	读和写	A Fable	2010/11/19 12:39	2010/11/19 13:07	29
5103090233	耿浩翔	读和写	读和写	Two Ways of Seeing a River	2010/11/19 13:07	2010/11/19 15:49	162
5101090111	滕秀文		视听说	切级视听原文及答案	2010/11/19 13:56	2010/11/19 14:02	6
5101090111	滕秀文		视听说	中级视听原文及答案	2010/11/19 14:02	2010/11/19 14:05	3
5101090111	滕秀文		视听说	切级视听	2010/11/19 14:05	2010/11/19 14:08	2
5101090111	滕秀文	读和写	读和写	Skill 1 Reading for Previewing	2010/11/19 14:08	2010/11/19 14:08	0
5101090111	滕秀文		汉语类	学习风格测试	2010/11/19 14:09	2010/11/19 14:09	1
5101090918	吴主琪		考试指南	上海交通大学英语水平考试样题	2010/11/19 14:48	2010/11/19 16:29	101
5103090233	耿浩翔	读和写	读和写	On the Difference Between Wit and Humor	2010/11/19 15:49	2010/11/19 20:18	269
5101090175	刘钦		视听说	切级视听	2010/11/19 17:00	2010/11/19 17:00	0
5101090175	刘钦		视听说	切级视听	2010/11/19 17:00	2010/11/19 17:00	0
5101090175	刘钦	读和写	读和写	Skill 6 Distinguishing between Facts and Opinions	2010/11/19 17:00	2010/11/19 17:21	21
5103090364	辛奕文	考试指南	考试指南	上海交通大学英语水平考试样题	2010/11/19 17:54	2010/11/19 18:26	32
5101090945	唐璐		视听说	切级视听	2010/11/19 18:29	2010/11/19 20:18	109
5103090944	葛颖		考试指南	四六级作文评分标准	2010/11/19 22:44	2010/11/19 22:44	0
5103090944	葛颖		视听说	中级视听	2010/11/19 22:45	2010/11/19 22:46	1
5108090669	秦叶舟	读和写	读和写	Skill 2 Finding Out Word Meanings	2010/11/22 9:06	2010/11/22 9:06	0
5108090669	秦叶舟	读和写	读和写	Skill 4 Skimming and Scanning	2010/11/22 9:06	2010/11/22 9:06	0
5108090669	秦叶舟	读和写	读和写	Skill 7 Appreciating Figurative Language	2010/11/22 9:07	2010/11/22 9:07	0
5108090669	秦叶舟		汉语类	新版书具体	2010/11/22 9:07	2010/11/22 9:07	0
5108090669	秦叶舟	考试指南	考试指南	上海交通大学英语水平考试大纲	2010/11/22 9:08	2010/11/22 9:42	34
5101090983	韩素素		视听说	中级视听	2010/11/22 12:45	2010/11/22 12:49	4
5101090983	韩素素	考试指南	考试指南	上海交通大学英语水平考试样题	2010/11/22 12:49	2010/11/22 12:51	2
5101090983	韩素素		汉语类	学习风格测试	2010/11/22 12:51	2010/11/22 12:52	1
5101090983	韩素素		课本资源	21世纪英语 Book 1 / 2 / 3	2010/11/22 12:52	2010/11/22 12:52	0
5101090983	韩素素		课本资源	21世纪英语 Book 1 / 2 / 3	2010/11/22 12:53	2010/11/22 12:53	0

Fig. 2 Samples of students' online learning records

In this study, the techniques of NLP are applied in the automated scoring of short answer questions in English and translation from English to Chinese. From the perspective of NLP, when processing English and Chinese, different resources and techniques are used. For example, in scoring Translation from English to Chinese, Chinese information processing is involved, plus two semantic resources——Cilin and HowNet. The scoring algorithm involves keyword matching, word similarity calculating, and sentence pattern matching [19]. Thus, the instant the students submit their online translations, their scores will be displayed on their computer screens with standard translations. Simultaneously, these results will be sent automatically via email to their email-boxes. Figs.3 to Fig.6 are interfaces of the translation process and the feedback.

Fig. 3 Interface of online translation exercises

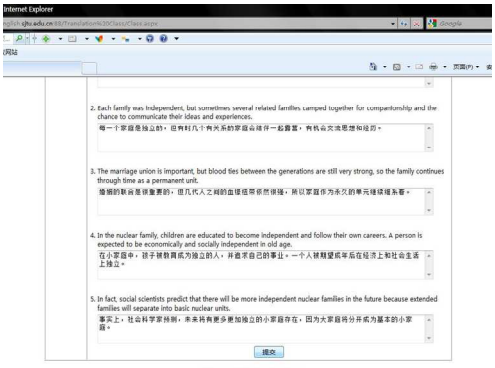


Fig. 4 Interface of online translating

Fig. 5 Results of automated scoring along with standard translations

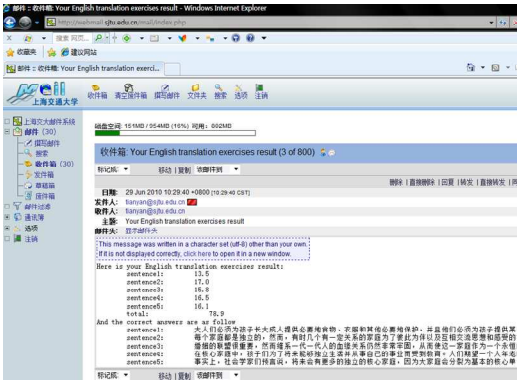


Fig. 6 Scores and standard translations received in student's email-box

Students' independent study in each section is achieved by Moodle learning management system with some modifications. Specifically, the modified system consists of six modules which are Learning Style Testing, Motivation Testing, Learning Contents, Adaptive Tests for Skill Practice, Pre-tests & Post-tests, and Online Automatic Monitoring and Email Auto-feedback.

The modules for Learning Style Testing and Motivation Testing are composed of Total Score Calculating and Classification by Scores. The system can automatically calculate the total score and provide suggestions for students in accordance with their scores.

The module for Learning Contents can generate and manage online courses, which is mainly used for the storage and retrieval of learning contents with specified levels. It can also present learning contents on the basis of students' selected levels and learning schedules.

The module for Adaptive Tests stores language skill exercises with marked difficulty levels. The first exercise is generated automatically. Then, the next exercise will be given according to student's former test score. When the exercise reaches a certain degree of difficulty and the student cannot answer it correctly, the system would determine whether the student passes the test of a certain level of language skills.

The module for Pre-tests & Post-tests is divided into the module for objective questions and that for subjective questions. The former handles all objective questions, such as multiple choice and blank filling, whereas the latter deals with subjective questions answered in English as well as in Chinese, such as short answer questions, essay writing and translation.

The module for Online Automatic Monitoring and Email Auto-feedback embraces the monitoring & reminding of the learning process and the feedback of test results & suggestions. The former is responsible for sending regular emails to remind students to finish online courses and to take tests on time, while the latter is to send the test results to their email boxes along with suggestions for further learning.

6 Conclusion

With the popularity of the Internet, the way of learning English would inevitably undergo fundamental changes. Automatic supervising and individualized learning are hopefully achieved with the aid of information technology. Obviously, an effort to explore the possibility of making an online English learning platform intelligent is worth the time and efforts. Actually, it proves that this website has increased Chinese EFL learners' after-class English learning efficiency and reduced the workload of teachers' personalized guidance.

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E-Learning, Teaching Cell Phones Usage for Emergency Managers and First Responders

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Abstract - The cell phone is a powerful tool that can be used for a variety of applications that many people are unaware of. This paper describes how e-learning can be used as a method of delivering education to emergency managers worldwide to help them learn to use existing cell phone technologies to enhance their field operations. The cell phone can be used as a location beacon, a communication device, picture transmission device, and a multilanguage translator. If emergency managers purchase and install certain software on Internet enabled camera phones, then they can learn to greatly increase multilanguage communication between people without waiting for a translator. Cell phones can also be recharged in the field and dual SIM phones and allow emergency personnel a means of keeping work and family matters separate.
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Keywords: Cell phones for emergency manages, e-learning

1 Introduction

A significant amount of emergency managers, firemen, and policemen worldwide already own a powerful tool that can be utilized for multi-language translation, communication, picture transmission, and a location beacon. Emergency managers already use e-learning from the online course offerings from FEMA, so creating and delivering e-learning for the subject of cell phone utilization is feasible.

2 Cell phones and multi-language translation

Many first responders and emergency managers have to communicate with new immigrants and their parents. Some of these immigrants have difficulty communicating due to Limited English Proficiency (LEP). A camera cell phone such as Nokia N82 or Nokia N86 is a good hardware platform for taking a picture of a piece of paper with writing or a street sign, and then translating it to another language [1]. If the camera cell phone camera has a flash, five megapixels or more, Microsoft Mobile 6, and sufficient storage, then one can install the Kurzweil Optical Character Recognition software and Language pack. Then one must make sure that there is Internet Service as well as phone service available for the phone. Then one must have installed the language packs that one is interested in translating too. If the community served is Spanish, then install Spanish. These phones could be set up before a disaster.

When the firemen, police, and emergency managers are in an area with people who have limited English proficiency, they could take a picture of instructions on a piece of paper and let it speak to the people they serve. The phone could translate the materials to Spanish or a dozen other languages if the software was preinstalled on the phone. Such phones could also be carried by blind immigrants to be able to read and translate street signs or public notices and navigate their way to safety.

3 Cell Phone Kiosks

Many times there are floods or power outages and cell phones cannot be recharged. Batteries have a limited operating potential and therefore must be recharged. Verizon sometimes responds to disasters by providing cell phone kiosks where first responders and emergency managers can recharge their cell phones. They also provide Internet stations at no charge so that the first responder community can communicate with their loved ones or with work [2]. Before one tries to recharge the phone, it is necessary to take the cover off the back of the phone. If there is a pink dot, it means that the battery got wet and needs replacing. Sometimes Verizon provides a Store on Wheels (SOW) and can sell batteries.

4 Drying a wet cell phone

A wet cell phone cannot be used for calling someone or accessing the Internet. In fact just powering it up can cause it to short out and be ruined. It needs to be dried. Hair dryers are often too hot and may damage electronic components. Sometimes the cell phone can be dried out by first wiping it off with a clean paper towel, take out the SIM card, and then placing it all in a plastic bag full of silica packets and sealing it with a twist tie [3]. The bag can be placed in the sun to further the drying effect. I teach cell phone forensics and had success doing this. The silica packets are often available to us free and are in boxes of food or electronics that we purchase. They appear to be small flat packages and are often marked, “silica gel, do not eat.”

5 Cell phones and tracking firemen in a wild fires

A person such as a fireman may be in a wild fire and not know where he or she is. He or she may want to send a real time photo to a base station to let the commander know his or her position and the condition of the fire. He or she may use the camera cell phone to take a picture and send it to the fire chief. One can use email if one has an email account enabled with the cell phone. One can use an MMS to send pictures to another person with a cell phone if SMS and MMS are enabled. Of course the GPS feature for the camera cell phone would have to be enabled so that the GPS coordinates of the fireman are embedded in the photograph. The person who gets the picture may be a fire chief who has a laptop with Internet capability at the emergency site. He or she could use a website such as www.gpsvisualizer.com with the google maps option to link with the received picture and show where the picture was taken.

I gave a talk on cell phone forensics at the High Tech Crime Investigative Association Conference in Atlanta, Georgia in September of 2010. A person in the audience who identified himself as a digital forensic expert told us that the location where the picture was taken may not be exact because of the number of the GPS satellites that could be accessed. Weather conditions such as fog, heavy rain or snow, or excessive smoke could block a connection to one of GPS satellites used for triangulation and location determination. He also said that tall buildings and thick tall trees might block communication with a satellite too. However; even a location that may have an inaccuracy of up to one thousand feet is still valuable in a large scale fire.

5.1 False GPS coordinates

Many times people in cell phone forensic classes who are lawyers, will ask if one can trust the GPS coordinates in a phone. They will ask if they are absolutely correct or can they be faked. This is a valid question because they need to understand the quality of the data that they collect which can be evidence in some instances. There are applications for the Iphone that allow a person to select another location for GPS spoofing. For example; if someone wanted to go to an undisclosed location as part of an undercover investigation or covert operation, but make it appear he was at work, he could use the application to put the coordinates of where he works as the GPS coordinates. If that person forgot to reset the application, the false GPS coordinates would still be there.

6 Dual SIM Phones

Perhaps a person is a fireman and wishes to keep his personal calls informing his family about his safety, from his work calls because a log of all activity on the phone may become part of a public report later. Then the fireman could be instructed in the e-learning class on cell phones to select a model of cell phone that supports two SIMs, also known as a dual SIM phone. Such phones allow a person to have two telephone numbers and two identities. One number could be for work and one for personal calls. Each SIM could also be with a different telephone provider thus providing more separation.

Dual Sim phones can be obtained on the online auction site known as eBay for about fifty dollars. Many are from Shanghai and take approximately one week to arrive. The dual SIM phone available on eBay looks very similar to an IPhone which should improve the learning curve for the student.

Ebay recently has offerings of Tri-SIM phones. This type of phone would allow an emergency manager to have three separate phone numbers and identities. This type of phone is also good if one wishes to have one identity for home, one for his or her agency, and perhaps a number that is part of a large Federal agency. One may also wish to consider this option if certain calls are to be charged with different accounts.

7 Transfer of data between cell phones

It is also important to realize that new cell phones with new features are often appearing on the market. Some cell phones people's cell phones may hold four hundred or more names in them and retyping them in a new phone is not feasible. Therefore firemen need to learn that there exists a device such as the Cellebrite UME36 that allows people to transfer data from one phone to another [4]. The device can also be used to transfer data from a phone to flash drive, network, or other digital device for backup. The saving of time and protecting one's valuable contacts is an important issue for anyone with a cell phone.

8 ICE – In case of emergency

It is very unpleasant to think of the possibility of becoming unconscious and unable to call for help. However it does happen. Many people in the United Kingdom are using a concept known as In Case of Emergency (ICE) in their cell phones [5]. Emergency managers or first responders in the UK can call the ICE number and speak to someone to identify the person and their loved ones in case of unconsciousness.

The ICE contact is also a person who could suggest where the unconscious person could be taken for help and tell what medicines the person may be allergic to. The ICE Contact might also tell the first responder about the person's medical history and special care that may be needed. A person could have a radioactive isotope in their body as part of a care regime for prostate cancer and it does not mean that he or she is radioactive.

9 Virtual Kidnapping

It is also important to educate anyone with a cell phone that virtual kidnappings do occur. This is a new crime. It occurs when someone steals a cell phone and other documentation such as a wallet. The caller uses the phone to call the victim's family with a story that he or she is being held for ransom and that the person will be released for a fee.

Then the person being called should immediately ask to speak to the person who is kidnapped to see if it is real. There should be some cooperation with the kidnapper and the FBI should be called. It is often possible to arrest the person when they try to collect the ransom [6].

10 Dual Band, TriBand, Quadband

It is also important for people with cell phone to know that their cell phone may not work everywhere. There are dual band phones with two frequencies. There are tri-band with three frequencies and now quad-band phones that support four sets of frequencies for cell phone communication. Cell phones also support various protocols such as CDMA and GSM. If fireman are flown from far away regions to fight a large scale regional fire, they must first be educated about the protocols and frequencies that their cell phones use and investigate if they will be supported in the region where they are going to.

11 Thoughts About Being Recorded

It is also possible that fireman may be fighting a fire that was deliberately set. This is known as arson and is a serious crime. It is also know that arsonists often go to the scene of a fire to admire their work. People at the fire may also be taking video at the fire. If it is thought that some of the video may be evidence in an ongoing investigation, it might be good to get the names, phone numbers, and addresses of those taking video because their footage may need to be subpoenaed for an investigation [7].

12 Seeking assistance with older phones

It is also good to learn about both old and new cell phones because someone may have an old cell phone that has some critical call logs or information in it that needs retrieving. Perhaps an emergency manager needs to extract a call log to show that he or she did try to contact a certain party or agency and was not negligent. One can often seek assistance from the certified computer examiner (CCE) listserver, the Antique Telephone Collector's Association (ATCA), or from the Phone Museum and Gallery in South Korea.

There is a museum that has an extensive telephone and cell phone collection. Their holdings range from the first cell phones and telephones to the present. They also have some documentation about the phones too. The Phone Museum and Gallery in located in Yeoju-gun in Gyeonggi Province of South Korea. South Korea is also generally known to have the most cutting edge cell phone technology that is about one year ahead of the American consumer market and getting an insight to what might come to the USA might be enlightening.

In the United States, there is the Antique Telephone Collectors Association (ATCA). This group has many specialties. One can contact the group and ask for someone who is an expert in cell phones. The group often has members who are former telecommunication engineers who worked on hardware or software. I have had positive experiences with them when speaking on the phone or attending one of their conferences.

13 Teaching about special priorty numbers

It is important to educate emergency managers and people who are critical to the infrastructure of the United States about special priority telephones numbers so that they may apply for one. People with priority numbers can make phone calls on congested phone networks when others cannot make calls. ''The Multilevel Precedence and Preemption (MLPP) is a military-unique feature designed to give individuals who are assigned critical job responsibilities a special priority calling function. At critical events, these users may initiate calls that preempt existing calls of lower priority. In the context of the original military and government users of MLPP, five levels of precedence granularity allow a "Missiles are inbound!" call to critical personnel to interrupt less-important calls. Although this feature was designed for use in military environments, it applies to emergency services and related scenarios in non-military environments [8]. ''

A student in a class on computer telephony once said that some people who are critical to the nation's infrastructure can apply for a telephone number with the Department of Defense's Defensed Switched Network (DSN) so that they can recieve service for secure calls. This network is also said to have MLPP calling features so that if the network is congested, people with lesser priortity are dropped for your calls [9].

It is sometimes important to teach about concepts such as the MLPP priority number because emergency managers may not know that exists. This can happen if they are new to the job and do not read all the FEMA material available to them.

14 Emergency Management Higher Education Conference

The Emergency Management Higher Education Conference take place each year at the National Fire Academy in Emmitsburg, Maryland during the first week of June. It is a good place to network with academics, emergency managers, first responders, and administrators from FEMA. There are workshops where one can ask about novel ways of teaching emergency managment. The conference also has many

colleges and universities that participate in round table discussions about emergency management technologies. Then various practitioners and academics will discuss what topics should go into continuing education and college courses. New books will be discussed and others will discuss topics that should be developed for writing a new book.

Educators and emergency management practitioners from all over the United States, Canada, and New Zealand participate in the week long discussions and presentations. There are also many times where people will discuss what classes served the needs of emergency management students and which ones did not. We plan to ask any new emergency manager and first responder conference attendees that we meet if they are using any of the advanced cell phone features for work.

We also plan to ask the course development personnel from FEMA if they will plan to develop any continuing education that utilizes the cell phone. Perhaps they will tell me that the smart phones with larger screens can be used by students to take online courses. Then the smartphone will not be an operational tool in the field but used more like a very small computer to study continuing education.

We also plan to ask emergency management personnel about how they want to learn online. Some people may like streaming video with a teacher talking and explaining things on the blackboard. Others may state a preference for Microsoft PowerPoint slides and PDF documents in a Blackboard or Moodle environment.

One of the previous concerns I heard in the early years of the conference was that many people had dial up accounts for Internet service. This was a problem because people's bandwidth was limited and only text with low resolution pictures was possible. Now in 2011, most people have broadband service at home from satellite or cable service and multimedia is welcomed. Downloading speeds are not a concern any longer. Some people at the conference even look at streaming videos on their smartphone since the bandwidth is so high.

In the past, some students have told me that they used a technique called cell phone tethering so that they could access the Internet on their laptop via their cell phone. The laptop had educational material on it and they wanted to use it to interact with the online class. However ; the laptop could not access any local wireless hotspots to connect to the Internet. The interesting part was that their cell phone had Internet connectivity, and by changing the cell phone's configuration, they could turn their cell phone into a wireless modem for the laptop.

I thought that the cell phone tethering technique is great for FEMA online course students, but could also be used by emergency managers who are deployed in the field at a disaster. The value of talking to students and people who attend conferences is that I can learn novel ways of using technology that I can pass along to others. Such information about cell phone tethering can easily be put in an online course. The story about cell phone tethering could also be passed to others via newsletter, or as an anecdote in an email.

It will be interesting to see what we learn from the conference this year and then discuss how to best deliver the education to the emergency manager.

15 Conclusion

The cell phone is a great tool for communication but it must have the correct frequencies and protocols if it is to be of use at an emergency site. Dual SIM phones allow the cell phone user to have a separate identity for work and family. Cell phones are small and can be lost. It is important to keep it safe because a lost phone can be used to cause panic and take money from victims in virtual kidnappings. Phones can get wet and there are ways to dry them out and use them again. If a fireman or emergency manager gets a new phone, there are ways to easy transfer the contents of one phone to another. Fireman and policeman also need to know that the cell phone camera is a good tracking and reporting device. It is good to enable the GPS features and learn how to send real time pictures which show conditions and location. Lastly, it is important to have ICE information in a phone so that in case of unconsciousness, a person can be called and provide real information about identity and medical history.

E-learning, webinars, and videoconferencing by Skype could provide online training with questions and answers for first responders. First responders and emergency managers could use e-learning to make their cell phones a powerful tool in their communities.

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An Investigation of the Effect of Higher Education Student's Perception on their Readiness for E-Learning Adoption: The Case of Egypt

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Abstract - *Implementing e-learning in a country like Egypt, with over 80 million, needs clear understanding of the Egyptian students' characteristics, perception, and cultural aspects. E-learning can serve a great number of students regardless of the class capacity; a fact that highlighted the role of and the necessity for e-learning as it can serve a great number of students regardless of the class capacity specially in Egypt where the large number of students per class and limited number of universities available in higher education is a major problem.*

This paper will focus on the Egyptian students as the customer in the e-learning process. It will try to identify the students' preference mode, perception regarding e-learning and its effect on their readiness foe e-learning adoption by answering the following question:

- *What is the effect of higher education student's perception on their readiness for e-learning adoption?*

A structured questionnaire was designed and administered to target higher education students both in Alexandria and Cairo as the two main cities in Egypt. Data collected was statistically analyzed using SPSS. Findings enabled the researchers to make conclusions and recommendations regarding e-learning implementation in Egypt

Keywords: e-learning; perception; e-readiness; cultural aspects.

1 Introduction

With the penetration of the Internet in many sectors, education has been facing competitive pressures. Nowadays, universities not only seek basic technical knowledge in a field of study, but also teamwork, communication, leadership, and applied decision making skills. The Internet has reshaped the educational industry, making changes in the way education is delivered to students a necessity in the learning systems [1].

A number of factors have made educational institutions reconsider their educational methods some of which are the rising costs, shrinking budgets, and an increasing need for distance education. E-learning has been defined in a number of ways [2]. It is generally described as the learning experience delivered by electronic technologies. E-learning has also been defined as delivering educational material through the use of the Internet.

Learning is a major sector in the Egyptian industry. Like most service providers, learning institutions have realized the importance of investing in technology, in order to reduce cost, attract students, and fulfill customers' needs for convenience and technical innovation [3]. E-learning in particular is becoming increasingly popular in higher education, especially with the increasing number of students enrollment in higher education. E-learning programs have been recognized as main alternative delivery methods for education and training available around the world [4].

Although e-learning is influenced by a number of factors, the paper's particular interest would be the personal higher education students' preference and readiness to adopt e-learning at the Egyptian educational institutes. In order to make e-learning more popular in Egypt, it is required to understand the users' nature, concerns, preferences, perception, and e-readiness.

2 Literature review

Learning refers to education that is facilitated by use of information and communication technology. It is also referred to as teaching and learning that is web-enabled [9] [10] [11]. E-leaning is delivered and managed regardless of the time and location aspects [4].

2.1 E-learning advantages and challenges

Literature has been very rich with the advantages and disadvantages of e-learning in general [13] [14] [15] [16] [17].

E-learning could dramatically increase access to education and training. E-learning programmes would improve the quality of education by accessing the best and global academic resources and by offering training to academics. Some of the clear e-learning advantages are the timeliness, where one can attend and participate in course discussions at anytime and from anywhere. E-learning also increases the interaction giving everyone the chance to contribute unlike the traditional classroom where students who are not shy dominate the class discussions. Student-centeredness is another e-learning advantage, where online education facilitates students' learning approaches that work best for everyone, either orally or practically. Moreover, e-learning provides a broad scale of courses that are available at all times, which overcomes geographic barriers to e-learners and guide them to find a diversity of courses. Additionally, e-learning allows learners to access a variety of libraries through their computers for course materials, articles, e-books.

Diversity of instructors is another e-learning advantage; as e-learning provides a variety of instructors from across the globe and that are not bound by a traditional schedule. Another clear advantage is that it grants e-learners an opportunity to communicate with others allowing them to enrich their skills. Anonymity is also considered an e-learning advantage; as it provides a bias-free atmosphere. Besides, online education offers newsgroups and chat-rooms for meetings and joint work sessions or informal discussions among learners which lead to potential friendship relationships. Finally, the use of web sites allows the site sponsor to turn the instructor to a facilitator rather than an expert lecturer, which in turn reduces the cost of e-learning for students.

On the other hand, as a relatively new and an immature educational mode, e-learning face many challenges, some of which are first, the fraud where it is important to ensure that the people logging on are who they claim to be. Lack of direct interaction with instructors is another major problem for many e-learners. Moreover, many corporations do not acknowledge online degrees, especially in Middle Eastern institutions wherein they realize that cheating in education is welcome and understood as helping others. Finally, not all learners are competent enough in using Internet tools for the purpose of taking online courses.

To sum up, it seems that promoting e-learning in educational institutions requires understanding of users' perceptions of its benefits as well as users' e-readiness to actually use it. Literature indicates that users' attitudes are considered as a main predictor of e-learning adoption [12]. Even though computers and Internet technology are widely used in businesses and educational institutions in the Middle East, the field still lacks enough research concerning users' perceptions and their e-readiness. This study will attempt to fill part of this gap.

2.2 E-learning readiness in Egypt

Beckstorm et al found out in their investigation about Egypt that there is a positive response to Egypt readiness [4]. Their study presented a summary of two significant government initiatives. First, the Ministry of Communications and Information Technology maintained a free Internet access nationwide since 2002, with more than 15,000 ports serving 2 million Internet users paying only for local dial up phone tariffs. The second initiative is where affordable PCs and laptops have been made available to students and professionals within a monthly installment plan that could also be financed up by a low interest loan.

The higher education quality in Egypt has been declining due to the rapidly growing enrolment rate that started in the 1970s and 1980s, which lead to a large number of students per class [5] [6]. E-learning is considered as a means of improving traditional educational problems that face Egypt. E-learning could provide solutions to problems such as overcrowded classrooms and transportation problems. The adoption of e-learning in Egypt can provide an economic and more suitable solution to the higher education problem by filling in the gap between the number of university places currently available in Egypt and the growing demand for higher education.

3 Research design

3.1 Research questions

In order to understand how the Egyptian student's perception affects the adoption of e-learning in Egypt, we need to answer the following question:

- What is the effect of higher education student's perception on their readiness for e-learning adoption?

3.2 Research methodology

In order to answer the above stated question, a questionnaire was designed to survey students' usage patterns, e-readiness, their perceptions and priorities with regard to E-learning preference and awareness issues. The survey was administered in the two main cities in Egypt. 200 questionnaires were distributed over Higher Education student respondents from Alexandria and Cairo. 130 valid questionnaires were returned.

The questionnaire was designed in English and translated into Arabic. Questionnaire forms were distributed in both languages, according to respondents' preferences. The questionnaire contained 17 variables distributed among different questions. Higher education students were asked to answer questions about: frequency of using the Internet, E-learning awareness, preference of learning mode, E-learning effectiveness and implementation. A summary of the questionnaire form is presented in Tables 1.

4 Statistical treatment

For questions 1 to 4 in the questionnaire simple frequencies were derived and are reported below. For further analysis of the findings, SPSS was used to code and analyze the data. Chi-squares tests have been applied to all questions to assess whether the distributions of results differ significantly from findings given by different segments of the population in the questionnaire which might have arisen by chance.

Modes, Crosstabs and Chi square tests were used for questions 5 to 17 to assess student's e-learning perception against their readiness for e-learning adoption for the following hypotheses.

4.1 Frequencies

- 77.4% of students use the Internet on daily basis, while 17.7% access the Internet weekly and only 4.9% of the sample visit the Internet on monthly basis.
- The majority of the sample under investigation (62.6%) browses the web for educational purposes, while 37.4% uses the Internet for entertainment and other applications.
- A very large percentage of students (92.7%) were aware of e-learning as an educational platform, only 6.7% were the opposite.
- 62.1% preferred traditional on-campus higher education, while only 37.9% decided on e-learning.

Table 1: Questionnaire summary

#	Question	Possible answers
1	How often do you access the Internet?	Daily Weekly Monthly
2	Do you use the Internet for educational purposes?	Yes No
3	Have you ever heard about E-learning?	Yes No
4	Which educational mode would you prefer?	Traditional On-campus Education E-learning
5	E-Learning is an educational system that encourages responsibility	1: Strongly agree 2: Agree 3: I do not know 4: Disagree 5:Strongly disagree
6	E-Learning is an educational system that acquires search and data gathering abilities	as Question 5
7	E-Learning encourages experiencing practical work environments	as Question 5
8	E-Learning supports the use of recent up-dated information sources	
9	E-Learning saves more time for developing talents	as Question 5
10	E-Learning involves more team work	as Question 5
11	E-Learning is supported by higher education authorities	as Question 5
12	Employers are familiar with E-Learning as an educational system	as Question 5
13	E-learning graduates are considered well educated	as Question 5
14	E-learning graduates studied the same set of topics and are evaluated through valid criteria	as Question 5
15	E-learning graduates has got the same practical training as on-campus graduates	as Question 5
16	E-learning graduates gained the same knowledge as traditional on-campus graduates	as Question 5
17	E-learning graduates are appreciated and admired by employers	as Question 5

4.2 Data analysis

$H_0$1: HE students are infrequent internet users

As Egypt is a developing country, with a high rate of illiteracy, we would expect higher education students to be infrequent Internet users. In order to test this hypothesis, chi square test provided the following results:

'How often do you access the Internet?'
Chi square = 147.598[b], (df = 2, sig. = 0.000)

With these values, we can reject the null hypothesis. The interpretation is that higher education Egyptian students are very frequent Internet users. This is very interesting because it clarifies that young adults are technology users and most of them use the Internet on a daily basis.

$H_0$2: HE students don't use the internet for educational purposes

Although higher education students are frequent internet users it is expected that they use it for entertainment purposes rather than educational applications. To test our expectations, chi square tests gave the following results:

'Do you use the Internet for educational purposes'?
Chi square = 10.313[c] (df =1, sig. = 0.001)

According to these values we can again reject the null hypothesis. The interpretation is that higher education Egyptian students use the internet for educational purposes. A clearer picture will be seen in the awareness and preference question.

$H_0$3: Higher education students in Egypt are unaware of E-learning as an educational mode.

Since e-learning programs have been evolving and adopted all over the world, we would expect that higher education students in Egypt would be aware of this learning module. To see whether there was greater than expected e-learning awareness in the survey population, we used the chi square test. Results were obtained as follows:

'Have you ever heard of E-learning before?'
chi-square= 262.836[d] (df = 2, sig. = 0.000).

With these values, we can reject the null hypothesis. The interpretation is that the majority of Egyptian students seem to have heard of e-learning. Although e-learning has just come out of its infancy, it is sound enough to make this clear significance in the awareness question.

$H_0$4: There is no significant variation in students' preferences regarding the higher education learning mode.

Since e-learning programs advantages have been clear and obvious, and because it has not yet dominated the Egyptian market, we would expect that higher education students in Egypt will not have a clear inclination towards any of the learning modes. To see whether their preferences are different from our expectations, chi square test was used and the results obtained as follows:

'Which would you prefer e-learning, or traditional on-campus learning?'
Chi square = 9.447 (df = 1, sig. = 0.002).

With these values, we can also reject the null hypothesis. The interpretation is that the majority of Egyptian students seem to prefer the traditional on-campus learning mode despite of all the advantages of e-learning. This may ring the bell to show that the Egyptian culture seems to resist change and fear uncertainty.

$H_0$5: There is no significant difference between student's e-learning perception and their e-learning readiness

Since higher education students are frequent internet users and they use it for educational purposes besides the awareness of e-learning as an educational platform, it is expected that their e-learning perception and readiness are enough for the adoption of such an educational system. To test this hypothesis, chi square tests, modes and crosstabs were used and the following results were achieved:

'E-learning as an educational system', 'E-learning graduates'
Chi square = 62.100a (df = 16, sig. = 0.000).

With these results we can again reject the null hypothesis. The interpretation is that higher education students doubt the effectiveness of e-learning as an educational system besides the quality of its learners. These results together with those of H04 emphasizes the role of higher education authorities needed in public awareness about the benefits and effectiveness of e-learning besides the efforts needed to solve cultural factors and resistance to change.

5 Discussions and conclusion

E-learning seems to be the upcoming trend. It has been spreading worldwide. However, Egypt has not really begun to take advantage of the e-learning medium. Although the adoption of e-learning in Egypt can provide an economic and more suitable solution to the higher education problem by filling in the gap between the number of university places currently available in Egypt and the growing demand for higher education, the Egyptian Ministry of Higher Education has not yet

dominated the Egyptian Market. Egypt has just launched its first non-profit private, electronic university in order to put some light and support to the e-learning modules, but still students seem to doubt the effectiveness of such a mode.

As Lorenzi and Riley have reported in their article [7], the main success factors to system success are behavioral more than technical. Egyptian higher education students seem to trust technology and its uses in educational purposes. They are frequent internet users, use the internet for educational applications and on top of all aware of e-learning as an educational system; yet they still prefer traditional on-campus higher education. The main reason for these choices is their doubt in the effectiveness of the e-learning system and the e-learner graduate. Although it seems that Egyptian higher students are ready for engaging in e-learning; their perception towards e-learning concepts and benefits are not strong enough. Cultural resistance and fear of uncertainty are the main causes of such results which highlight the role of the Egyptian higher educational authorities in public awareness about the benefits, advantages and quality of the new higher education learning route that is being implemented.

In the wider study of which this survey is part, further investigation of the social and stakeholder context will be undertaken. Better understanding of the context of e-learning readiness and perception should enable decision makers in Egypt to address their customers' needs more fully. As customers are becoming more powerful than they previously were, and are more able to switch to other providers that if their expectations are not met [8], universities seeking e-learning adoption should try to make their potential students aware of the technique, process, and output.

Finally, we would say that although e-learning has a lot of potentials and advantages, it can not be actually promising in Egypt until cultural dimensions, e-learning readiness and perception have been taken into consideration.

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INTEGRATION OF SEMANTIC WEB IN E-LEARNING ADAPTIVE ARCHITECTURE

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Abstract - *In this article, we present a model of e-learning which enable the learners to obtain pedagogical services. These services aim to response to their needs, to keep pace with their scientific curiosity and their rhythms of learning, and go down to their private desires. From this standpoint, we adopted the pedagogy of objectives as a frame of reference for a technological approach, taking from the ontological engineering and the multi-agents systems a basis for achieving the pedagogical goals. The evolution cannot neglect the integration of Semantic Web technology within the distance learning system; On the one hand, the computerization of pedagogical contents will open broad prospects to upgrade the quality of learning. On the other hand, the system based on multi-agents system is a fertile field to exercise the pedagogical act cross paths betting on the quality of performance and the generation of new rhythms of learning, taking into account the profile of the learner (level of knowledge, preferences, competences, centers of interest, style of learning, etc.).*

Keywords: pedagogical services, ontological engineering, multi-agents systems, Semantic Web, profile

1 Introduction

In order to increase the intelligence in the environments of remote formation, supporting the creation of the relevant pedagogical paths, ontologies became inescapable within the research tasks undertaken in the design of these environments, insofar as the creation of the pedagogical paths adapted to the learners is an increased and central need for any system of E-Learning. From this point of view, ontologies have a main role to hold for the division and the formal representation of knowledge in an exploitable form by a data-processing agent. The technological and pedagogical context of our work is that of the incorporation of ontological engineering while benefitting advisedly from their contributions for the construction of models and tools from which could be developed various services for the actors of a platform of remote teaching while basing on a multi-ontologies approach and co-operative multi-agents. The finality is to equip any e-Learning system of capacities allowing it to carry out reasoning on descriptions obtained in order to automatically adapt the resources and the services proposed to one learner according to his profile (preferences, level, style of learning, centers of interest, knowledge, competences, etc).
In this paper we will present a model of Adaptive e-Learning, closely binding pedagogy and technology, centered on the learner in order to give him formations to measure.

2 Adopted pedagogical approach

To design pedagogical paths adapted to the profiles of the learners, we resorted to the adoption of the pedagogical approach by objectives (PAO).
The latter supports a hierarchy on three levels of pedagogical objectives [1,2]:

- General objectives;
- Specific objectives ;
- Operational objectives.

2.1 Structuring of the Modules of formation

Let us recall that the PAO consists in decomposing a complex module of teaching into its simple and essential elements in order to facilitate its teaching/learning and its evaluation [1].
This decomposition enabled us to consider three levels of abstraction of the module of teaching:

- parts (satisfying the general objectives);
- chapters (satisfying the specific objectives);
- Pedagogical services of learning (PSL) (satisfying the operational objectives).

The latter are the appraisable units of transfer. The system thus organizes the process of instruction around these pedagogical components. The PSL is supposed to receive, by instantiation, all kinds of knowledge of the field, in all the forms of media permitted by the HTML language (fragment of text, image, sound, video, etc). To consume the services of learning provided by the system, the learners must formulate their intentions in the form of pedagogical objectives.

Resting on the tactics (to say, to show, to make), the PSL of a path of learning present the theory on the subject to be taught (to say) and the examples allow (to show) learner how to apply the theory to concrete examples. The pedagogical services of evaluation (PSE) make it possible as for them to measure the achievement of the operational objectives by the learner, and this, by pushing him to make himself even applications of the studied theory. The management of the pedagogical services (PSL and PSE), must be assured by an adaptive system multi-ontologies and co-operative multi-agents centered on five packages rules:

- ✓ Negotiation of the objectives of learning;
- ✓ Estimation of the pre-assets after the negotiation;
- ✓ Planning of the sequences of the PSL and PSE;
- ✓ Seek, filtering and presentation of a hypermedia document of the services;
- ✓ Evaluation of the learner.

The sequence of the pedagogical objectives (PO) by the system is carried out on the basis of "network of pre-necessary" suggested by the author of the module of teaching. A bond of Pre-requisites between two objectives PO1 and PO2 (PO1 towards PO2) defines on the one hand a precedence desired by the author between the two objectives, by proposing that the learning of second objective PO2 can be carried out only after the attack (or the success) of primary goal PO1, and on the other hand, a bond of indicative progression or a potential bond of remediation. This last functionality means that the system can choose a PO which is pre-necessary to another PO on which the learner did not succeed, in order to propose to this last a contribution of knowledge which relates to the pre-necessary PO.

2.2 Pedagogical service

In this approach, we consider that a service is a form of component having properties of autonomy, re-use and division. A service has moreover a semantic description which makes it possible to specify the context in which we can re-use it and the use which we can make [3]. A pedagogical service is a fragment of process making it possible to achieve an operational pedagogical goal. The concept of pedagogical objective is adapted to define the use of a service (its finality). Indeed the same objective can be reached by various manners according to the profile of the learner. Dimension process is another important aspect of the services, it makes it possible to take into account the various methods and pedagogical strategies in the definition of the pedagogical paths.

Each pedagogical service is characterized by a part "profile" which makes it possible to describe the general aspect of the pedagogical service (interface of the service). It comprises an objective, a context and a manner. It will be used at the time of research to establish a correspondence between the services available, on the one hand, and the intentions of the learners, on the other hand [3].

3 Multi-Ontologies Approach

Without reconsidering the various definitions of the concept, we can say that an ontology in the data-processing field is a manner of representing an unspecified field of knowledge in the form of concepts, organized by structuring relations whose principal one is the relation "**is a**". For example a pedagogical service of learning is a pedagogical service.

The objective of the suggested architecture (Figure 1) is to equip our system of capacities enabling it to carry out reasoning on descriptions obtained in order to automatically adapt the resources and the proposed services to a learner according to his profile (preferences, level, center of interest, etc). In our model, we will be interested in ontology of the taught field which is structured in two sub-ontologies: one of the modules and the other of the actors. The ontology of the modules is structured in two sub-ontologies: one of the objectives and the other of the Pedagogical Services of Learning (PSL) and evaluation (PSL). The ontology of the services makes it possible to annotate documents (Fragments of text, images, sounds, videos…) by associating to them a semantic description. This semantics is essential, on the one hand, to ensure the division and the re-use of the services and on the other hand, to facilitate and automate their research and their composition while being based on the profile of the learner described in its model.

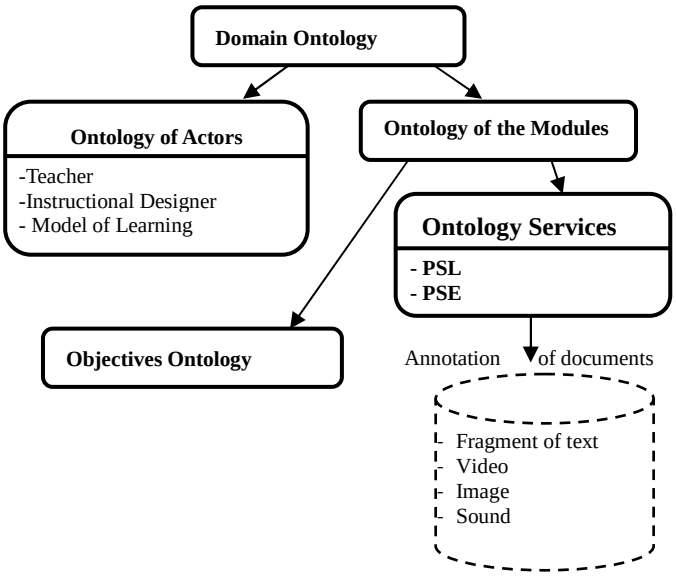

Figure 1 : Multi-ontologies Architecture

3.1 The ontology of the modules

The ontology of the modules is used to structure a module of formation according to three levels of pedagogical objectives (Figure 2):

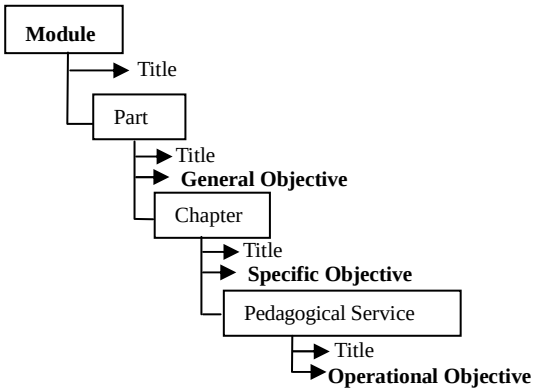

Figure 2: Ontology of a training module

3.2 Ontology of the pedagogical services

This ontology allows describing two pedagogical service types semantically (Figure 3):
- Pedagogical Service of Learning (PSL) correspondent to a unit satisfying an operational objective.
- Pedagogical Service of Evaluation (PSE) allowing testing the attack of a goal which is aimed by a PSL. In another context, a whole of PSE can be used as a basis to generate a whole test of degree of control of a general or specific objective.

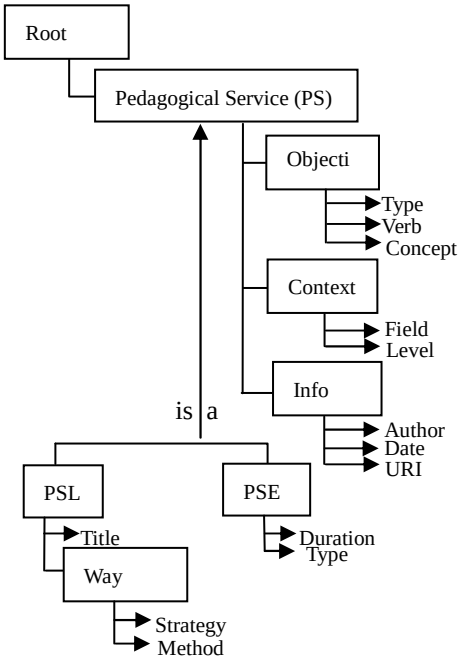

Figure 3: Ontology of pedagogical services

3.3 The ontology of the pedagogical objectives

The ontology of the objectives proposes classes of objectives and verbs to indicate the objectives. This sub-ontology will be used, on the one hand, to describe the part "objective" of the pedagogical services and on the other hand to help the learners to express their needs. Let us recall that we retained the Bloom taxonomy (Bloom 1975) to organize the objectives [2, 3].

3.4 The ontology of the actors

The ontology of the actors is constituted of the following main actors: Learners - Teachers - Designers of modules. It mainly makes it possible to model one learner in a model which has the necessary information on his profile (his knowledge, his preferences, his objectives, his competences, his centers of interests, etc) supporting the personalization of his process of learning (relevance and adaptation of the pedagogical objects according to his intentions). This model must be semantically rich, interoperable, formal (interpretable by machines), evolving in time as well as the learning (it grows rich progressively by the learning).

3.5 Ontology representation language

For representing ontologies, several languages have emerged successively, it is called RDF, RDFS [4] and OWL after then. We chose OWL (Web Ontology Language). First, OWL is the standard

currently recommended by the W3C for representing ontologies. This is an extension of the vocabulary of RDF (S), it enriches the model of RDFS by defining a rich vocabulary for describing complex ontologies. Then, OWL is based on a formal semantics defined by a rigorous syntax advantage of the universality of XML syntax. And finally, If RDF and RDFS provide the user the ability to describe classes (ie.avec the manufacturer) and properties, OWL includes, in addition, tools for comparing properties and classes: identity, equivalence, contrary , cardinality, symmetry, transitivity, disjunction, etc.. Thus, OWL offers machines greater ability to interpret web content that RDF and RDFS, with a wider vocabulary and a real formal semantics.

But, it is not possible to satisfy all of the constraints of a domain, that is why it comes in three flavors:

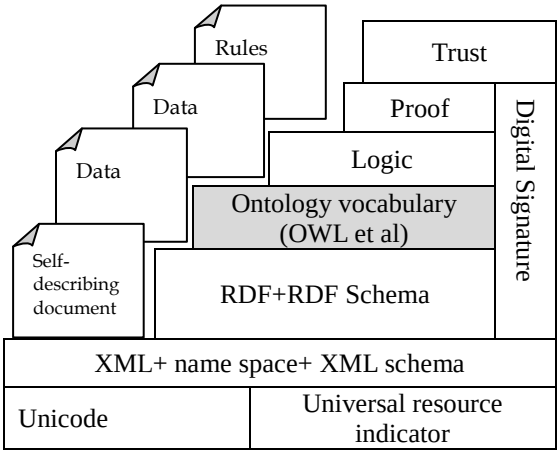

Figure 4: Web Language layers

OWL Lite: expressiveness is weak contribution to other sub languages, but which nevertheless remains sufficient for users who primarily need a classification hierarchy and simple constraints. For example, although it allows us to express cardinality constraints, it limits their values to 0 or 1. Cardinality 0 or 1 corresponds to the functional relationships, for example, a person has an address. However, that person may have one or more first names, OWL Lite is not sufficient for this situation. Thus, the language offers a maximum computability (computing time acceptable), which compensates for its low expression.
OWL DL: DL named because it matches the description logic. It is maximum expressiveness without losing computational models. It is suitable for users who want maximum expressiveness while maintaining the completeness of calculation (all inferences are guaranteed computable) and decidability (all computations are performed in a finite time). OWL DL includes all OWL language constructors, but they are useful only under certain restrictions to ensure the decidability of the calculations. For example, when a class is subclass of several classes, it cannot be instance of another class.

OWL FULL: offers maximum expressiveness. It has the advantage of full compatibility with RDF / RDFS, but no guarantee computability (decidability and completeness of calculations related to the ontology) is offered by this language.

Figure 5 shows an OWL example:

```
<owl:Ontology rdf:about=""/>
  <owl:Class rdf:ID="PedagogicalService"/>
  <owl:Class rdf:ID="PSE">
    <rdfs:subClassOf
rdf:resource="#PedagogicalService"/>
  </owl:Class>
  <owl:Class rdf:ID="PSL">
    <rdfs:subClassOf
rdf:resource="#PedagogicalService"/>
  </owl:Class>
```

Figure 5: OWL example

4 Cooperative Multi-Agents Approach

This part is interested in the design of the software agents able to be organized effectively to achieve together the tasks entrusted to them by using at the same time their individual capacities and the possibilities offered by the organization which they form (communication, co-operation, learning, etc) [5]. In this paper the stress is laid on the creation of the paths of the pedagogical services (PSL and PSE) while being based on a policy of communication and co-operation between the various agents of the system (figure 6).

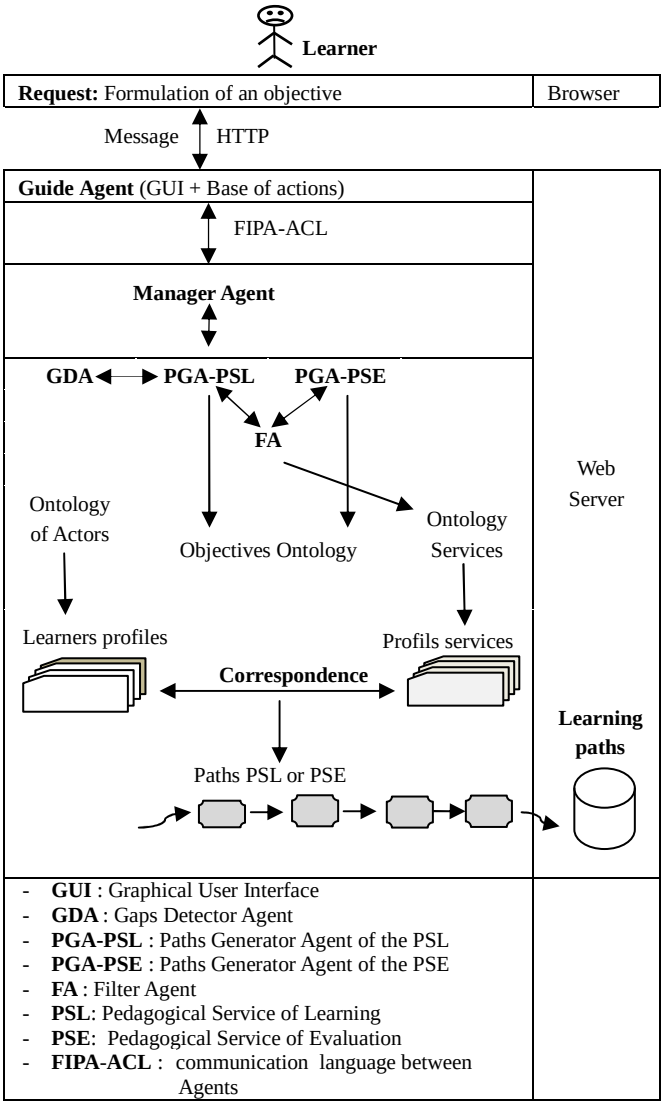

Figure 6: Creating a personalized path

4.1 Guide Agent

In our system, this agent consists of two principal elements: the interface and a base of actions.

- The interface allows the learner to start operations according to his needs and to display the results. It also enables him to communicate his profile (his knowledge, his preferences, his style of learning, his centers of interests, etc)

- The base of actions is made up of a series of functions (LISP, PROLOG or JAVA) coded in a HTTP server and started remotely by the interface. This last part allowing a reasoning containing a continuation of actions carried out by the learner to create his profile at the time of his inscription or to update it during or at the end of a process of learning and/or evaluation.

This agent uses two means of communication, the HTTP protocol for the communication with the learner (the Web browser) and the FIPA-ACL language for the communication with the Manager Agent.

4.2 Manager Agent

Represent the bond between the Guide Agent and the other agents of the system. This last, after having analyzed the request received in the form of a FIPA-ACL message containing at the same time the operation to be carried out and the necessary information on the learner, it proceeds to the determination of the agents which will be able to contribute to the achievement of the request (path of learning or remediation, path of evaluation, etc).

4.3 Paths Generator Agent of the PSL (PGA-PSL)

It receives from the Manager Agent a FIPA-ACL request containing the pedagogical objective expressed by the Guide Agent according to two cases:

- Case of the paths of remediation: this operation comes at the end of a not successful test by taking into account the report generated by the Gaps Detector Agent (GDA) and the profile of the learner. This report contains the unsatisfied objectives.
- Case of the paths of learning: in this case, the objective is directly formulated by the learner and is reformulated by the Guide Agent to enrich it by the profile of the learner for the reason of the adaptation and the personalization.

In all the cases, the PGA-PSL questions the base of paths to check if the desired path already exists. If it is the case, the latter sends an answer directly to the Manager Agent. In the contrary case the PGA-PSL questions the ontology of the objectives to determine the type of the objective: General, Specific or Operational. If the objective is abstract, this last concretizes it by operational objectives to communicate in a request containing the profile of the learner, to the Filter Agent. After having received the answer, the PGA-PSL builds the path desired in the form of a hypermedia document whose services will be accessible and achievable thanks to their URIs.

4.4 Filter Agent

It questions the ontology of the services to choose the suitable PSL or PSE while basing itself on the correspondence between the profile of the service and that of the learner, and the operational objective which is communicated to it. It is the responsible for the personalization and its main role is to seek,

order and reduce the list of the services to be returned to the Appealing Agent (PGA-PSL or PGA-PSE) which in its turn generates the list of the paths sorted according to the profile of the learner.

4.5 Gaps Detector Agent (GDA)

This agent uses functions of similarity to evaluate the proximity of two productions (that awaited and that of the learner). The result of the evaluation will be presented in a report to use by the generating agent of a special path of remediation.

4.6 Paths Generator Agent of the PSE (PGA - PSE)

It receives from the Manager Agent a FIPA-ACL request containing the objective to be evaluated, then questions the ontology of the objectives to determine its type (General, Specific or Operational). If the objective is abstract, the PGA-PSE concretizes it by operational objectives to communicate to the Filter Agent. After having received the answer, the PGA-PSE builds the path desired in the form of a hypermedia document whose services will be accessible and achievable thanks to their URI.

5 Technical Architecture

To implement the designed solution, we propose the following technology architecture:

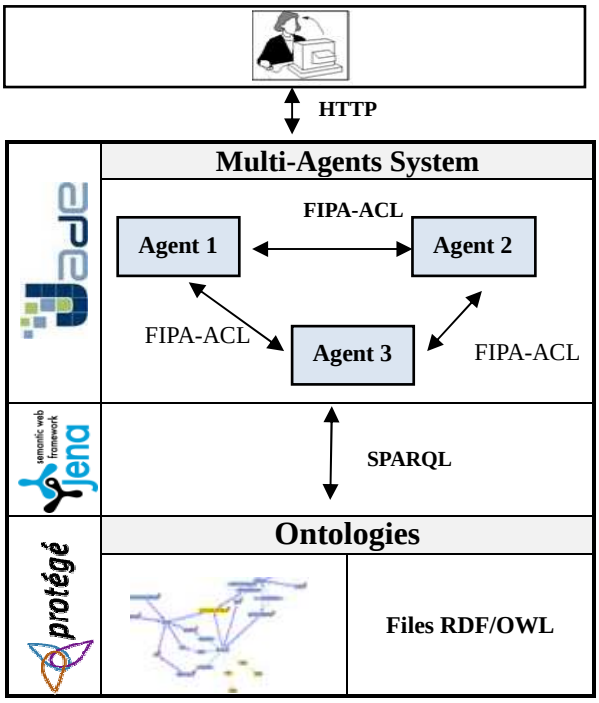

Figure 7: Technical Architecture

We used jade to implement our SMA. Jade is an open source platform provides a development environment for multi-agent systems reliable, it provides a comprehensive set of services and agents comply with the FIPA specifications. The communication between agents is provided by FIPA ACL messages.

To edit the ontologies we chose Protégé 3.4.6 (http://protege.stanford.edu), but there are other software that can be used. about the representation of ontologies we studied several languages such as DAML + OIL, OWL, RDF, etc.. finally we chose to represent our ontologies in OWL.
Jena is a Java framework for building Semantic Web applications(http://jena.sourceforge.net/). It provides a programmatic environment for RDF, RDFS and OWL, SPARQL and includes a rule-based inference engine.
Jena is open source and grown out of work with the HP Labs Semantic Web Programme.

6 Conclusion and prospects

We presented a Model of E-Learning based on the approach by objectives and the ontological engineering in order to pertinently meet the needs of the learners by giving them personalized paths of quality.
The generation of the personalized paths requires a co-operation between several agents of the same system or between the agents of several systems e-Learning which are in collaboration between them. This co-operative and collaborative approach will be possible thanks to the creation of a centralized system of control aiming at selecting, while being based on criteria, the systems e-Learning which can contribute to the generation of a more adapted path. This last point could be the subject of a later study.
Thus the model that we proposed ensures the following functionalities:

- To accompany the learner during his formation;
- To define pedagogical services centered on the pedagogical approach by objectives;
- To compose, in a dynamic way, the personalized paths answering the intentions of the learners.

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Organizing E-learning Standards and Specifications

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Abstract - *Nowadays there are a lot of standards, specifications and recommendations developed by different organizations, which the aim of providing a common framework in order to regulate the various aspects related to the development and use of e-learning environments. This paper provides a compilation of major e-learning standards that exist today, and all of them have been classified in twelve different categories, according to their main area of application*.

Keywords: eLearning standards, eLearning technologies, eLearning quality.

1 Introduction

In order to provide an instrument that can be useful to those involved in the development of standards-based e-learning: suppliers, consumers, platform designers, content authors, among others; in this paper an exhaustive classification of the best-known standards is showed.

The classification has been developed taking into account the work of other authors, including those referenced [1, 2, 3, 4] and other initiatives for the classification of e-learning standards, highlighting the important work done in this regard by LTSO Observatory (Learning Technology Standards Observatory) (http://www.cen-ltso.net), who has served as an obligatory reference in the classification presented in this paper.

Although many documents make a distinction between concepts as "standard", "specification" and "recommendation"; as the main goal in all cases is create a common language, we have decided to use in this paper the term "standard" to refer to them all, taking into account that in some cases these standards are "de jure" standards and in other cases "de facto". The rest of the paper is organized as follows: in the next section the classification criteria of the standards identified is described, which has resulted in twelve different categories. Section 3 presents 107 standards organized by category. And finally, last section is devoted to discuss some conclusions from the work done.

2 Classification criteria

The definition of categories that structure the classification has followed these criteria:

- The categories have been created taking into account the total of 107 different standards compiled and the area covered by each of them.
- A category is considered only if it deals with one aspect of e-learning sufficiently important in the process of creating learning management systems, or learning resources.
- There must be, to the extent possible, a reasonable number of standards into each category, so as to avoid creating particular standards for particular categories. In these cases, the standard has been subsumed in a broader category.
- Categories must be defined in order to future standards, currently under development, can be classified without undergoing any changes.
- Within the categories, a standard can be included, although it is not directly related to e-learning, but if it can be essential when developing e-learning. Some of these standards are XML or HTML.

On the basis of these criteria, and considering the LTSO initiative and the Guide by Hilera and Hoya [5], the following classification with twelve different categories has been established:

1. **Accessibility**: It is Included in this category all those standards that facilitate access to virtual educational resource to any person, with or without disabilities, and those who are defined to adapt the user interface.
2. **Architecture**: Standards that defining software or hardware architectures for e-learning systems, and useful and effective protocols for such systems.
3. **Collaboration**: Standards that facilitate the exchange of information in run-time e-learning systems, and those standards whose goal is to resolve hardware or

software incompatibilities that this exchange of information can present.

4. **Competencies**: Standards dedicated to creating a useful model of student competence, and the standards that deal to distribute the information about competences among different systems. A "competence" is defined as that measurable characteristic, skill or expertise that can be required to perform a specific job or task.

5. **Content and Assessment**: Standards set for learning content management, including aggregation models and content exchange and packaging. Also the standards about knowledge assessment.

6. **Digital Repositories**: Standards describing the content and development of digital repositories, and those that provide information models and protocols to enable interoperability between different repositories, both for search operations and for publication and storage through the Web.

7. **Digital Rights**: Standards related to the expression, management and delivery, or authorization of content considering digital rights.

8. **Learner Information**: Standards that address the storage and management of information about a student or a group of them, in an e-learning environment.

9. **Learning process**: Standards that help to define pedagogical theories or sequencing of content, in order to adapt the learning process to each student according to his or her interaction with a learning management system.

10. **Metadata**: Standards relating to the identification or management of metadata sets applicable to virtual learning.

11. **Quality**: Standards developed in order to ensure quality in e-learning, including those that help in the creation of quality approaches for the development of e-learning products, and those based on a series of well-defined criteria and indicators for the evaluation of any platform or content related to virtual learning.

12. **Vocabulary and languages**: Standards to define vocabularies or languages that promote understanding and exchange of information throughout the virtual learning process, and those who try to minimize the impact that the implementation of a language or vocabulary may have in different geographic areas due to linguistic or cultural differences.

The LTSO initiative collects about 70 standards organized in 18 categories, compared to the total of 107 standards organized into 12 categories shown in this work. Although the categories defined by the LTSO initiative do not coincide with the classification described in this paper, both may be compatible in some way, as both try to sort and organize the different specifications and community initiatives about standardization in eLearning.

3 Standards classified

As already indicated, it is classified a total of 107 standards in 12 categories. Tables 1-12 indicate the titles of these standards, as well as the organization that has published each of them and the year of the last version published. The details about the complete name and URL of the organizations are shown in figure 1.

Table 1. Standards classified in the category "Accessibility" (Shared standards are equivalent)

Standard	Org.	Year
UNE 139801, Computer applications for people with disabilities. Computer accesibility requirements. Hardware.	AENOR	2003
UNE 139802, Computer applications for people with disabilities. Computer accesibility requirements. Software.	AENOR	2009
UNE 139803, Computer applications for people with disabilities. Web content accesibility requirements.	AENOR	2004
AGR009,Icon Standards: User Interfaces.	AICC	1996
Guidelines for the "Access for All" Digital Resource Description Metadata Elements	CANCORE	2009
IMS AccessForAll Meta-data (IMS ACCMD).	IMS	2004
IMS Guidelines for Developing Accessible Learning Applications (IMS DALA).	IMS	2005
IMS Learner Information Package Accessibility for LIP (IMS ACCLIP).	IMS	2003
ISO 9241-171, Ergonomics of human-system interaction. Part 171: Guidance on software accessibility.	ISO	2008
ISO/IEC 24751-1, Individualized adaptability and accessibility in e-learning, education and training.	ISO/IEC	2008
ISO/IEC 24751-2, Part 2: "Access for all" personal needs and preferences for digital delivery.	ISO/IEC	2008
ISO/IEC 24751-3, Part 3: "Access for all" digital resource description.	ISO/IEC	2008
W3C, Accessible Rich Internet Applications (WAI ARIA)	W3C	2009
W3C, Authoring Tool Accessibility Guidelines (WAI ATAG)	W3C	2000
W3C, Web Content Accessibility Guidelines (WAI WCAG)	W3C	2008

Table 2. Standards classified in the category "Architecture"

Standard	Org.	Year
AGR011, CBT Package Exchange Notification (PENS)	AICC	2005
AGR002, Courseware Delivery Stations	AICC	2002
Content Object Repository Discovery and Registration/Resolution Architecture (CORDRA)	CORDRA	2005
IEEE 1484.1, Learning Technology Systems Architecture (LTSA)	IEEE	2003
IMS Abstract Framework (IMS AF)	IMS	2003
IMS General Web Services (IMS GWS)	IMS	2005
IMS Tools Interoperability (IMS TI)	IMS	2006
Open Architecture and Schools in Society (OASIS)	OASIS	2004
Open Knowledge Initiative (OKI)	OKI	2004
Schools Interoperability Framework (SIF)	SIF	2008

Table 3. Standards classified in the category "Collaboration" (Shared standards are equivalent)

Standard	Org.	Year
ADL SCORM Run-Time Environment (SCORM RTE)	ADL	2006
AICC/ CMI Guidelines for Interoperability	AICC	2004
CWA 14928, Review on SIF Infrastructure, Architecture, Message Processing and Transport Layer	CEN	2004
CWA 14929, Internationalisation of SIF and harmonisation with other specs/standards	CEN	2004
CWA 15155, Adaptation of SIF (Schools Interoperability Framework) Data Model for a European context	CEN	2004
IEEE 1484.11.1, Data Model for Content to Learning Management System Communication	IEEE	2004
IMS Sharable State Persistence (IMS SSP)	IMS	2004
ISO/IEC 19778-1, ITLETCT, Collaborative workplace	ISO/IEC	2008
ISO/IEC 19778-2, Collaborative workplace, Part 2: Collaborative environment data model	ISO/IEC	2008
ISO/IEC 19778-3, Collaborative workplace, Part 3: Collaborative group data model	ISO/IEC	2008
ISO/IEC 19780-1, CB, Collaborative Learning Communication part1	ISO/IEC	2008
ISO/IEC TR 29163-1, IT Sharable Content Object Reference Model (SCORM®) 2004 3rd Edition, Part 1: Overview Version 1.1	ISO/IEC	2009
ISO/IEC TR 29163-3, IT Sharable Content Object Reference Model (SCORM®) 2004 3rd Edition, Part 3: Run-Time Environment Version 1.1	ISO/IEC	2009

Table 4. Standards classified in the category "Competencies"

Standard	Org.	Year
CWA 14927, Recommendations on a Model for expressing learner competencies	CEN	2004
CWA 15455, A European Model for Learner Competencies	CEN	2005
HR-XML Competencies	HR-XML	2007
IEEE 1484.20.1, Data Model for Reusable Competency Definitions (DMRCD)	IEEE	2008
IMS Reusable Definition of Competency or Educational Objective (IMS RDCEO)	IMS	2002

Table 5. Standards classified in the category "Contents and Assessment" (Shared standards are equivalent)

Standard	Org.	Year
ADL SCORM Content Aggregation Model (SCORM CAM)	ADL	2006
AGR006, Computer Managed Instruction (CMI)	AICC	1998
AGR007, Courseware Interchange	AICC	1995
AGR010, Web-based Computer Managed Instruction (CMI)	AICC	1998
CMI 012, AICC Packaging Specification	AICC	2006
IMS Common Cartridge (IMS CC)	IMS	2008
IMS Content Packaging (IMS CP)	IMS	2004
IMS Question and Test Inteoperability (QTI)	IMS	2005
IMS Resource List Interoperatibility (RLI)	IMS	2004
ISO/IEC 12785-1, ITLET Content packaging, Part 1: Information model	ISO/IEC	2009
ISO/IEC 23988, A code of practice for the use of information technology (IT) in the delivery of assessments	ISO/IEC	2007
ISO/IEC TR 29163-2, IT Sharable Content Object Reference Model (SCORM®) 2004 3rd Edition, Part 2: Content Aggregation Model Version 1.1	ISO/IEC	2009
OAI, Object Reuse and Exchange (ORE)	OAI	2008

Table 6. Standards classified in the category "Digital Repositories"

Standard	Org.	Year
CWA 15454, A Simple Query Interface Specification for Learning Repositories (SQI)	CEN	2005
CWA Simple Publishing Interface for Learning Object Repositories (SPI)	CEN	2009
IMS Digital Repositories Interoperatibility (DRI)	IMS	2003

Table 7. Standards classified in the category "Digital Rights"

Standard	Org.	Year
XRML, Extensible Rights Markup Language	Content Guard	2002
IEEE 1484.4, Trial Use Recommended Practice for Digital Rights Expression Languages Suitable for eLearning Technologies (DREL)	IEEE	2007
IMS Common Cartridge Authorization Web Service (IMS CCAWS)	IMS	2008
OMA Digital Rights Management (OMA-DRM)	OMA	2008
Open Digital Rights Language (ODRL)	ODRL	2002

Table 8. Standards classified in the category "Learner Information"

Standard	Org.	Year
CWA 14926, Guidelines for the production of learner information standards and specifications	CEN	2004
IEEE P1484.2, Public And Private Information Learner (PAPI)	IEEE	2002
IMS Enterprise (IMS E)	IMS	2002
IMS Enterprise services (IMS ES)	IMS	2004
IMS ePortfolio (IMS eP)	IMS	2005
IMS Learner Information Package (IMS LIP)	IMS	2005
ISO/IEC 24703, Participant Identifiers	ISO	2004

Table 9. Standards classified in the category "Learning Process" (Shared standards are equivalent)

Standard	Org.	Year
ADL SCORM Sequencing and Navigation (SCORM S&N)	ADL	2006
IMS Learning Design (IMS LD)	IMS	2003
IMS Simple Sequencing (IMS SS)	IMS	2003
ISO/IEC TR 29163-4, IT Sharable Content Object Reference Model (SCORM®) 2004 3rd Edition, Part 4: Sequencing and Navigation Version 1.1	ISO/IEC	2009

Table 10. Standards classified in the category "Metadata" (Shared standards are equivalent)

Standard	Org.	Year
UNE 71361, LOM-ES application profile for standarized Digital Learning Objects metadata.	AENOR	2009
CanCore Element Set	CANCORE	2002
CWA 14855, Dublin Core Application Profile Guidelines	CEN	2003
Dublin Core Metadata	DCMI	2008
EdNA Metadata	EdNA	2002
IEEE 1484.12.1, Learning Object Metadata (LOM)	IEEE	2002
IMS Learning Resource Meta-data Specification (IMS MD)	IMS	2006
ISO 15836, The Dublin Core Metadata Element Set (DCEMES)	ISO/IEC	2009
LORN Vetadata	LORN	2008
OAI, Protocol for Metadata Harvesting (PMH)	OAI	2002
ProLEARN, Harmonization of Metadata Standards	PROLEARN	2008

Table 11. Standards classified in the category "Quality"

Standard	Org.	Year
UNE 66181, Quality management. Quality of virtual education.	AENOR	2008
CWA 14644, Quality Assurance Standards	CEN	2003
CWA 15533, A model for the classification of quality approaches in eLearning	CEN	2006
CWA 15660, Providing good practice for E-Learning quality approaches	CEN	2007
CWA 15661, Providing E-Learning supplies transparency profiles	CEN	2007
EFQM Excelence Model	EFQM	1999
UNIQUE, European University Quality in eLearning	EFQUEL	2006
ISO 9001, Quality management systems, Requirements	ISO/IEC	2008
ISO/IEC 19796-1, ITLET Quality management, assurance and metrics, Part 1: General approach	ISO/IEC	2005
ISO/IEC 19796-3, ITLET Quality management, assurance and metrics, Part 3: Reference methods and metrics	ISO/IEC	2009
ISO 29990, Learning services for non-formal education and training, Basic requirements for service providers	ISO	2010
Code of practice for the assurance of academic quality and standards in higher education. Section 2: Collaborative provision and flexible and distributed learning.	QAA	2004

Table 12. Standards classified in the category "Vocabulary and Languages"

Standard	Org.	Year
AICC/ CRS002 Glosary of Terms Related to Computer-Based Trainning	AICC	2003
CWA 14590, Description of Language Capabilities	CEN	2002
CWA 14643, Internationalisation of the IEEE Learning Object Metadata	CEN	2003
CWA 14645, Availability of alternative language versions of a learning resource in IEEE LOM	CEN	2003
CWA 14871, Controlled Vocabularies for Learning Object Metadata: Typology,	CEN	2003
CWA 15453, Harmonisation of vocabulares for eLearning	CEN	2005

Standard	Org.	Year
CWA 15555, Guidelines and support for building application profiles in elearning	CEN	2006
IMS Application Profile Guidelines(IMS AP)	IMS	2005
IMS Vocabularies Definition Exchange -VDEX	IMS	2004
ISO/IEC 2382-36, IT, Vocabulary Part 36: Learning, education and training	ISO	2008
ISO/IEC TR 24725-3, ITLET Supportive technology and specific integration, Part 3: Platform and Media Taxonomy (PMT)	ISO/ IEC	2010
CSS, Cascading Style Sheets	W3C	2008
HTML, Hypertext Markup Language	W3C	1999
XML, Extensible Markup Language	W3C	2008

4 Conclusions

The proliferation of heterogeneous educational applications using the Web, and the commercial interest of these applications has led to a natural process of standardization of various aspects of educational technology.

The main objective pursued is the reusability and interoperability of educational content between different systems and platforms. As we have seen, there are a large number of institutions, organizations and projects behind this process, making it difficult to predict the future about the standardization in the field of e-learning.

ADL	Advanced Distributed Learning	www.adlnet.org
AENOR	Spanish Association for Standardization and Certification	www.aenor.es
AICC	Aviation Industry CBT Committee	www.aicc.org
CANCORE	Canadian Core	www.cancore.ca
CEN	European Committee for Standarization	www.cen.eu
Content guard	Content Guard	www.contentguard.com
CORDRA	Content Object Repository Discovery and Registration/ Resolution Architecture	www.cordra.net
DCMI	Dublin Core Metadata Initiative	www.dublincore.org
EdNA	Educational Network Australia	www.edna.edu.au
EFQM	European Foundation for Quality Management	www.efqm.org
EFQUEL	European Foundation for Quality in e-Learning	www.efquel.org
HR-XML	Human Resources- XML Consortium	www.hr-xml.org
IEEE	Institute of Electrical and Electronics Engineers	www.ieee.org
IMS	IMS Global Learning Consortium	www.imsglobal.org
ISO/IEC	International Organization for Standarization	www.iso.org
LORN	Learning Object Repository Network	http://lorn.flexiblelearning.net.au
OAI	Open Archives Initiative	www.openarchives.org
OASIS	Open Architechture and Schools in Society	http://oasis.cnice.mec.es
ODRL	Open Digital Rights Languaje	www.odrl.net
OKI	Open Knowledge Initiative	www.okiproject.org
OMA	Open Mobile Alliance	www.openmobilealliance.org
PROLEARN	Professional Learning	www.prolearn-project.org
QAA	Quality Assurance Agency for Higher Education	www.qaa.ac.uk
SIF	Schools Interoperability Framework	www.sifinfo.org
W3C	World Wide Web Consortium	www.w3.org

Figure 1. Organizations responsible of publishing classified standards

It seems an accepted fact that the standardization of e-learning is necessary in order to get a quality education through the Web. This is because the creators of educational systems and content need working patterns that allow them to pool their efforts. As a result, will be possible, for example, that the authors can improve the content rather spend their time creating them from scratch, define mechanisms for reuse/authoring of educational content, and adapt the process to specific learning needs of students.

The aim of this work is to provide an overview of the current situation of heterogeneous e-learning standards, trying to gather the most relevant and making a classification that provides guidance to anyone interested.

As can be seen in Figure 2, 107 different standards have been classified into 12 categories. Categories about accessibility and about vocabulary and languages contain the greatest number of published specifications, and the categories about repositories and learning process, the least.

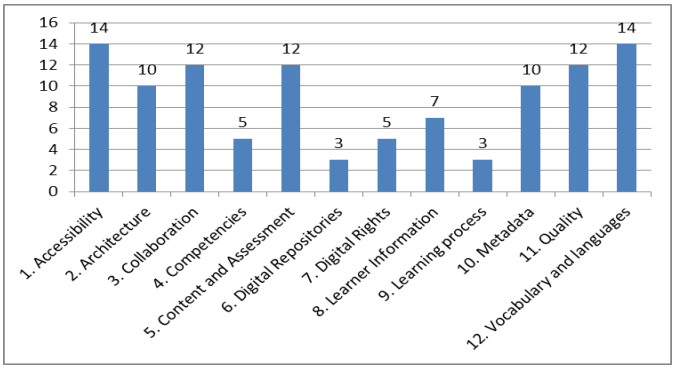

Figure 2. Statistics quality standards focused on the descriptive model.

This classification must be continuously updated, depending on the evolution of organizations for the standardization of e-learning, the creation of new organizations, as well as the evolution of the various emerging standards, and of those adopted or absorbed by other standards and organizations. In addition, over time, new categories of standards or modification of any of the proposals in this paper can be necessary.

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Investigating Learners' Acceptance of e-Learning Courses Using Adopted Technology Acceptance Model

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Abstract - *E-learning has become an increasingly popular learning approach in educational institutions due to the rapid growth of Information Communication Technology (ICT). There are several factors influencing e-learning effectiveness and usability resulting in learner satisfaction and acceptance of web-based learning. The focus of this paper is to investigate learners' acceptance of e-learning based courses by proposing a model based on the Technology Acceptance Model (TAM); emphasized with two important factors. These factors are learner interface design and content quality, which have a significant impact on usability and effectiveness of e-learning. The paper used a questionnaire method to test the proposed research model. The study was conducted among pharmacy and physical education students at Helwan University in Egypt. The results demonstrate that learners who found well-designed interface and good course content are likely to have more positive usefulness and ease of use beliefs. The contributions of this study are two-fold. First, this study identifies the degree by which learners accept e-learning based courses. Second, this study helps to determine which criteria have the most significant impact on learners' acceptance of e-learning.*

Keywords: Technology Acceptance Model, e-learning, Interface design, Content Quality.

1 Introduction

E-learning is the most recent way to carry out distance education by distributing learning materials and processes over the Internet [1]. The purpose of e-learning software is to support learning. A major challenge for designers and Human Computer Interaction (HCI) researchers is to develop software tools able to engage novice learners and to support their learning without face to face communication [1].

The consequence to the advancements of web-based technologies is the development of powerful software systems, known as Learning Management Systems (LMS) [2]. Essentially, an LMS provides an automated mechanism for delivering course content and tracking learner progress. LMS allows learners to view multimedia lectures, communicate with their teachers and each other in learning communities, take online quizzes and submit homework and class work assignments. In addition, LMS is used to improve the internal faculty organization [3].

Universities that adapt e-learning face enormous difficulty in achieving successful strategies, including the delivery, effectiveness, and acceptance of the courses [4]. These challenges are observed by the little number of learners' login to e-learning courses. Therefore, identifying the critical factors related to learner acceptance of e-learning technology continues to be an important issue [4].
The usability of e-learning designs is directly related to their pedagogical value [9]. Nielsen J. (1999) brought the concept of web usability by stating that making web pages simple to navigate and intuitively organized; helps the users find the information easily [3]. Zaharias (2006) stated that usability of e-learning application is not enough to achieve the pedagogical goals [9].

Accordingly, Criteria determining effectiveness and usability of e-learning need to be considered in order to assist e-learning developers in early stages in the development of e-learning based courses. Effective implementation of an e-learning initiative requires that a number of issues must be taken into account. Learner interface must be easy to use to actually be used [8] and course content quality should be considered to achieve the effectiveness of e-learning [10,53]. Therefore, well designed learner interface and content quality are critical factors to learner acceptance of e-learning.

This paper proposes an adapted model, based on TAM, to investigate learners' acceptance of e-learning based courses by adding two important factors, learner interface and content quality, which have a significant impact on usability and effectiveness of e-learning [8,10,53]. High effectiveness and usability in turn results in positive satisfaction and acceptance of the e-learning system.

The paper is organized into six sections. The introductory section includes a general introduction to the topics of the paper. Section 2 provides an overview of TAM as a theoretical background and other related work. Section 3 proposes the research model depending on TAM. Section 4 presents the operational measures of the model's variables. Likewise, it clarifies the data collection methods and techniques. Section 5 presents the data analysis and results, and discusses the findings. Finally, section 6 presents a summary of the general findings of this paper, and exposes limitations, suggestions for future research.

2 Background

2.1 Technology Acceptance Model

TAM, introduced by Davis (1986), is one of the most widely used models to explain user acceptance behavior for any application. Davis (1986, 1989) introduced the constructs in the original TAM as follows: Perceived Usefulness (PU), Perceived Ease Of Use (PEOU), attitude, and behavioral intention to use as depicted in figure 1. According to Davis (1989) PU is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance". PU is expected to be influenced by PEOU as "the easier a technology is to use the more useful it can be" [21]. PEOU is defined as "the degree to which a person believes that using a particular system would be free of effort" [7,20,21].
Among the constructs, PU and PEOU form an end-user's beliefs on a technology and therefore predict his or her attitude toward the technology, which in turn predicts its acceptance [5,20,22].

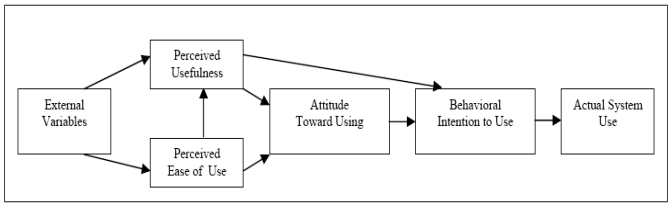

Fig. 1 Original technology acceptance model

Source: [20]

TAM has been applied in numerous studies testing user acceptance of information technology, for example, word processors [23], spreadsheet applications [25], e-mail [27], web browser [26], telemedicine [24], websites [28], e-collaboration [29], and blackboard [17].

2.2 Literature Review

Ghobakhloo, Zulkifli, and Abdul Aziz (2010) investigated a broad range of user satisfaction models and theories. They presented information quality and user interface features as factors influencing user satisfaction of Information System (IS) [14]. TAM measures the intentions to use systems [35,36]. Therefore, Adamson and Shine (2003) suggest that it would be better to shift from predicting behavior to measuring satisfaction in the context of studying new IS acceptance specifically in the mandatory environments [14,34]. Ghobakhloo et al. (2010) proposed their model to be tested and applied in small and medium sized enterprises not for web-based learning.

There are several studies that have used TAM in educational settings [4,7,8,13,15,16,17,18,19].

Based on the literature on technology acceptance and IS success, Poelmans, Wessa, Milis, Bloemen, and Doom (2008) developed a parsimonious model, integrating the behavioral beliefs of the TAM with the object-based concepts of the IS Success Model of Delone and Mclean (2003). In particular, their model includes information and system quality as multi-dimensional concepts that are supposed to have a direct impact on the usefulness and ease of use of e-learning system. They turned to the website usability literature to measure system and information quality (both concepts include several dimensions) [15].
The quality of the information content of the system should indeed lead to the perception of functional usefulness and therefore to the intention to use the system in the future. Information quality is a multi-dimensional concept that covers dimensions such as the understandability, the relevancy, the completeness and the effectiveness of the information provided by an information system. On the other hand, the quality of the system itself (e.g. technical stability and reliability, sufficient search and navigational functionalities, attractiveness of the user interface) is supposed to lead to a system that is easy to use, which again is assumed to contribute to the perceived usefulness and an increased intention to use the e-learning environment [15].

Landry, Rodger, and Hartman (2006) and Saade and Galloway (2005) made use of TAM to measure student's acceptance of web-based e-learning tools. In both studies TAM is found to perform well with the main hypotheses being supported and a total variance in usage intentions explained with a little less than 40% [19]. Landry et al. (2006) found usage to be determined by PEOU and PU, and could furthermore find support for the two dimensions suggested for PU, namely perceived effectiveness and perceived importance. The relationship between university students' perceptions of ease of use and usage of Blackboard elements was fully supported but varied at different levels [17]. As originally hypothesized by Davis (1989); Landry's et al. (2006) findings suggest that if students perceive Blackboard to be easy to use, they would also perceive Blackboard to be useful. This could be confirmed also by Saade and Galloway (2005). Usefulness turned out to be the strongest determinant of usage intentions [7,17,19].

In order to predict a user's acceptance behavior of e-learning, Liu, Liao, and Peng (2005) developed a theoretical framework to explain students' intentions to an e-learning system using TAM and flow theory. Additional variables that were investigated are different presentation types (Text audio, Audio-video. Text-Audio-video) and concentration. Liu et al. (2005) found the difference in presentation types as well as concentration to have a significant impact on usage intentions [16].

Roca, Chiu, and Martínez (2006) investigate student's intention to continue using an e-learning system. As the focus is on continued use, a satisfaction construct is proposed. They suggest that the impact of the two TAM variables PU and PEOU on continued use is mediated by the satisfaction. Roca et al. (2006) break down the component perceived performance into perceived quality and perceived usability

and further propose the constructs information quality, confirmation, service quality, system quality and cognitive absorption as antecedents of satisfaction. Roca et al. (2006) found support for their proposed model, yet again, PU turned out to be the strongest determinant [18].

Pituch and Lee (2006) integrated determinants from TAM as well as system and user characteristics as external variables. They selected three system characteristics that are considered to be critical for the development of e-learning systems. The first of the system characteristics, functionality, refers to the perceived ability of an e-learning system to provide flexible access to instructional and assessment media. Such media, for example, allow students to access course content, turn in homework assignments, and complete tests and quizzes online. In addition to providing access to instructional and assessment media, effective e-learning systems must provide for interactivity, which is the second system characteristic examined in their study. Finally, no matter how well the e-learning system integrates various media and allows for interactivity, the system will not be perceived as useful or easy to use if it has poor response time, which is the third system characteristic [13].

Park (2009) added e-learning system accessibility which refers to the degree of ease with which a university student can access and use a campus e-learning system as an organizational factor. He supposed that since most students have computers with Internet at home, system accessibility factor was measured by only one indicator, which was the difficulty in accessing and using e-learning systems in the university [4].

On the other hand, there are several studies on learners' acceptance of e-learning that do not use TAM to measure students' perceptions and attitudes toward web-based learning courses [11,12].

Lim, Hong, and Tan (2008) used questionnaires adapted from the research instruments used by Poon, Low, and Yong (2004) to measure distance learners' acceptance of e-learning. They measured learners' acceptance by students' characteristics, instructors' characteristics, technology support and system, institutional support, course content and knowledge management, and online tasks and discussion groups. They highlighted that well-designed course content provided students with better learning experiences and helped students with easily information access [11]. In their study, the results indicated that students had moderate level of e-learning acceptance for the factor of technology and system. Hong, Lai, and Holton (2003) and Rafaeli and Sudweeks (1997) stated that an e-learning system or a web-page with harmonious configuration of color and background enhanced students' interest to study. Attractive combination of colors with appropriate graphics and animations on web sites were useful in delivering information in a user-friendly way [11,30,31,32,33].

Selim (2007) specified four categories of e-learning Critical Success Factor (CSF) that can assist universities and instructors to efficiently and effectively adopt e-learning technologies. These categories are: (1) instructor; (2) student; (3) information technology; and (4) university support. The technology CSF category of e-learning acceptance was measured by 13 indicators. The indicators used in the technology factor were related to the ease of technology access and navigation, visual technology interface, and the information technology infrastructure reliability and effectiveness. The ease of use of the course web was the most critical factor followed by browser efficiency and screen design [12].

3 Research Model and Hypotheses

Similar to prior research on TAM [13,15,16,18], the ''attitude'' construct was removed to simplify the model. The proposed model for the study is based on prior research, which suggested that user acceptance is determined by two key beliefs. The first is perceived usefulness and the second is perceived ease of use. In addition, two variables, Learner Interface Design (LID) and Content Quality (CQ) were integrated into TAM to adapt it for the empirical study of e-learning. Fig. 2 depicts the proposed research model of this study.

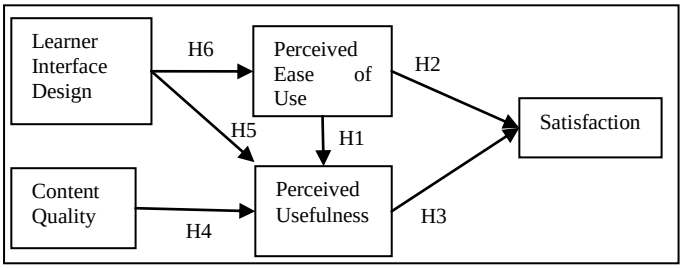

Fig. 2 Proposed Research Model

Based on TAM studies which presented empirical evidence that PU and PEOU predict the learners' acceptance of web-based leaning courses and as Roca et al. (2006) who proposed that the impact of PU and PEOU on learners' acceptance is mediated by the satisfaction; this model proposes the following hypotheses:

H1: PEOU has a positive effect on PU.
H2: PEOU has a positive effect on learner satisfaction.
H3: PU has a positive effect on learner satisfaction.

Consistent with Ghobakhloo, Norzima, and Abdul Aziz (2010), Poelmans et al. (2008), and Lim et al. (2008); well-designed course content provided students with better learning experiences and helped students with easily information access. According to Hong et al. (2003), Poon et al. (2004), and Selim (2007); increasing ease of use through well-designed learner interface is useful in delivering information in a user-friendly way so it results in enhanced acceptance to use the LMS. Therefore, LID and CQ constructs are hypothesized as follows:

H4: CQ has a positive effect on PU.
H5: LID has a positive effect on PU.
H6: LID has a positive effect on PEOU.

4 Research Methodology

4.1 Sample and Method

In December 2009, a field survey was conducted to test the proposed research model and to evaluate the LMS, MOODLE. This system has been applied in two courses. At that time, students had been using the system for three months. Throughout this period, students in pharmacy and physical education courses at Helwan University in Egypt used the LMS to access course material and to interact with system content, classmates, and instructors. The LMS is web based and can be accessed using any web browser.

Students had received a hands-on training during the first classes but they were not given any additional lectures on using the system. At the end of the semester, they were given a printed, anonymous questionnaire to evaluate the e-learning courses that had already used and interacted with. The questionnaire was translated to Arabic in accordance with Brislin's (1986) suggestions for research culture [61]. They self-administered the questionnaire and for each question, were asked to circle the response which best described their level of agreement with the statements. After the exclusion of missing values, the sample that was tested in this study consists of 253 respondents, corresponding to a response rate of 76%.

Data collected by the questionnaire are recorded first in MS Excel program and later transferred to SPSS, Windows version 17. A random sample of five percent of the entered data is checked for coding accuracy. Descriptive statistical analyses such as mean, standard deviation, frequency, percent, and correlation were implemented using SPSS. In order to test the hypotheses by Structural Equation Modeling (SEM), Amos is employed.

4.2 Measures

The design parameters included in the research model are the main constructs included in the questionnaire. These constructs are measured with items adapted from prior research. To identify items for possible inclusion in the questionnaire, an extensive review of prior studies referring to e-learning design criteria, acceptance, and satisfaction was conducted. More specifically a number of design criteria [39,40,43,46,47,48,49], a number of instruments in e-learning acceptance [13,14,20,42,45], and a number of questionnaires in e-learning satisfaction [15,38,44,50,51] have been reviewed. Items that carefully selected so that to cover all parameters included in the research model are presented in Appendix A. Some wording of the items was changed to account for the context of using the LMS. All items were measured using a five-point Likert-type scale with anchors from 1 (Strongly disagree) to 5 (Strongly agree). The measures used to assess the research model are described in the following:

4.2.1 Perceived Ease of Use (PEOU) and Perceived Usefulness (PU)

These two concepts stem directly from the TAM. This paper used an adapted version of the items that were proposed by Davis (1989) and Gefen and Straub (2000). Each construct was measured using 4 reflective items.

4.2.2 Content Quality (CQ)

Content is essentially the material used to convey the subject matter. It is expressed via text, graphics, audio, and other form of interaction [52]. Content quality determines the user's perception of the quality of the information available in the system [14]. Content quality is a multi-dimensional concept that covers seven dimensions which are: accuracy, originality, authority, sufficiency, currency, objectivity, and well organization.

- ***Accuracy***

  The purpose of accuracy is to guarantee that the content is actually correct, factual, exact, and free of bias. The language of the course content must be correct, clear and unambiguous both syntactically and semantically in order to be truly useful [14,47,48,54]. Two items, CQ4 and CQ5, were used to measure content accuracy. They were selected from [48].

- ***Originality***

  Originality means that the sources and references of the content are clearly stated, whether original or borrowed, quoted, or imported. For learning interfaces, sources are given for the course, or links are provided to related sources of content to support effective learning [47,48]. One item, CQ8, was used to measure content originality. It was also taken from [48].

- ***Authority***

  Knowing who created the content of the course and providing information about the author's experience/education determines whether the content is credible or not [46,47,48,55]. One item, CQ3, was used to measure content authority. Again, it was selected from [48].

- ***Sufficiency***

  Sufficiency means that learners are provided the learning material in breadth and depth in order to enable them to understand it and meet its learning objectives [10,14,47,51,55]. One item, CQ2, was used to measure content sufficiency. It was taken from [51].

- ***Currency***

  Currency is user's perception of the degree to which the information is up to date. Nothing frustrates a user and limits his continuity with e-learning courses more than finding that the content is out of date [10,14,46,47,51,55].

One item, CQ1, was used to measure content currency. It was selected from [46].

- ***Objectivity***

The course goals and objectives are clearly stated what the participants will know or be able to do at the end of the course [46,47,48]. One item, CQ6, was used to measure course objectivity. It was taken from [46].

- ***Content Organization***

It is important to ensure that the content of the course is clearly organized. Organizing the content in a logical way makes a course easy to read and understand. Chunking is a useful strategy that involves breaking the course into units that can be organized into meaningful order or hierarchy [12,13,14,46,47]. One item, CQ7, was used to measure content organization. It was selected from [46].

4.2.3 Learner Interface Design

Learners judge e-learning systems on more than courses and content. Most learners make their decisions within seconds of seeing the design of the first page of the course. Opinion based on content and site features comes only after visual judgments [54,56]. The visual design has four dimensions which are: legibility, consistency, attractiveness, and simplicity.

- ***Legibility***

Legibility means that text is easily read. A display's legibility is critical and necessary for designing a usable interface. The designer should be able to determine a comfortable font style. High figure-ground contrast between text and background increases legibility. Dark text against a light background is the most legible [50,54,56]. One item, LID5, was used to measure legibility. It was taken from [50].

- ***Consistency***

Consistency is creating a sense of interface layout and primary elements which are in a harmony within the LMS [56]. Consistency also means that the behavior of interface controls such as buttons, lists, and menu items are not changed within or among pages. Using the same or similar colors, fonts, and backgrounds for similar information enforces consistency [50,57,58]. Two items, LID6, LID7, were used to measure consistency. They were also selected from [50].

- ***Attractiveness***

Design success depends on attractiveness or visual appeal. Attractiveness means that the interface is pleasing to the eye and users enjoy and become engaged in the e-learning interface. Beautiful and attractive visuals can encourage learners to stick around a little longer [11,12,51,56]. Three items, LID1, LID2, and LID3, were used to measure attractiveness. They were taken from [11,12,51].

- ***Simplicity***

The visual design is preferred to be simple. Simple design means clear and uncluttered one. Crowded interfaces are difficult to understand and, hence, are difficult to impress the learner [50,57]. One item, LID4, was used to measure simplicity. It was selected from [50].

4.2.4 Satisfaction

Learner satisfaction has been found to be an important component in the effectiveness of e-learning systems [53]. Satisfaction encourages learners to continue using the LMS. Satisfaction tells whether learners are happy or not, when they used the LMS, how likely they are to return, whether they will recommend it to others, and much more [53,54,59]. Two items, S1 and S2, were used to measure learner satisfaction. They were taken from [53].

5 Data Analysis and Results

5.1 Analysis of measurement validity

Measurement validity in terms of reliability and construct validity is evaluated.

Table 1 Descriptive statistics of items and Cronbach's alpha

Construct	Mean	S. D.	Cronbach's
Learner Interface Design (LID)			0.82
LID1	2.65	0.83	
LID2	2.78	0.64	
LID3	3.75	0.65	
LID4	2.55	0.67	
LID5	3.59	0.79	
LID6	3.7	0.81	
LID7	2.61	0.8	
Content Quality (CQ)			0.79
CQ1	2.55	0.82	
CQ2	2.55	0.85	
CQ3	3.74	0.75	
CQ4	2.92	0.68	
CQ5	2.48	0.86	
CQ6	2.67	0.83	
CQ7	3.71	0.66	
CQ8	2.57	0.85	
Perceived Ease of Use (PEOU)			0.71
PEOU1	3.07	0.84	
PEOU2	2.91	0.71	
PEOU3	2.34	0.8	
PEOU4	3.86	0.66	
Perceived Usefulness (PU)			0.92
PU1	3.59	0.78	
PU2	3.64	0.6	
PU3	3.74	0.87	
PU4	4.06	0.77	
Satisfaction (S)			0.93
S1	3.94	0.88	
S2	3.65	0.86	

Reliability of the instrument is evaluated using Cronbach's alpha. All the values are above 0.7, exceeding the common threshold value recommended by Nunnally (1978) [60]; as presented in Table 1.

Factor analysis are applied to examine the convergent and discriminant validity [41].

A principal component factor analysis is performed and five constructs are extracted, exactly matching the number of constructs included in the model. As shown in Table 2, there were no cross-loading items. Additionally, items intended to measure the same construct exhibited prominently and distinctly higher factor loadings on a single construct than on other constructs, suggesting adequate convergent and discriminant validity. The observed reliability and convergent/discriminant validity suggested adequacy of the measurements used in the study.

Table 2 Factor analysis results: principal component extraction

Factors	1	2	3	4	5
Items	**Factor Analysis**				
Learner Interface Design (LID)					
LID1	0.04	-0.09	**0.79**	0.00	0.06
LID2	0.02	0.25	**0.56**	-0.01	0.06
LID3	-0.12	0.06	**0.74**	0.13	-0.08
LID4	0.13	-0.10	**0.71**	0.30	-0.09
LID5	-0.03	0.09	**0.77**	0.01	0.11
LID6	0.21	0.36	**0.40**	-0.21	0.10
LID7	-0.05	0.31	**0.68**	0.19	0.02
Content Quality (CQ)					
CQ1	0.05	0.09	-0.10	**0.68**	0.17
CQ2	0.15	-0.22	0.10	**0.62**	-0.15
CQ3	0.09	-0.11	0.07	**0.44**	-0.20
CQ4	-0.04	0.08	-0.10	**0.73**	0.21
CQ5	0.00	0.01	0.29	**0.71**	0.04
CQ6	0.11	0.07	0.15	**0.70**	0.18
CQ7	0.26	0.33	0.34	**0.42**	-0.07
CQ8	0.11	0.33	0.13	**0.54**	-0.19
Perceived Ease of Use (PEOU)					
PEOU1	0.13	**0.42**	-0.33	-0.20	-0.04
PEOU2	0.15	**0.49**	-0.05	0.02	-0.34
PEOU3	0.02	**0.43**	0.01	-0.23	-0.13
PEOU4	0.26	**0.53**	0.01	-0.19	-0.15
Perceived Usefulness (PU)					
PU1	**0.58**	0.41	-0.12	0.02	0.17
PU2	**0.66**	0.31	0.06	-0.08	0.10
PU3	**0.55**	0.26	0.01	0.12	0.21
PU4	**0.72**	-0.06	0.23	0.04	0.07
Satisfaction (S)					
S1	-0.31	-0.12	0.02	0.07	**0.70**
S2	0.04	-0.13	0.04	0.12	**0.68**

5.2 Model testing results

The hypothesized relationships are tested using the Amos procedure of SPSS 17. This provides estimates of parameters and tests of fit for linear structural equation model similar to LISREL.

Properties of the causal paths, including standardized path coefficients, P-values, and variance explained for each equation in the hypothesized model are presented in Fig. 2.

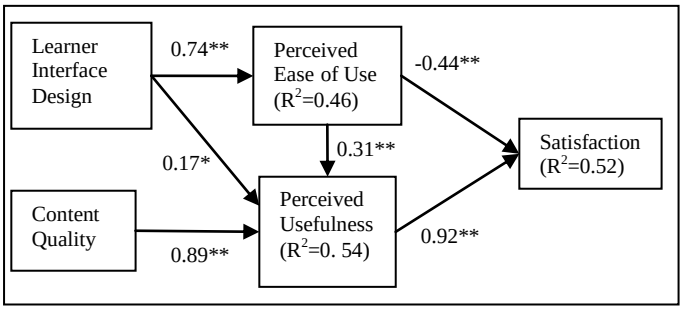

Fig. 3 Model testing results: *P < 0:05; **P < 0:01.

As expected, learner interface design has a significant positive effect on both perceived usefulness (beta = 0.17, P < 0.05) and perceived ease of use (beta = 0.74, P < 0.01). Therefore, hypotheses H5and H6 are supported. Learner interface design explained 46 percent of the variance in perceived ease of use.

Both content quality and perceived ease of use are found to be significant factors in determining perceived usefulness (beta = 0.89, P < 0.01) and (beta = 0.31, P < 0.01) respectively and 54% of the variance in perceived usefulness is explained by learner interface design, content quality, and perceived ease of use. Thus, hypotheses H1 and H4 are supported.

Finally, perceived usefulness has a significant positive effect on satisfaction (beta = 0.92, P < 0.01) whereas perceived ease of use is not significant factor in determining satisfaction (beta = -0.44, P < 0.01). Thus, hypotheses H3 is supported while H2 is not supported.

The proposed model accounted for 52% of the variance in satisfaction. According to the path coefficients, perceived usefulness exhibited the strongest direct effect on satisfaction while perceived ease of use has a negative effect on satisfaction.

6 Discussion and Conclusion

Learner interface design appeared to be a significant determinant of perceived usefulness and perceived ease of use. Content quality appeared to be a significant determinant of perceived usefulness. This finding supports prior research [15]. Learners who found well-designed interface and good course content are likely to have more positive usefulness and ease of use beliefs. The fact that the ease of use is not a direct predictor of satisfaction has also been confirmed in the literature on the TAM [11,45]. Ease of use influence usefulness, but providing an easy to use learning platform is not sufficient. As students get more acquainted with the technology, they focus more on its instrumental value and the information content that it provides.

Judged by its direct effect on satisfaction, perceived usefulness was found to be the most significant factor

affecting users' acceptance of e-learning. It seems that learners have specialized training and practice in using computer systems and Internet. Thus, an essential acceptance criterion is whether or not the e-learning system provides useful content for filling the needs of learners.
As expected, learner interface design and content quality were found to be important factors influencing users' acceptance of e-learning, indicating that it is not sufficient to develop an e-learning system with valuable functions but more easy to use these functions, well-design learner interface and course content to attract more users to use are required.

Using the proposed model in this paper, this study helps practitioners and researchers better understand why learners resist using e-learning, predict how users respond to e-learning, and increase user acceptance by improving the learner interface design and the content quality. Also, it can help researchers considerate the findings for development and evaluation of e-learning theories.
Major contributions are:

1. Perceived usefulness has the most significant direct effect on learners' satisfaction of e-learning: they must provide useful content to enhance learning effectiveness.
2. Perceived ease of use was found to be an important antecedent of perceived usefulness. Learner interface design is also important for the success of e-learning. It increases e-learners' perceptions of perceived usefulness and perceived ease of use.
3. TAM has been extended in an e-learning context with two important factors: the first is learner interface design and the second is content quality.
4. Learner interface design has a positive effect on perceived usefulness and perceived ease of use.
5. Content quality had a positive effect on perceived usefulness.

Three limitations of this study should be noted. First, investigating acceptance of e-learning is relatively new. This paper is the first study of a particular technology in Egypt. Second, users who were interested in, had used, or were currently using e-learning were more likely to respond. Finally, the R-square reported by the current research represents another limitation: there may be a need to search for additional variables (e.g., gender, internet experience, level of education) to improve the ability to predict satisfaction more accurately.

Appendix A: Questionnaire Statements

Factor	Code	Statement
Learner Interface Design	**LID**	
	LID1	The e-learning system has attractive features to appeal to the users.
	LID2	The configuration color and background are clear and harmonious for the system.
	LID3	I found the interface design pleasant.
	LID4	The course pages are balanced, clean, and uncluttered.
	LID5	Fonts are visually appealing and easy to read.
	LID6	The navigational elements are placed at the same location(s) in each and every page of the site.
	LID7	The page layout and use of color, fonts and images are consistent throughout the site.
Content Quality	**CQ**	
	CQ1	The course is updated periodically to ensure currency.
	CQ2	The course provides sufficient content related to the learning objectives.
	CQ3	Author has appropriate credentials to author the content of the course.
	CQ4	Content is free from grammatical and typographical errors.
	CQ5	Content is free from bias.
	CQ6	The course goals and objectives clearly state what the learners will know or be able to do at the end of the course.
	CQ7	The course is organized into units and lessons.
	CQ8	The original references are cited properly to allow access to a larger information base.
Perceived Ease of Use	**PEOU**	
	PEOU1	Learning to operate the Web-based learning system is easy for me.
	PEOU2	I find the Web-based learning system easy to navigate.
	PEOU3	The Web-based learning system makes it easier to search for the needed content.
	PEOU4	I find the Web-based learning system easy to use.
Perceived Usefulness	**PU**	
	PU1	Using the Web-based learning system will make it easier to learn course content.
	PU2	Using the Web-based learning system will increase my learning productivity.
	PU3	Using the Web-based learning system will enhance my effectiveness in learning.
	PU4	I find the Web-based learning system useful in my learning.
Satisfaction	**S**	
	S1	You are satisfied with the use of e-learning system in this course.
	S2	Are you likely to use this e-learning system in another course?

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ELearning Software Maintenance Diagnostic Model supported by a Decision Support System

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Abstract - *Elearning projects often give most of their attention to the design of the content of the course, giving less consideration to its maintainability. By omitting this, elearning specialists do not take into account all the software maintenance activities required over time. Maintenance of software accounts for more than 80% of the cost of software over time. Changes of online courses may vary from basic text and graphic changes, editing complex animation and video, to wide-scale translation and localization requirements. Additional to content changes, many technology evolutions may be required over the life time of the course. This research intends to provide elearning specialists with an early software diagnostic model to help them in early identification of software maintainability issues during their elearning initiative. This will allow them to take proactive decisions during the development stage of an online course.*

Keywords: Instructional engineering, elearning, software maintenance, decision support system, ***S3m***, maturity model

1 Introduction

The knowledge transfer of the many best practices described in maturity models has proved difficult [1]. This is especially true during the training of an assessor or a new participant in a process improvement activity. It is also challenging to quickly refer to, or access, the right practice, or subset of practices, when trying to answer specific questions during or after a process maturity evaluation.

The software maintenance maturity model ***S3m*** contains a large number of software maintenance concepts and information, which are structured in many successive levels [2]. The first is called the 'process domain level', and groups together the maintenance practices in 4 process domains (process management, maintenance request management, software evolution engineering, and software engineering evolution support). Each process domain is broken down into one or more key process areas (KPAs). These KPAs logically group together items which conceptually belong together. For example, all training-related practices are grouped into one KPA. A KPA is further divided into roadmaps with one or more best practices spanning five maturity levels.

The complete ***S3m*** has 4 domains, 18 KPAs, 74 roadmaps, and 443 best practices. It would be beneficial to have a decision support system (DSS) to help access this complex structure with its large amount of information. A potential solution to this problem would be to develop a decision-based system for the ***S3m***. This DSS could be made available to both maintainers and maintenance clients. The proposed modeling of a software maintenance DSS was based on the van Heijst methodology [3], which consists of constructing a task model, selecting or building an ontology [4], mapping the ontology onto the knowledge roles in the task model, and instantiating the application ontology with this specific domain knowledge. According to van Heijst, there are at least six different types of knowledge to be taken into account when constructing such a system: task goals, problemsolving methods, task instances, inferences, the ontology, and the domain knowledge (see Figure 1). (Note that Van Heijst uses the different types of knowledge in a more generic way than we do in this document.)

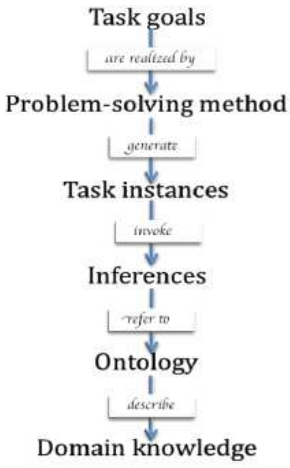

Fig. 1. The various components of knowledge models [3]

For van Heijst, domain knowledge refers to a collection of statements about the domain [4], which in our research here is software maintenance, divided into four process domains. The problem-solving methods and tasks are described at length in section 5. The tool environment and conclusion, as well as future work, are presented in section 6. Section 2 begins by presenting the instructional engineering followed by the goals

of the software maintenance maturity model (***S3m***) used to create the DSS.

2 Instructional Engineering

Instructional engineering (IE) is a particular systemic method in the field of education problem solving located at the crossroads of instructional design, software engineering and knowledge engineering as shown in the figure below [9].

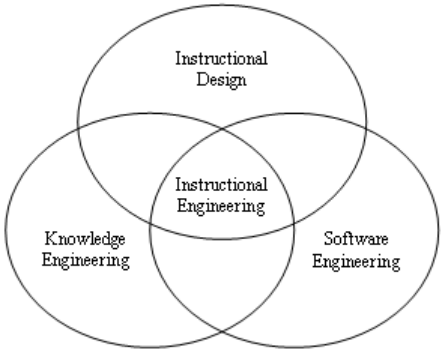

Fig. 2. Foundations of instructional engineering [9]

Instructional engineering is defined as [9]: "a method that supports the analysis, the creation, the production, and the delivery planning of a learning system, integrating the concepts, the processes, and the principles of instructional design, software engineering, and knowledge engineering."

Instructional engineering is born when software engineering principles were adapted to instructional design. This method which proposes well-defined processes and principles that help produce "deliveries", precisely describing the products of these processes. From a technical point of view, a distributed learning system (DLS) is an information system, a complex array of software tools, digitized documents and communication services. Likewise, multi-agent systems represent a DLS at delivery time as a set of agents, persons and computerized objects. They all interact to facilitate learning [8].

Recently, instructional design is often equated with instructional engineering [11]. Instructional design and instructional engineering have in common that they offer a cycle that they both cover a whole life-cycle of a product from analysis to delivery. There are many similarities between engineering and instructional design in terms of methodology, tools used and emerging trends. They both show a growing consideration for the client, tend towards quality, prototyping and concurrent approach. In this sense, the expression instructional engineering is well justified [12].

3 *S3m* Architecture and knowledge statements

Software maintainers experience a number of problems. These have been documented and an attempt made to rank them in order of importance. One of the first reported investigations was conducted by Lientz and Swanson [5], who identified six problems related to users of the applications, to managerial constraints, and to the quality of software documentation. Other surveys have found that a large percentage of the software maintenance problems reported are related to the software product itself. This survey identified structurally complex and old source code which had been badly documented. More recent surveys conducted among attendees at successive software maintenance conferences [6] ranked the problems they perceived as reported in Table 1. These are also examples of knowledge statements about the domain of software maintenance. Key to helping software maintainers would be to provide them with ways of resolving their problems by leading them to documented best practices.

Table 1. Top maintenance problems [6]

Rank	Maintenance problem
1	Managing changing priorities
2	Inadequate testing techniques
3	Difficulty in measuring performance
4	Absent or incomplete software documentation
5	Adapting to rapid changes in user organizations
6	A large backlog of requests for change
7	Difficulty in measuring/demonstrating the maintenance team's contribution
8	Low morale due to lack of recognition and respect for maintenance engineer
9	Not many professionals in the field, especially experienced ones
10	Little methodology, few standards, procedures and tools specific to maintenance
11	Source code in existing software complex and unstructured
12	Integration, overlap and incompatibility of systems
13	Little training available to maintenance engineers
14	No strategic plans for maintenance
15	Difficulty in understanding and support for IS/IT managers
16	Lack of understanding and support for IS/IT managers
17	Maintenance software runs on obsolete systems and technologies
18	Little will or support for reengineering existing software
19	Loss of expertise when a maintenance engineer leaves the team or company

There are a growing number of sources where software maintainers can look for best practices, a major challenge being to encourage these sources to use the same terminology, process models, and international standards. The practices used by maintainers need to show them how to meet their daily service goals. While these practices are most often described within their corresponding operational and support processes, and consist of numerous procedures, a very large number of problem-solving practices could be presented in a DSS, which would answer their many questions about those problems. Examples are presented in section 6. Maintenance client problems could also be linked to these internal problems, because of their potential impacts. When using the software maintenance ontology in the DSS, it is necessary to consider the structure of the maturity model relationship between the many process domains, roadmaps, and practices.

4 High level view of the S3mDSS

According to [3], the first activity in the construction of a DSS is the definition of task analysis, which begins, at a high level, with a definition of an index of terms. This index includes words commonly used in software engineering (see Figure 3). From this index, a subset of more restrictive words is identified. This subset is a list of keywords specifically recognized in software maintenance. Each keyword is then connected to one or more maintenance concepts. A maintenance concept in software maintenance is a concept found in the Software Maintenance Body of Knowledge and ontology (represented in Figure 3). Every maintenance problem identified by Dekleva has been translated into a case problem and connected to the software maintenance ontology. Each case problem is then linked to a set of themes (questions), which help the user of the DSS to navigate to a part of the maturity model that will propose recommendations in the form of best practices.

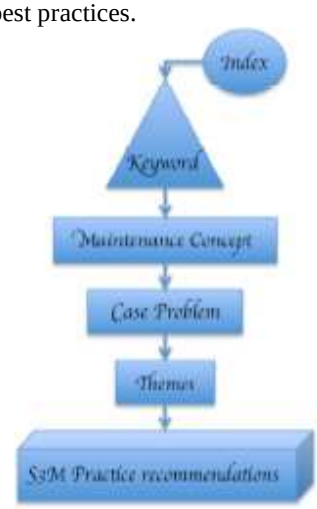

Fig. 3. High-level view of *S3mDSS* architecture

The link between the maintenance concepts and the maturity model is made in the concept of themes. Themes are questions which have been developed to hop from node to node in the ontology. A close look at Figure 3 reveals that the ontology concepts can sometimes combine different maintenance concepts, and, consequently, result in a set of recommendations. For every best practice of the maturity model, there is a linked theme (or choice) that the user can select (the corresponding "facts") which will lead to a final specific set of recommendations. This one-to-one matching between theme and recommendation contributes to a composition of the set of recommendations directly adapted to the user context. When presenting these recommendations, a distinction is made between 'maintenance engineers/managers' and 'maintenance users/clients' when presenting questions. We think that the same problems is perceived for both perspectives, but we need to adapt the way we ask a question based on the particular audience. In this case, when a maintenance client uses the DSS, themes are adapted to this culture, terminology, and level of understanding.

The recommendations provided constitute a kind of invitation to implement a best practice to solve a problem. This approach tends to invite both maintainers and clients of maintenance to become aware of a possible solution to their common problem. Expanding the 6 high-level tasks presented in Figure 3, we actually implemented 12 detailed tasks, which help identify a subset of best practices related to the ***S3m***.

5 S3mDSS Prototype Technology

Next, we present the technology used, as well as an overview of the design of the DSS. Then, we demonstrate how this DSS can be used to help a user answer a question and how a maintenance expert populates a complete case problem.

5.1 *S3mDSS* prototype technology and high level design

The ***S3mDSS*** was built using the Java, Java Server Pages, JavaScript, CSS, and HTML technologies. This combination of technologies was selected for its easy access via the Internet. Behind that, a SQL Server database was added to manage the knowledge base. This choice was justified by the lack of reactivity proposed by XML parsing previously. The architecture is based on a 3-tier model, which provides easy maintainability, and is composed of a presentation layer, a business layer, and a data access object (DAO layer). The business layer design has been split into 2 parts: the first part groups together all the controlling servlets, and the second part groups together all the business methods. Servlets ensure proper communication between the presentation layer and the business layer, while the business methods communicate with the DAO layer.

Table 2. Examples of DSS questions

#	Questions
A	Are there training plans for new maintenance engineers about generic topics like management and process activities?
B	Do maintenance engineers periodically update their knowledge associated with the software that they maintain and its infrastructure?
C	Are maintenance engineers trained and motivated to perform well when using the processes/services and their support role?
D	Is any training communication with customers offered to software maintenance engineers?
E	Are any internal benchmarking data used to guide the training of maintenance resources?
F	Does the maintenance organization have a training budget?
G	Are there plans describing the training needed for each maintenance position and for individual application software?
H	Is there planned training time?
I	Do senior maintainers orientate new employees?
J	Are training needs defined for both technical and management responsibilities for each development project?
K	Do individuals working on predelivery and transition receive the training deemed appropriate by the software developer?

Currently, more than 550 words and 70 keywords have been introduced into the DSS. Five maintenance problems identified by Dekleva were introduced and took 17 hours to address. We estimate that a further 2,000 hours are required to populate the knowledge base for all the ***S3m*** practices for maturity levels 0, 1, and 2. The DSS has 3 different interface types: administrator, expert, and user. The administrator interface manages access rights to the DSS, while the expert interface offers experts the option of adding new index words, keywords, concepts, cases, themes, and recommendations. In the next section, we demonstrate how the DSS helps a user answer a specific question: How can I improve a maintainer's training.

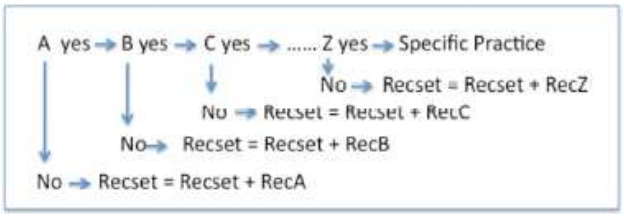

Fig. 4. Effect of Yes/No answers in *S3m*^{DSS}

The DSS presents the user with the case problems associated with the selected maintenance concept in order of priority. A percentage of relevance is attached to each case problem that had previously been established by the expert. The user chooses, using yes or no answers to questions (see Fig 4), one or more case problems that represent the situation most similar to the one he is experiencing and would like help addressing, in our example: lack of training available to maintenance engineers. With this case problem, 11 themes were presented to the user in the form of questions (see Table 2). The user will find facts for each practice (theme), and then he can answer yes or no to any of the themes. As a function of the facts chosen, the system composes a set of recommendations for the user.

The DSS prototype has a number of user interfaces that are used to query for solutions and also populate the information. This is presented in detail during the workshop. To populate the information a maintenance expert enters maintenance cases and link them to the maturity model set of practices for potential solutions. This interface allows maintenance experts to add, modify, or delete any of the DSS concepts. With this interface, maintenance experts can add a complete case to the DSS by respecting the sequence: recommendation, question, case problem, maintenance concept, keyword, and word order, because of the needed links between elements. Experts can also fill in information like the element name, help content, or links to upper and lower elements.

All existing elements are accessible by conventional HTML lists, and can be added very easily by selecting and pressing a button. When the validation button is pressed, an additional interface is presented, where association percentages between linked elements can be selected. Experts can use HTML markups to add hyperlinks, lists, or tables.

6 Conclusion and future works

Next, identifying the best practices in a maturity model is a difficult task, considering the number and the multiple possible answers associated with each possible question. In this paper, we propose a decision support system (DSS) that could help guide the user towards an appropriate recommendation. The next step in this research project is to continue the work of populating the DSS with a large number of cases [7], add levels of maturity, and validate the results with maintenance experts and end-users to determine whether or not the DSS could be a useful support tool to guide maintainers in exploring the content of the detailed recommendations of the software maintenance maturity model.

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Athenian Democracy & Networked Learning Communities

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Abstract – The Athenian democracy is worthy of study if for no other reason than that it was inspiration for many academic fields. This project highlights some institutions and policies of the Athenian democracy, during its flowering in the fifth and fourth centuries BC, in order to interpret them for the benefits of networked learning communities. Concepts such as ephebes and the power of reward can be applied to both the ancient and digital era, without implying an exact parallel..Praxis and further research are required to test the validity of the theory presented.

Keywords: Ephebes (new members), Poli, Power of reward, , Street –level epistemology, Epistemic fluency.

1 Introduction

During the course of history, people form alliances, political parties, societies, associations and communities of practice to share and exchange commodities, ideas or find social support and national or personal identity. Bickford and Wright (2006, p. 42) explain that e-communities form shared values, and agreement on goals because teams have powerful qualities that shape learning and motivate its members to exceptional performance. In the field of educational research, there is an on-going dialogue about democratization, open resources, self–regulated learning and social networking. What needs to be clarified is that Democracy does not mean freedom from any form of control. It presupposes training (real life-experiences, epistemological awareness), logos (critical thinking), ethos (ethical criteria), and skillful governance.

Aristotelian philosophy (the Politics, 335 B.C) is one that influences democratic practises, based on the concept that man is 'political being' by nature. Every action, learning, voting, working has direct or indirect political (social) impact on the society (poli). In this philosophical background, learners and tutors have political duties and rights, living within a community with laws and customs (Reynolds, 2009).

Networked learning communities, committed to helping adults pursue their interest in lifelong learning, is the focus of this project. Networked learning societies have been influenced by the democratic principle that learner-to-learner interaction promotes the inner dialogue and consequently transformative learning. Furthermore, universities have embraced flexible Open and Distance Learning (ODL) programs to open and cater to new markets for higher education. The ground has shifted quickly in favor of the flexibility and power of networked communications technologies to provide service to increasingly diverse and dispersed student cohorts. In order for networked learning to be a viable long-term means of provision, it must demonstrate an ability to support learning in a sustainable way. The challenges are to provide high quality learner and tutor support in networked environments based on logos, ethos and well-organized infrastructure.

The ultimate goal is to design harmoniously balanced networked environments that can be used by different people or institutions with different learning objectives, setting the rules of the game in such a way that users cannot violate them and at the same time, freedom of speech and circulation of information are protected. The Athenian democracy can be

described in this framework as an experiment remarkable enough to deserve attention. What policies and institutions helped the Athenian democracy be so prosperous? How can the lesson learnt (on policies and institutions) be interpreted for the benefit of networked learning cohorts?

The Focus of the Research

The ancient Greeks believed that individuals should be free as long as they acted within the laws of Greece. The two most important concepts that the ancient Greeks followed were found inscribed on the great shrine of Delphi, which read "Nothing in excess" and "Know thyself". In the same line of thought, contemporary economics are generally defined as the study production, distribution and consumption of resources according to market demand. Democratization and economics are closely related because the one cannot succeed without the other. Economy of knowledge, learning needs analysis and efficient planning could assist online democracies.

According to Christopher Blackwell (2002), in 508 BC, Athens became the first society in ancient times to establish democracy. Democracy came from the Greek words, *demos*, meaning people, and *kratein*, meaning to rule. This form of government was used at a meeting place, which the Greeks called the Assembly (discussion forum). Actually, the people governed themselves, debating and voting individually on almost every issue. The Athenian democracy was not of course, a chaotic situation of mob rule. The Athenians understood the value of checks and balances and of enforcing time for reflection before acting. They understood that professionalism is necessary in certain jobs, that accountability was necessary in most jobs, and that some jobs required absolute job-security. Despite its moments of imprudence, injustice, and indecision, Athenian Democracy came to provide a successful political system, which still influences the way people think in different fields. Therefore, it could be useful to see networked learning communities through this lens. The first stage is how to welcome and support new members.

New Members in Athenian Democracy & Networked Learning (NL) Communities

In Athenian Democracy, young members presented themselves to officials of their discussion forum and were enrolled in the participant list. There were some important limitations taken into account before enrolment. The member should have Athenian parents; further, the new young member must never have avoided fighting a battle or paying his debts. To illustrate further, the new member had to create a very primitive form of e-portfolio (personal profile) before fully participating in the democratic processes. The new members of the assembly had to go through a two year period as *ephebes* (preparation stage) after which they were members of the citizen body (Blackwell, 2002).

In the same manner, new members of e-learning communities should be chosen (or make that decision themselves) according to the ethos (ethical criteria) and logos (critical thinking) of a NL environment. Supporters of democratic ideology often overlook that people need to be educated to respond effectively to the demanding democratic environment. Thus, appropriate orientation and support can improve the quality of social interaction aiming at life – long exchanges of information.

In the networked learning arena, members with fewer experiences need training to create their e-portfolios, acquire digital literacy and epistemic fluency. E-portfolios (*know thyself*) could be a tool not only for reflection and self–assessment, but also democratic participation in learning. Moreover, digital literacy, adaptation to e-learning platforms and quest for information through online libraries could facilitate interactivity and minimize technophobia (Alkalai, 2004). Educational epistemic fluency can be defined as the ability to recognize and participate in educational discourses. Epistemic fluency develops through interaction with other people who are already relatively more fluent (Goodyear & Zenios, 2007). The correlation between education and democracy is clear. "Education increases the society-wide support for democracy because democracy relies on people with high participation benefits for its support" (Glaeser et al., 2007 pp. 93-94).

The Power of Reward

Despite the fact that it was a great honor to be an Athenian citizen, every citizen was paid for attending the Discussion forum, to ensure that even the poor could afford to take time from their work to participate in their own government. A historical anecdote recorded in Aristotle's *Constitution of the Athenians* supports this assertion: In 411, when a group of Athenians temporarily overthrew the democracy and established an oligarchy, one of their first acts was to pass a law that no one should receive pay for political activity, referring to the subsequent regime of 411 and 410. In the 4th century, when Timocrates had proposed that the Athenians loosen enforcement of penalties against those who owe debts to the state, Demosthenes claimed that there would be no money left in the treasury to pay for attendance at the Assembly. He went on to equate that outcome with an end to democracy (Blackwell, 2003). To make a long story short, the Greeks relied heavily on the power of reward, meaning that they benefited economically, ethically and socially from their democratic involvement (Josiah, 2008; Hansen, 1999). Pericles in his Epitaph claimed "that where the rewards for merit are

greatest, there are found the best citizens" (Anastasiou, 1986, p.8).

The *power of reward* works as positive reinforcement and enhances social ties within learning communities. Parchoma (2005) adapts French and Raven's work categorizing the power to offer rewards among the five powers that influence the development and sustainability of a virtual organization. In the same train of thought, Parchoma (2005) refers to Laks' work in defining reward power as "the most effective basis for expanding opportunities," and "the fuel upon which the work is accomplished is the rewards received by the people who do the job (p. 472)."

The democratic government of Athens rested on three main institutions, and a few others of lesser importance. The three pillars of democracy were: the Assembly of the Demos, the Council of 500, and the People's Court. In NL communities, the terms discussion forum, e-community managers, and tutors' team will be analyzed aiming at envisioning the democratic ideas without implying an exact parallel.

Athenian Democracy: The Assembly of Dialogue

The Assembly (the Ekklesia) was the regular opportunity for all citizens of Athens to speak their minds and exercise their votes regarding the government of their city. The Assembly became synonymous with democracy because of participation and dialogue required (Blackwell, 2002).

The discussion forum of e-learning communities could be built in the same mentality as the Assembly. After all, the net has opened a "world of discussion" (Fox, 2002), allowing people to express themselves and learn from one another. Dialogic education draws parallels between democracy and education. It is based on the principle that learners must be seen as subjects acting upon content instead of objects to be acted upon or to receive content. "Don't ever do what the learner can do; don't ever decide what the learner can decide." (Vella, 2002, p. 16). Once there is conversation there is hope to resolve every conflict. As Habermas argues, in dialogue there is a "gentle but obstinate, a never silent although seldom redeemed claim to reason" (Habermas, 1979, p. 3). However distorted our ways of communicating are, there is within their structures a "stubbornly transcending power" (Habermas, 1979, p.3). Salomon (1998), Kreijns (2003) and others emphasized social dialogue as an integral part of learning, rather than something seen as peripheral to the more important task-based activities. Concisely, the more effective the dialectic process, the better democratic education is served.

Athenian Democracy: The Council & e-Management

Blackwell, (2002) describes the Council of 500 represented the full-time government of Athens. It was an advisory citizen body of the Athenian democracy. The Council could issue decrees on its own, regarding certain matters, but its main function was to prepare the agenda for meetings of the Assembly (Discussion forum). The Council would meet to discuss and vote on "Preliminary decrees" and any of these that passed the Council's vote went forward for discussion and voting in the Assembly. Aristotle claims that before taking their seats on the Council, newly selected Councilors had to undergo scrutiny (dokimasia), an audit of their fitness to serve. As far as the online learning communities are concerned, the Council could be e-community managers or Networked workers. Ford (2008) among many others claims that the job of e-community managers is one of the most promising jobs for the years to come.

What would be their role? In some academic settings, online community managers are module conveners (tutors who manage module content and processes). They can act as an advisory body, preparing the agenda for quality teaching and learning. The agenda may aim at increasing demand for highly skilled labor, which can deal fast and effectively with the multidisciplinary challenges of global economy (Baumeister, 2005):

- Be responsible for the effective digital tools (fit-for-purpose tools) used to serve the learning objectives and relieve lecturers for their huge workload.
- Give participants extra incentives to sustain their interest in e-learning and maintain social ties.
- Fulfill the expectations of the knowledge economy and its permanent pressure for innovations.
- Promote bottom up approaches to raise the awareness of the individual participant to new requirements and help educational institutions to adjust organically to the new situation.
- Promote critical thinking.
- Give people choices and allow space for differences.

An e-learning community needs much effort and careful organization to built social trust in order to ensure transparency and information exchange just as the council did ages ago. To achieve efficient e-management of the online democratic community, tutor-module conveners specialized in technology-enhanced learning could help to sustain life-long learning.

Athenian Democracy: The People's Court and Democratic Norms

Of equal importance to the Assembly and Council, was the People's Court. The courts were the ultimate guarantor of democratic rule, and so the juries that ruled those courts had to be as democratic as possible.

Timekeeping was also important during the course of trials, to ensure that the plaintiff and the defendant had equal time to speak. Aristotle describes the water-clock (klepsydra) that measured the time for each side's speeches.

The people's court could be tutors within the frame of online communities. Their roles focus on learning outcomes, teaching methodologies and time-management. "The effective online educator is constantly probing for learner comfort and competence with the intervening technology, and providing safe environments for learners to increase their sense of Internet efficacy" (Anderson, 2008, p. 48). Similarly, Bransford et al. (1999) argue that effective learning is bounded by the epistemology and context of disciplinary thought. Thus, online tutors must be very well informed and acknowledge the change from an era of shortage to an era of abundant content that needs careful filtering.

Epistemology & Ontological Implications of Democratic Communities

Epistemological perspective or position

Epistemology justifies truth claims by defining criteria that make a claim true. Democratic ideals could embrace street–level epistemology or economic theory of knowledge. By definition, the Greek words democracy and economy can be broadly translated the former as management of community and the latter as management of personal resources. In other words, it would be difficult to have a socially fulfilling community without effective personal policies.

Hardin (2002) describes street–level epistemology as an "economic theory of knowledge for the ordinary person" (p. 214): why an individual comes to know various things. In Hardin's economic theory, it makes sense to say that different people get to know different things in the same context. It is ideal in lighting up the democratic NL community because the participants are their own judges. "Each of us sees different things, and what we see is determined by a complicated mix of social and contextual influences and/or presuppositions" (Moses & Knutsen, 2007, p.10).

From a different perspective, in standard philosophical epistemology, knowledge is 'justified true belief'. According to Hardin (2002), street-level epistemology is personal knowledge that can be mistaken. It can be argued though that the members of networked learning societies could make informed beliefs or educated guesses since they are supposed to be trained to the principles of logos and ethos.

The essence of the theory is not characterized by justification but by usefulness for the people involved. After all, street-level epistemology as an economic theory is based on the full benefits and costs of coming to know and use knowledge. It does not presume full knowledge, but it does presume social construction Therefore, the important aspect to know is how the person has come to have his/her beliefs. Hardin follows John Dewey's 'pragmatic rule' (2002, p.215): in order to discover the meaning of an idea, ask for its consequences.

This epistemological stance is closely associated with the concept of power of reward. People invest more time and effort when the perceived benefits are greater. The rewards may be intrinsic, extrinsic or both and they could contribute to the knowledge economy (knowledge as a product and tool) (KE), which is a significant force within the learning society." The influence of the KE across all aspects of life makes it a "powerful social, political, cultural, and educational force" (Parchoma & Dykes, 2008, p. 633).

Ontological iimplications of economic theory of knowledge

The ontological assumption is subjectivistic: the people view "reality" under different light. The word reality is in quotation marks because the writer and the readers of this project may have different ideological perspectives. Following Personal Construction Theory (PCT), - "observer bias" points toward the construction of reality – even in scientific work. Kelly suggested that the PCT was based on the philosophy of "constructive alternativism": "to assume that all of present interpretations of the universe are subject to revision or replacement" (Kelly, 1955, p. 122). There are always some alternative constructions available to choose among in dealing with the world that can contribute to knowledge economy.

Despite the fact that the process begins with a subjective view, the reliability of democracy increases as different points of views are incorporated into a socially 'agreed' way of interaction and participation. This ontological assumption does not infer subjectivity of knowledge itself. The subjects questing for truth interpret their findings according to the economic theory of knowledge (usefulness). Metaphorically speaking - as in Darwin's theory: *Evolution of Species* - people accept or refute ideas according to their social survival and personality. They choose ideas and praxis that help them to excel at the fast changing world of knowledge and the community benefits as a whole too.

In reference to this project, every community socially constructs the language and norms that ensures or not its future. Each member has to play an active role if his/her view of the world can be seen through the NL communities' lenses in the knowledge economy arena.

The Dark Side of Democratic e-Communities

Implications and complexities always exist. The purpose of this paper is not to dig deeper in this direction. Different definitions of democratic theory and even anti-democratic ideology keep the debate ongoing. Critics started from Socrates and continue to this very date. The dark side of democracy more closely related to NL communities could entail mainly the ideas of irrational decision-making,

monoculture (single, homogeneous culture without diversity) and demagogy.

To start with, economists such as Milton Friedman and Bryan Caplan (2005) have strongly criticized the efficiency of democracy. They base their criticism on the premise of the irrational voter. Meaning that voters are highly uninformed about many political and social issues, especially relating to economics, and have a strong bias about the few issues on which they are not very knowledgeable. Moreover, the dark side of democracy was equally gloomy because of prejudices against women and other cultures. The democrats of that age (5th B.C.) strongly believed that non-Greeks could not participate in democratic process due to lack of education and different culture (Papageorgiou, 1990).

The greatest fear of the Athenians was demagogy. The demagogues were orators or political leaders, who gains power and popularity by arousing the emotions, passions, and prejudices of the people. In the same line of thought, Barry (2000) refers to the work of the Italian thinkers Pareto and Mosca who argued that democracy was illusory, and served only to mask the reality of elite rule. Indeed, they argued that elite oligarchy is the unbendable law of human nature, due largely to the apathy and division of the masses (as opposed to the drive, initiative and unity of the elites), and that democratic institutions would do no more than shift the exercise of power from oppression to manipulation.

To enlighten some dark corners of democratic e-communities, a form of 'aristocratic democracy' could be considered. The terms are translated based on original Greek words as the best rules in every domain. Allocation of labor, according to skill and knowledge could establish 'aristocratic democracy'; that is why, emphasis is put on the ephebes, the preparation stage so that the participants are able to make informed decisions and learn how to negotiate meaning. Life-long learners have to play an active role in making choices for themselves and their community. As Schumpeter wrote, "without the initiative that comes from immediate responsibility, ignorance will persist on the faces of the masses of information however complete and correct" (1942, p.242). Furthermore, e- community managers could facilitate social networking be they the specialists. Last but equally important, professors could not only filter the vast information available and assist construction of new knowledge, but also support synergy of different cultures.

Cultural pluralism could illuminate e-communities that are more democratic. Cultures differ in what people develop and contribute to the world civilization (Kim, Yang, & Hwang, 2006). Intercultural conflicts are often the most difficult to resolve because the expectations of the disputants can be very different, and there is much occasion for misunderstanding. Community managers and all participants, therefore, could negotiate and share ethics, pedagogy and learning objectives to resolve expected or unexpected conflicts. Aristotle maintained that the well educated in the task and those willing to spend time and effort to pursue virtue- excellence and ethos- should rule and prevail (Papageorgiou, 1990).

Conclusions

The purpose of the proposal in this paper was not to imply exact parallel between ancient Athens and contemporary Networked learning communities, but to envision a different perspective of e-communities, especially for undergraduates or those less experienced with either social networking or democratic processes. Irrational choices, cultural conflicts, and demagogy hinder the evolution of online and real time democracies. Democratic policies may alleviate the situation, but they are not panacea. The Athenian political system, albeit only a framework for constructive engagement for all people involved, could promote education and allocation of services and labor that safeguard 'aristocratic democracy'. What needs to be investigated further is how to enhance dialogue and critical thinking by any means to help people make economic decisions related to knowledge construction. In other words, participants could learn how to analyze their needs and quest for information most valuable for their professional practice. Community managers, like the ancient council, could enhance social networking services and relieve tutors from their workload. After all, tutors act as the people's court judge, deciding and planning how to transform learning into real-life experiences. What remains to be seen is how to implement this proposal into praxis.

"Knowledge must come through action; you can have no test, which is not fanciful, save by trial".

Sophocles Greek tragic dramatist (496 BC - 406 BC)

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Pervasive Assistance Decision System to Enhance Lifelong Mobile Learners Process

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ABSTRACT

In this paper, we present a pervasive assistance system for mobile lifelong learning. It constitutes a solution for mobile professionals motivated to improve their skills through a lifelong learning process. Those have to move from place to another to accomplish their duties which make very difficult the mapping of their schedule to lifelong learning centers ones. The proposed solution, which has to respect some assumptions, is performed in four steps: learning centers localization, learning centers courses matching with mobile professional curriculum and level, learning centers courses schedules matching with mobile professional free time, and mobile professional subscription according to learning centers vacancies. These tasks are achieved thanks to dedicated collaborating agents.

KEYWORDS

Pervasive systems, Lifelong learning, Decision systems, Mobile learning.

1. INTRODUCTION

Lifelong learning includes all learning activity carried out throughout life, with the aim of enlightening knowledge, skills and capabilities within a personal, civic, social and/or employment-related viewpoint. It is often self-directed, interest and needs driven. Technological advancements have delivered pervasive systems based on mobile devices and applications which meet requirements of an important number of persons that fail to pursue their studies because of various reasons and keep their ambitions for graduation or post-graduation into their hearts. Mobile Professionals (MPs), a subset of this kind of people, can find themselves in desperate situations when they have ambitions and will to improve their skills but they can't match their work schedule with their class one. In fact, they are handicapped by their mobility and the inflexibility of Long Life Learning Centers (3LC).

A MP, also called in our context a Mobile Learner (ML), usually moves from place to place connected by a road network, to take care of his permanent and occasionally customers dispersed geographically. The ML activities may vary in time and can allow him to have a free time at any moment. The ML has to react quickly in front of happening events to catch an eventual course or exam. To perform this objective, he has to find a 3LC, a class and a place in an acceptable time, while moving in one of the roads (e.g. in his car or on his feet). This can be performed using mobile devices well equipped to query distant databases and get efficient answers while moving. Answers can be ensured through a mediator implemented thanks to wireless and mobile network architectures (Lin and Chlamtac, 2001), able to provide efficient responses for location dependent queries triggered by MLs.

The goal of this paper is to propose an approach based on pervasive assistance system for mobile learners able to localize, to match MLs free time with scheduled courses, and to make reservation of learning resources while being in motion. It supposes the following assumptions: The 3LCs are distributed in various locations, the 3LCs are grouped and managed in one centralized structure, and MLs can get their lectures in any of the 3LCs.

This paper is organized as follows: in section 2, we present the state of the art related to pervasive systems. In sections 3 and 4, we describe the proposed solution. In sections 5, we introduce an overview related to the implementation. We finish by the conclusion and future works.

2. STATE OF THE ART

Learning is populated by new concepts and technologies which might be used to enhance lifelong learning. Indeed, x-learning such as e-learning (Stockley, 2003), m-learning (Caudill, 2007) and p-learning (Syvänen et al., 2005), represent various approaches that were adopted for distance learning purposes. However the utility of x-learning don't reside only in being far from educational institution but also it lets the learning opened to any person, any age, at any educational level and social class or job (Reding, 2000).

E-learning involves the use of a computer in some way to provide training, educational or learning material (Stockley, 2003). It is a principal solution for distance learning which has emerged considerably with the development of the internet. It is based on providing practical tools via the internet and provides the potential for cooperation and interaction (Bourne and al., 1997).

M-learning is defined as learning with mobile technologies when the learner is not in predetermined location. This system is related to mobile devices that are available and used by all people, such as Personnel Digital Assistant (PDA), pocket personal computers or smart phones. It ensures the effectiveness in the professional domain and provides a way to learn wherever and whenever (Caudill, 2007; Schrum, 2002).

Pervasive computing was originally discussed as a new manner of thinking about computers (Weiser, 1991) taking into consideration the human world and giving the occasion to computers to be out of sight in the background while being an integral but invisible part of people's life. Nowadays, it is integrated, in general, with all sides of ordinary life and; in particular, in educational activities. Furthermore, the use of mobile devices for e-learning entails the use of the appropriate standards and the creation of an environment for self-motivated learning (Chang, 2002; Lin, 2004). Pervasive learning is learning enhanced, by taking into account unsolved constraints, with intelligent environment and context awareness. It is an immersive experience which mediates between the learner's mental (e.g. needs, preferences), physical (e.g. objects, other learners) and virtual (e.g. content accessible with mobile devices, artefacts) contexts (Syvänen et al., 2005). Pervasive learning environment, that has to be offered to nowadays learners, is a collection of mobile users, mobile services, mobile devices, contexts and policies (Syukur and Loke, 2006) through which apprentices can become totally absorbed in the learning practice. In that perspective, we aim to offer to MLs a pervasive learning atmosphere able to respond efficiently to their needs through a combination of the above tools with Location Based Services (LBS) concepts and tools.

Data warehouses (DW) play a central role in current Decision Support Systems (DSS) because they provide crucial business information to improve strategic decision-making processes (Inmon, 2002). DW components are usually depicted as a multi-layer architecture in which data from one layer is derived from data of the previous layer (Jarke and al., 2000). The main layers of targeted system are two. The first one is concerned with mobile devices used by ML, and the other layer is concerned with a repository where data residing on mobile devices are gathered.

The architecture of data warehouses falls into three categories (Chao, 2004; Liu and al., 2006): virtual view, materialized view, data mart approaches. We opt for the materialized view approach in which the repository of the data warehouse encloses the data schema and the physical data composed of all significant information in the data warehouse.

Various approaches for the development of DW systems have been proposed in the last few years. In (Kimball and Ross, 2002), the DW design is based on the use of the star schema and its different variations such as snowflake and fact constellation. In (Golfarelli, and al., 1998), authors propose the Dimensional-Fact Model (DFM), a particular notation for the DW conceptual design. In (Tryfona and Busborg, 1999), the building of a conceptual multidimensional model of the DW repository from the conceptual schemas of the operational data sources is proposed. In (Abelló and al., 2006), a conceptual object-oriented multidimensional model called YAM2 for designing the DW repository is presented. In (Lechtenbörger and Vossen, 2003), authors propose a well-structured approach to formalize the development of the DW repository, based on a set of multidimensional normal forms, in order to obtain the correct conceptual model of the DW repository from the operational data sources.

Concerning the development of ETL processes, a conceptual model is proposed in (Vassiliadis and al., 2002). This model is customized for the tracing of inter-attribute relationships and the respective ETL activities in the early stages of a DW project. Furthermore, in (Vassiliadis and al., 2005), the logical design of ETL scenarios is presented. This logical design is based on a metamodel particularly customized for the definition of ETL activities by following a workflow like approach, where the output of a certain activity can either be stored persistently or passed to a subsequent activity.

3. THE PERVASIVE ASSISTANCE SYSTEM

Using his mobile device, any mobile learner interacts with a mediator based on main four agents. He submits a query aiming to localize a 3LC able to provide to him a course corresponding to his level. The query includes data describing ML position determined by a global positioning system, preferences administered by ML to indicate his availability, and ML desired courses and levels associated to them. All these mobile object data is combined with 3LCs data to deliver adequate answers.

3.1 Matching mobile learner needs

Any ML, obviously, ask the following questions: Which are the nearest 3LLCs close to my current position? Is there some classes corresponding to my planned courses and to my level? Do those classes' schedules match with my free time? Is there available place in these classes?

Our approach is performed to ensure providing answers to above questions through a location based services application interface implemented on the ML mobile device and based on the following agents:

- 3LCs Locator: following an ML query, the 3LC Locater agent determines the Continuous k Nearest Neighbors (CkNNs) 3LCs thanks to Delaunay Triangulation based On road (DTr) (Khayati and Akaichi, 2008). DTr provides a valid response for continuous research of the k-Nearest Neighbors according to ML position (for examples: Seek for me the 3 closest 3LCs from my current position?).
- Classes and Level Matcher: The result of queries, obtained above by the 3LCs Locator, is a set of 3LCs localized in the road network map of the ML current region. For a ML, it is not most of the times a matter-of-fact response. In fact, more than determining the point of interests, the learner desires are to distinguish if these points enclose some classes corresponding to his planned courses and to his level. This is achieved through the Classes and Level Matcher agent which is able to match the planned courses stored in ML mobile device database with the located 3LCs databases. The matching, of course, takes into account the level reached by the ML and the course level provided by the 3LCs.
- Free Time Matcher: After the above matching, another one has to be performed. It consists on looking for if the computed courses schedule corresponds to the ML proposed free time. This is achieved through a matching performed according to free time preferences stored in ML mobile device database with the 3LCs courses schedules tables.
- Availability Matcher: The last step consists on determining if there is an available place for the ML in the selected 3LC. Availability Matcher agent looks for such availability into the 3LC database and informs the ML. If it is a positive answer the latter decides on its subscription into a class.

3.2 An alert system

Most of the services presented above are interactive. Obviously, this interactivity has to be decreased due to the professionals' mobility related to their work nature. This can be ensured by defining alerts according to ML preferences such as those specifying free times, programmed locations at programmed times, etc. The mediator may extract preferences information to compute matching performed by the above agents without interaction with users, and alert MLs in an adequate time. Those have only to visualize such messages and to decide, whether or not, they are tolerable to their eventual needs. In fact, needs may evolve with time and leads to inadequate propositions when preferences are not updated. The following figure 1 describes the alert process through a simplified algorithm.

Figure 1. Alerts Algorithm

```
Algorithm Alerts (ML preferences);
Begin
  For each ML do
    Begin
      Step 1: Determine the list of 3LCs ℓ1 according to ML position;
      Step 2: Determine the sub list of 3LCs (ℓ2 ⊆ ℓ1) according to ML desired course and level.
      Step 3: Determine the sub list of 3LCs (ℓ3 ⊆ ℓ2) according to ML availability.
      Step 4: Determine the sub list of 3LCs (ℓ4 ⊆ ℓ3) according to 3LCs vacancies.
      Step 5: If not empty ℓ4 send it to ML.
    End;
End.
```

The first step is performed thanks to 3LCs Locator agent which determines the continuous k nearest neighbors to ML current position. It uses DT_r to filter a first list ($\ell 1$) of 3LCs eventually reachable by ML. The list $\ell 1$ is provided to Classes and Level Matcher agent which has to perform the second step. It consists on the matching of the planned courses stored in ML mobile device database with the located 3LCs databases by taking into account the level reached by the ML and the course level provided by the 3LCs. The result of this second filtering is a list $\ell 2$ of 3LCs providing courses belonging to ML curriculum. The list $\ell 2$ is an entry for the third step performed by Free Time Matcher agent which has to verify if the computed courses schedule corresponds to the ML proposed free time. This is achieved through a matching performed according to free time preferences stored in ML mobile device database with the 3LCs courses schedules table, and giving as a result a list of 3LCs ($\ell 3$). This latter serves as an entry to Availability Matcher agent to perform the forth step. It consists on determining if there is an available place for the ML in $\ell 3$. Availability Matcher agent looks for such availability into the 3LC database and informs the ML with $\ell 4$. Results can be visualized by ML on a map in which we show elements of $\ell 4$.

4. ML ACTIVITIES ANALYSIS

In our proposed system, a huge of data is manipulated. Obviously, the analysis of this data may help to enhance 3LCs activities and MLs success. This is performed by gathering and historizing data about 3LCs and MLs activities related to learning process into one repository called Pervasive Data Warehouse (PDW).

A data warehouse is a subject-oriented, integrated, time-variant, and non-volatile collection of data in support of management's decision making process (Inmon, 1992). Our PDW is subject-oriented because it is organized around major subjects, such as ML, 3LC, and courses. It is integrated because it is constructed by integrating multiple heterogeneous sources, such as MLs and 3LCs databases and transaction records related to learning process. It is time-variant because data are stored to provide information from a historical perspective (e.g., the past 3-5 years). It is non-volatile because it is separated physically of data transformed from the application data found in the operational environment. Moreover, it includes spatial and temporal data about movements of mobile learners.

A data cube consents to model and viewed data in multiple dimensions. Those are the perspectives with respect to which we desire to maintain records. For example, we may create a Mobile Learner Activities (MLA) data warehouse in order to keep records of the 3LCs's assignments with respect to the dimensions time, ML, branch, and location. These dimensions allow the 3LCs centralized administration to keep track of things like monthly assignments of MLs, and the branches and locations at which the MLs were assigned. For example, a dimension table for ML may contain the attributes ML identifier and name, initial ML 3LC, etc. A multidimensional data model is typically organized around a central theme, like ML activities. This theme is represented by a fact table which includes numerical measures destined to analyze relationships between dimensions. Examples of facts for a MLA data warehouse include number of assignments, learning time spent, number of courses, etc. The fact table contains also keys to each of the related dimension tables.

Using the above information many types of analysis are conducted on both MLs and 3LCs activities leading to decisions that can be made on enhancing 3LCs infrastructures and MLs work assignments and/or success. Analysis can be also conducted on alerts by including another fact table called Alerts which shares dimensions time, location, etc. with the other two fact tables ML and 3LCs Activities. Analysts may make trigger queries about rates of MLs subscription following sent alerts. This may lead to enhance MLs administered preferences by performing adjustments on them.

5. CONCLUSION AND FUTURE WORKS

In this work, we proposed a pervasive assistance system for mobile lifelong learning. It constitutes a solution for mobile professionals motivated to improve their skills through a lifelong learning process. The solution is performed in four steps: learning centers localization, learning centers courses matching with mobile professional curriculum and level, learning centers courses schedules matching with mobile professional free time, and mobile professional subscription according to learning centers vacancies. These tasks are achieved thanks to dedicated collaborating agents exploiting data gathered from 3LCs and MLs databases. Moreover, the proposed system generates alerts, indicating classes' vacancies, according to ML preferences. All activities

described above generate data which are integrated into a data warehouse and analyzed according decision makers' needs.

Future works will focus on many aspects such as conceptual modeling of ML trajectories data, enhancement of analysis through a trajectory data warehouse equipped with new OLAP operators and data mining techniques.

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The Quality Online Learning Experience (QOLE)

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Abstract

Online learning continues to grow in popularity and scrutiny, with both points of view demonstrating noteworthy issues that warrant further investigation. This paper goes beyond basic best practices to facilitate an online class, but carefully examines the critical elements needed to create a Quality Online Learning Experience also known as the QOLE. The Quality Online Learning Experience brings together best practices of online facilitation to create a complete learning experience that capitalizes on learning opportunities creating a collaborative environment of teaching and learning that is consistent, effective, and synonymous with quality adult learners demand and expect

Introduction

The impact of the Internet to businesses over the last 10 years includes innovative ideas, phenomenon, and a plethora of new potential customers. Educational institutions reap the same rewards as businesses by using the Internet to provide many innovative ways to bring the classroom experience online. Kartha (2006) explained benefits of online education eliminate distance concerns and strict time constraints of traditional universities and replace them with convenience, flexibility, and a more effective way of learning. Educational institutions continue to search for the best methods that will provide a Quality Online Learning Experience (QOLE) for all students regardless of the students selected course of study.

The online student may significantly differ from the traditional student. Bocchi, Eastman, and Swift (2004) asserted that successful online students must have a strong motivation to succeed, discipline, the ability to manage time, and an ability to work alone. These qualities can vary from student to student based on age, work ethic, and life experiences.

As an online instructor of adult education, I decided to focus on four essential elements of providing a Quality Online Learning Experience. The elements are based on my assumptions and beliefs as an online facilitator supported by scholarly works from professionals in the industry and studies completed over the last 10 years. The elements of a QOLE are a combination of suggested practices and instructional methods that attempt to maximize the potential of online learning environments.

Assumptions

As a facilitator, I have assumptions about adult learners taking online classes. The assumptions of the online adult learner are as follows:

- Online adult learners require flexibility
- Online adult learners are self motivated
- Online adult learners are require constant feedback
- Online adult need to understand how lessons are applicable to real world situations
- Online adult learners can offer insight and additional information gained from professional experience that contradicts the textbook

In many cases, online learners seek out distance education programs because of their inability to adhere to traditional university schedules that require learners report to class certain days of the week on a fixed time schedule. Ostrow and DiMaria-Ghalili (2005) stated, "Web-based courses are highly desired by students because of the convenience of time and place" (p. 5). Adult learners may have other commitments such as day jobs and or the responsibilities of being a homemaker. While some may argue that any pursuit of higher education requires motivation, online learners require a high level of motivation in

order to achieve success in their scholarly quest for higher education. Lee and Busch (2005) explained students in online or distance education programs tend to have higher grades on homework and examinations because online learners are usually self directed and highly motivated. My method of teaching recognizes the motivation required by students and incorporates all of my assumptions into a teaching philosophy that understands the needs of the online adult learner as well as the role and responsibility of the instructor.

Teaching Philosophy

My teaching philosophy is based on my area of expertise, Business/Management and Information Technology, which is committed to providing students with an educational experience by capitalizing on learning opportunities and ongoing assessment. The teaching philosophy I incorporate into my instruction is as follows:

Teaching online allows the introduction of experience from a diversity of backgrounds and professional setting that goes beyond the foundational knowledge of textbooks. There are many questions that have the same answer, as well as many answers for the same question as I encourage all answers to have two important words "It depends" I believe in providing a warm environment that promotes openness and community building that fosters into learning opportunities.

As a facilitator, I hold the unique responsibility to help students be successful in attaining the knowledge in their respective courses that is current, relevant, and aligned with a rapidly changing global workplace. My goal is to help shape and refine the workforce of tomorrow with by establishing a foundation with the applicable principles of today. I believe facilitating adult education requires a mutual respect of the learner as well as openness to different points of view. While it is essential to engage the students by providing a stimulating learning environment, it is equally important to capitalize on every possible learning opportunity to ensure students get a valuable and quality learning experience.

To seek out and capitalize on various learning opportunities, I facilitate with an open mind to learn, encouraging students to question the text and the foundations of the origins of the knowledge they seek. I teach with the idea that most things that are possible today were impossible yesterday, with a respect of foundational knowledge to make all things queried possible for further examination. My teaching philosophy looks at the examples of greatness and industry standards, and draws a comparison between the two, challenging learners to dare to be greater than those that preceded them.

In summary, my teaching philosophy is to teach with an open mind to learn. In Business and Technology, change is frequent and comfort is not a luxury. For every principle taught two more are created and my method of instruction allows no room for complacency or bias because of personal preference. My instruction requires methodology and implementation to have a factual basis in the interest and best direction for the organization. It also clearly defines the line between cutting edge and maintaining

industry standards and the diligent pursuit of either when direction is applicable and appropriate. In the adult educational arena, there are many backgrounds and experiences that everyone can learn from and benefit. My facilitation allows all the proper experiences to be shared and built upon but in a manner that is consistent with the learning objectives in class. I believe adult education is a collaborative experience that takes place through interaction and an ability to engage. Adult learners have a need to apply what they learn and doing so makes every principle relevant. I teach Business and Technology students to remain on the search for new knowledge prepared to challenge the experts, as well as seminally build upon the knowledge of the experts taking learning to the next level. The most important principle of my facilitation is the understanding that the pursuit of education has no end with an inability to know it all and those that choose to end their quest quickly learn they know they know very little at all.

My teaching philosophy slightly contradicts the ideology behind the pedagogical model is that a facilitator decides what the students will learn. Knowles, Holton, and Swanson (2005) explained the instructor has the ability to dictate what students will learn and the methods used to bring about that learning. I believe that adult learners that bring professional experience to the classroom have the ability to alter what the students will learn. With my teaching philosophy students learn from other students through discussion, feedback, and assessment of their peers as well, which removes the instructors ability to decide what students will learn. Salmon (2003) explained that learning by interaction and doing are far superior to learning by hearing or traditional lecturing by adult learners. My intention is to use this teaching philosophy to provide students with a quality online learning experience also known by me as The QOLE.

The QOLE

What is the best way to deliver a quality online learning experience? A series of methods and practices that facilitators can use to provide a QOLE that keep students stimulated, engaged, and, learning

The QOLE is comprised of a series of methods and practices that I use to provide keep students stimulated, engaged, and, learning. I focus on four key elements that apply universally which will help online students take full advantage of a quality online learning experience. The four essential elements include the following:

Clear Communication
Learner Assessment
Timely and meaningful feedback
Commitment to Student Success

Clear Communication

Online learning requires clear and concise communication between the student and facilitator throughout the course. Instructors should make it a practice to communicate frequently with students in the classroom utilizing every available outlet to

reiterate important and miscellaneous points whenever and wherever they may apply. The course syllabus should serve as a guide of deliverables and expectations of the instructor throughout the course. According to D'Orsie and Day (2006) , "because web courses lack spontaneous discussion between teacher and class, teachers must communicate requirements in as much detail as possible, in advance, via syllabus" (p. 20). The syllabus is one of the first methods of communication that an online student experiences but clear communication extends beyond a structured document outlining expectations for the term. Ryan, Hodson-Carlton, and Ali (2005) stated, "Effective communication techniques require development of new and effective ways of motivating and engaging student" (p. 362).

Frequent use of announcements is another great tool to communicate with students and displays instructor presence in the classroom. Instructors should remind students of important deliverables, as well as make them aware of other important items this tool. When making announcements it is important to specify the current date, so students can easily see the frequent instructor involvement and activity within the course. Although professors should be mindful to reply to all student email in a timely matter, the instructor should reserve the use of initiating emails to students for matters that are not good for discussion in the classroom. Instructors can have a warm tone in email, but they should never deviate from the same professional tone used in the classroom. Feedback is also an important aspect of communication, but discussed in detail later in the document.

Clear communication is a great start to providing a QOLE, but instructors must also utilize effective community building techniques to create a warm community atmosphere that promotes social skills using the online course environment.

Learner Assessment

The assessment process is an essential element of teaching and a continued area of struggle for online teachers and learners. Gaytan (2005) stated, "Online assessment, however, requires a more ongoing, systematic approach than that of traditional instruction" (p. 27). Online learners and teachers are isolated and the despite strong instructor presence, there is an absence of external cues and signs that traditional instructors can notice with their students. A common theme in traditional and online assessment theories is the need for constant and meaningful feedback to benefit instructor and student.

While tests and assignments are viable methods of assessing student knowledge, the essence of comprehension in online learning is displayed in online discussions. Students have the opportunity to apply knowledge gained from readings and assignments and tie it into personal experience or discussion topics that rely on their knowledge to participate. Hazari (2004) explained online discussions provide instructors a constant means of assessment allow prompt feedback and correction if the instructor discovers the student is not applying the materials effectively. In an online and traditional institution, there is a need for constant assessment, but in online learning environments assessments opportunities are more frequent because of the structure of online learning classrooms.

My assessment theory lies with understanding for the student and instructor through methods that provide continual feedback. While assessment measurements such as tests and assignments provide some information, the best information comes from the ability to review and assess statements within the discussion areas because most discussions operate on the higher level of blooms. Students gain knowledge from the book or lectures. Students then demonstrate the knowledge by completing tests and assignments. That knowledge is then applied, synthesized, and evaluated through discussion. Assessment can take place on all levels, but online assessment methods are ongoing and not limited to one action or activity.

Proper Facilitation

Thread facilitation is an essential element to providing a QOLE. Threaded discussions provide students with an opportunity to display understanding of objectives through value added discussion. Christopher, Thomas, and Tallent-Runnels (2004) explained that online discussions are essential in supporting the classroom experience by allowing students to demonstrate understanding through debate providing an array of perspectives and interpretations. The instructor must serve as a facilitator and a guide capitalizing on as many learning opportunities as he or she can.

The ability to recognize learning opportunities is essential in proper facilitation. Just as students must add value added comments to build upon existing postings, instructors must also add value by keeping discussions in line with learning objectives, taking discussions as far as they can possibly go. It is difficult to predict what students are going to post on any given topic, which makes it hard for instructors to preplan for student responses. Instructors can plan for the direction of discussions creating meaningful follow up questions that extend the initial topic challenging students to expand their thinking. Instructors should have a meaningful rubric that includes a minimum initial posting date to attempt to manage an even flow of discussion throughout the week. For example, if a new week of discussion starts on Sunday, instructors can require students post an initial response by Wednesday. On Wednesday the instructor can post the follow up question challenging students to further their thinking based on the anticipated direction of the discussion and guiding those that back that appeared to stray from the learning objective.

It is important for instructors to show a strong presence in threaded discussions, but they should be mindful not to encourage one on one conversation between the instructor and student or missing additional learning opportunities presented by other students experience and insight. Instructors should always invite the entire class to join in any meaningful learning opportunity. For example, if Mike posts a value added posting which relates to the topic and the instructor can expand on it; the response should not be to Mike, but to Mike and class. This provides recognition for a good posting for Mike, but it also invites the rest of the class to contribute to this learning opportunity. Only in the event of specific questions directed toward the professor should the instructor consider addressing only the student.

If instructors properly plan and facilitate the threads in a direction consistent with the learning objectives, good follow up questions and capitalizing on potential learning opportunities will further enhance the QOLE.

Timely and Meaningful Feedback

Online students require timely and meaningful feedback on a consistent basis to ensure success and essential in providing a QOLE. Timely feedback allows the student to quickly correct problems outlined by the instructor as well as reinforces positive behaviors from the instructor as well. It is not sufficient to tell a student "good job" or simply respond with a numeric value that equates to a grade. Students need meaningful feedback when they do well and when their performance reaches sub par levels. Gaytan (2005) asserted, "Immediate, ongoing, and detail-oriented feedback assists students in better understanding the material and more effectively applying what they have learned" (p.28). Instructors should always provide at least three of the following elements with feedback:

Grade (If applicable)
Reasons for taking points
Detailed information how to improve
Reasoning for the grade (good or bad)
Reference to grading rubric

This provides the student with meaningful feedback to correct or maintain expected levels of performance in the classroom. If students get high grades, instructors should not make the mistake of assuming detailed feedback is not a requirement. Just as instructors should explain what students did wrong, it is equally important to explain what they did right.

Students should receive feedback in a sufficient manner so they can make any adjustments before the next required submittal. This does not mean if students have, three weeks before the next assignment is due that instructor should wait two weeks before returning grades. Instructors should work to return grades on assignments within three days and projects/exams with seven days.

Commitment to Student Success

For any QOLE to succeed instructors must have a firm commitment to student success. Instructors can eliminate a great deal of student frustration by being equipped with information students need and following through as if it was an issue in the classroom. For example, if students are having technical issues, instructors should be able to supply students with all the information they need to get the help required to solve their problem. Instructors should make it a point to stay in contact with a student until the issue is resolved. For students just being exposed to the online learning experience, the instructor plays a key role of how the student will perceive online learning despite

classroom success. If students do not have the ability to access the classroom because of technical issues, students can have a negative view of online learning as a whole.

Conclusion

As an online instructor, I want to provide my students with a Quality Online Learning Experience. As adult learners seek higher education in an online setting, they are looking to apply the knowledge they gain immediately at their jobs or as they change careers. My goal is provide learners with an experience that goes beyond traditional learning and encourage others to do the same. A quality learning experience allows the student to gain knowledge, but also apply it in different situations provided by the instructor that makes the need for the newly acquired knowledge evident and perceived as useful to the student. Providing a quality online educational experience continues beyond the one class. Facilitators continue to learn through the diversity and backgrounds of my students, forcing me to grow and challenge myself on a consistent basis. A QOLE forces students to seek new knowledge and continue to grow through experience and interaction, which is an asset in the workplace. Delivery of a QOLE will make a positive impact on society by teaching students how to apply knowledge other than simply retaining it for a semester.

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Optimizing the Process of Internal Quality Assurance of E-Learning in Developing Countries

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Abstract: In this paper some measures for optimizing the process of internal quality assurance of e-learning at a university in a developing country are proposed. Those measures are thought of to assure achieving high quality teaching, learning, and researching during this process. The current situation of establishing the process of internal quality assurance in developing countries is illustrated. The advantages of adopting international measures for optimizing the process of internal quality assurance are underlined. An optimized procedure for internal quality assurance for e-learning in developing countries is stated. Some recommendations for the future and a conclusion are then given.

Key-Words: E-Learning – Developing Countries – Internationally Acknowledged Measures – Optimizing Internal Quality Assurance

1 Introduction

Some measures for optimizing the process of internal quality assurance (IQA) of e-learning at a university in a developing country are proposed. Those measures are thought of to assure achieving high quality teaching, learning, and researching during this process. Although the procedure for

internal quality assurance involves several issues such as quality of curricula, and performance of faculty, administration, students, and alumni, …etc, optimizing this procedure is essential for all those aspects. Various advantages of adopting international measures for optimizing the process of internal quality assurance of e-learning together with some recommendations for the future are given

In section 2 the current situation of establishing internal quality assurance in developing countries is briefly illustrated. A comparison between the procedures of establishing internal quality assurance with and without optimization is given in section 3. Section 4 states some aspects of adopting internationally acknowledged procedures for optimizing internal quality assurance of e-learning in developing countries. A Procedure of establishing optimized internal quality assurance is proposed in section 5. Some recommendations are given in section 6. Finally a conclusion is then stated in section 7.

2 Current Situation of Establishing Internal QA in Developing Countries

The current situation of education in general and especially of e-learning in many developing countries in several aspects is quite poor. Among others the most essential deficiencies are the quality assurance process and the accreditation (see [1], [2], [3], [4]).

3 Optimized versus Non-Optimized IQA

Every university is aiming to offer high quality education, to have satisfied students, faculty, administrators, and stakeholders as well as to get accredited by internationally acknowledged independent organization such as the Council for Higher Education Accreditation (CHEA) and the International Accreditation for Universities (IUAA) (see [5], [6]). For relatively new universities, especially in a developing country, it is necessary to establish an

internal quality assurance process before applying for external quality assurance (see [1]). This internal quality assurance process should apply internationally acknowledged measures. Unfortunately many universities in the developing countries spend too much time and lose huge amount of energy in the process of internal quality assurance. Correspondingly teaching, learning, and researching suffer enormously (see [7]).

On the other hand optimizing the process of internal quality assurance will yield a mixture of an excellent time and energy usage, and establishing an effective process for internal quality assurance before applying for external quality assurance.

4 Internationally Acknowledged Measures for Optimizing IQA

Applying internationally acknowledged measures for optimized internal quality assurance is highly recommended for universities in developing countries (see [8], [9], [10]).

Two ways to achieve that are as follows:

4.1 Professional Offices for Quality Assurance

4.1.1 Advantages

The advantages of hiring a professional office for quality assurance of e-learning in developing countries are to:

a) Release faculty and administrators.
b) Teach students in the same usual way.
c) Have a perfect professional procedure and results.
d) Get more flexibility in tailoring the procedure as needed.
e) Save time and energy

4.1.2 Disadvantages

The advantages of hiring a professional office for quality assurance of e-learning in developing countries are :

a) High costs.
b) Loss of an interesting experience for faculty and administrators.

c) Intensive follow up of the outcomes of the office.

4.2 University Internal Procedure for IQA

Several universities in developing countries prefer not to hire professional offices but to do the procedure by their faculty and administrators.

4.2.1 Advantages

a) Involvement of faculty and administrators in establishing the procedure in a team work.
b) Gaining knowledge in this field.
c) Optimizing the daily duties and the establishment of the procedure for IQA.
d) Saving costs.

4.2.2 Disadvantages

a) Less involvement in daily duties.
b) Necessity of training faculty and staff.
c) Producing beginner mistakes.
d) Taking irrational decisions.
e) Causing negative effect on students performance.

5 A Procedure for Establishing Optimized IQA in Developing Countries

5.1 Procedure for a Professional Offices for Quality Assurance

In case a specific university in a developing country has good financial situation and decides to hire a professional office for QA, the administration should form a committee to :

a) Choose a reliable well established office for quality assurance which apply international standards.
b) Follow up very closely with hat office.
c) Report all results of important stages to the university administration.
d) Propose any needed corrections and/or modifications of the university administration.

5.2 Procedure for a University Internal Process for IQA

In case of establishing a university internal process for internal quality assurance by faculty and administration, this university should:

a) Start the process of establishing the process for internal quality assurance at least one year before applying for external quality assurance.
b) Form a standing committee for quality assurance from senior administrators.
c) Limit the number of indicators to be examined.
d) Form subcommittees of limited number of faculty and administrators (2-3) for each indicator.
e) Exchange results mutually between subcommittees.
f) Limit the number and duration of all meetings.
g) Refer to internationally existing similar procedures.
h) Keep deadlines firm.
i) Use technologies instead of paper work.
j) Rationalize surveys with stakeholders.

5.2.1 Advantages

a) Self assessment of the university e-learning program.
b) Involvement of administrators, faculty, students, and alumni.
c) Assuring more satisfied students, faculty, and administrators.
d) Earning accreditation for universities by their governments and internationally acknowledged organizations.

5.2.2 Disadvantages

a) Time consumption for administrators and faculty.
b) Possible less teaching, learning, and research performance.

6 Recommendations

To perform optimized internal quality assurance of e-learning in developing countries successfully we recommend to:

a) Hire a professional office, in case the university has good financial situation.

If this is not the case, then:

b) Start the process at least one year before applying for external quality assurance.
c) Use international references.
d) Use technological tools instead of paper work.
e) Limit the number and duration of all meetings.
f) Involving as few number as possible of faculty and administrators.
g) Educate and train the persons who are going to establish the process of apply internal quality assurance system for a comprehensive assessment.
h) Establish intensive communications in the field of internal quality assurance of e-learning between developed and developing countries.

7 Conclusion

Establishing an optimized process for internal quality assurance at universities in developing countries is highly recommended. The process should be implemented and further optimized well in advance before obtaining external quality assurance.

It is highly advised to make use of international references to establish a framework of options and goals to be attained.

Hiring a professional office poses many advantages, primarily time efficiency, but may not be an option for some universities due to its cost intensity. In such case seeking technological and financial support from the governments and institutions of developing and developed countries should be pursued.

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Model for the implementation of courses in B-Learning modality

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Abstract *- The Autonoma University of Manizales and the University of Rosario, within the framework of the project: "Implementation of a Learning Management System (LMS) on a Cluster infrastructure using RENATA", passed at the Colciencias call 487-2009 and funded by the Ministry of National Education (MNE), suggest the need to validate the computing Cluster infrastructure developed for the project through the design and implementation of a course in the area of health. The course is characterized by a high information flow demand and a significant number of students. Hence, it's developed under a B-Learning model using the high speed academic network RENATA as a communication channel. An educational incorporation model of Technology Information and Communication for education was created in order to implement the course in the developed Cluster infrastructure. This article explains the model from a philosophical perspective and the necessary procedures for the implementation in an educational institution.*

Keywords - Model, Information and Communication Technologies, General Systems Theory, Heuristic, Holism

1 Introduction

Within the framework of the project: "Implementation of a Learning Management System (LMS) on a cluster infrastructure using RENATA[a]" raised the need to validate[b] the computing Cluster infrastructure developed for the project through the design and implementation of a course in the area of health, specifically on the issue of human motion analysis. The course identification was done as a result of needs analysis conducted at the Universities that lead the project: Autonoma University of Manizales, and University of Rosario. After this analysis, and since they have and demand great information flows, the subjects Biomechanics and Human Motion Analysis, that belong to the Health Programs of each university, were chosen to be taught through the high-speed network RENATA.

The considerable number of students, who are generally located in places distant from the two universities (practice sites in institutions and hospitals in the cities and some municipalities), and the type of resources motivated the development of a combined educational process: classroom and distance learning (Blended Learning). Classroom teaching is required for some thematic units of the courses regarding some parts of the body since analysis and assessment in situ are mandatory both for teachers and students. However, other thematic units can be guided at distance with the pre-requisite of counting on good resources, an excellent course design, and a sound interactivity that replace the presence of the teacher and the substitute the moving of students to each of the campuses. This occurs since teaching and learning can take place from each student's workplace or from the campus where they are located.

The technological[c] infrastructure made up by two nodes (the Cluster and the computing Grid) was implemented by the research group Software Engineering from the Autonoma University of Manizales, which originated the project. The infrastructure is based on OSG (Open Scientific Grid), adopted by Grid Colombia with the objective of uniting the two nodes that make up the Grid computing infrastructure.

The cluster consists of 9 servers: of them located in the Autonoma University of Manizales and four in the University of Rosario in Bogotá. This infrastructure is intended to make information processing parallel and distributed so as to reduce the times and speeds in the information processing and transmission used in this infrastructure.

The issue of human motion analysis needs some resources represented in concept maps, diagrams, drawings, written text, links to open access pages, videos, simulations, teleclasses, teleconferences, resources that demand high computational performance and a fine bandwidth[d] for its teaching and learning. Thus, we implemented this high-performance infrastructure for the development of B - learning modality teaching to ensure collaborative and inter-

[a] *Project number IF005-09. Development by Universidad Autónoma de Manizales and Universidad del Rosario. Call for paper COLCIENCIAS 487-2009. Sponsorship Ministerio de Educación Nacional Colombiano.*

[b] *The validation will be done through the course implementation in B-learning mode, during the first 6 months of 2011.*

[d] *The bandwidth is important because the platform must ensure high performance.*

group efficiency because the project requires the use of a safe and efficient information highway, web 2 for the whole emission process, in this case the High Speed Academic Network: RENATA that ensures interaction among teachers, students and resources.

In order to ensure the quality of courses design, we worked on it with the teachers members of our research line "Computers in Education of the UAM[e]", and with the advice and supervision of the expert and teacher of the subject of Biomechanics of the UAM regarding contents and resources. The program, the units and the respective teaching resources will be available to users in the content management platform (LMS), known as MaatG[f], located on the implemented computing cluster. We choose this platform because it facilitates the fast visualization of the information contained in the resources. Additionally, this collaboratively distributed platform links the process of several servers in order to improve the performance on the resources emission and allows the nodes implanted for the project to have a backup of the data stored in them.

This article shows the theoretical development about the model topic with the purpose of describing its components. It also describes the methodological dimension that allows the staging of the course content in the selected LMS. This lets us know that the introduction of a course at B-learning method is a rigorous and academic process, rather than a merely operational one.

2 Development

This research under development is interrelated to the projects: strategic plans of Information Communication Technology Incorporation (PLANESTIC) in IES[g] and curricular[h] research UAM, which have been developed in the context of fulfilling the institutional strategic planning objectives: 2010 to 2015.

2.1 Model definition

The form of combined or blended learning (B-Learning) requires the identification and adoption of an educational model to guide the teaching process - learning supported by ICT.

According to Díaz, José Luis[i] (2005), a model can be understood as "a prototype that can be imitated." That "something" is a specimen that is identified and designated because it has all the elements that make up the essence of the entity as a whole.

The author (Diaz, 2005:13) describes the way in which the original sense of the term is abandoned at the beginning of the nineteenth century, and how its use in science leads to an opposite meaning. The term model becomes the "copy of something," "the carbon copy of something "," what has been copied." The most common example of this sense is in a sketch or drawing preparation that represents a reality with external[j] existence. The drawing is the representation of a portion of the world or a part of it, always bearing in mind that between the representation and the world there is a boundary that marks the ontological distinction between them.

This latter sense in science serves a heuristic function, such as mathematical, logical, linguistic, physical, chemical, architectural, or engineering models that, by representing reality, allow their understanding. This representation makes its further intervention possible, without the risk of manipulating it at first. The ontological distinction is retained as a safeguard that ensures effective further intervention, based on the results of the model intervention as a "representation of ...", or a "carbon copy of ..."

This second sense, the model as a "carbon copy of ..." emerges from the first ("prototype to imitate, specimen) and has a functional purpose to adapt to the world of ICT-supported education, the characteristics of a general model in this case the " Curricular Model UAM. "

The components of a model called "elements" and "functions" in Diaz (2005) are defined after a long analysis and debates process by the community involved. In this way, and following the model, the teaching - learning processes that allow ICT support are evaluated and renewed.

The ICT incorporation model in the UAM is part of an institutional curricular model that is under permanent construction. It also allows constant updating both in content and in teaching strategies for the various programs offered at the institution.

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[e] *The Project is supported by Cognition and education Investment group of Universidad Autonoma de Manizales.*

[f] *Maat Gnowledge. http://www.g-knowledge.com/ptr/vista/vptr002/index.html*

[g] *Planestic is a Project development by Ministerio de Educacion Nacional Colombiano.*

[h] *Actually the model is led by "Unidad de Enseñanza aprendisaje". The group is conformed for a interdisciplinary person whose function is to update UAM's institutional curriculum .*

[i] *Díaz, Jose Luis 2005. Modelo científico. conceptos y Usos. En: El modelo y la ciencia en la cultura. Díaz Jose Luis ET al. Cuadernos del seminario de problemas científicos y filosóficos de la UNAM. pag 11-28.*

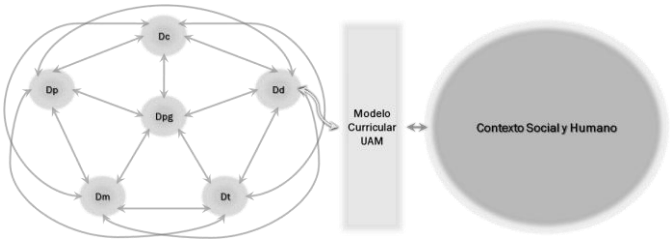
[j] *The author compares this meaning with an artistic design: A Man or woman who is drawing by an artist or student group in their class exercises. The picture becomes a copy of subject that serves that a model.*

In the presentation for COLCIENCIAS (call 487 of 2009), the project: Implementation of a Learning Management System (LMS) on a Cluster infrastructure using RENATA the IEO model, studied in the course: "virtual tutor training", was initially adopted. However, taking into account that models are transformed according to the moment they are constructed, to the nature of disciplines (Diaz 2005), and once the ICT incorporation model in the UAM was secured, the courses aim of this project: Motion Analysis and Biomechanics, build the model presented here, so that integrated most of the elements identified in the OEI[k] model. And because it was a "case" or "a copy", which can evaluate the functionality of the model guidelines incorporating ICT-UAM. It adopts an institutional perspective as well as to incorporate information and communication technology in higher education institutions.

The initial assessment of the intervention object reality preceded the application of the model. This reality is made up of the educational context of the University of Rosario and Autonoma University of Manizales, specifically in the academic programs related to the topic of human motion analysis. The evaluation was based on an educational needs analysis, which reported the perceived need[l] to design a course on the general topic of human motion analysis, in which there could be interactive, synchronous and asynchronously participation. Besides, it was also possible to determine the importance and role of multimedia resources in learning in order to incorporate them to the design of the themes that support distance learning.

The model applied to the teaching-learning process in B-learning mode requires, according to Cirigliano, G, (2010), as any model of distance education, a rigorous[m] instructional design on behalf of the teacher and a participation commitment and retention on behalf of the students. Rigor in design and material content is necessary because there is not, in this case, "a direct contact between teachers and their students [n]." The contact is achieved thanks to the fact that the complementary material somehow supplies the distance with the teacher and the classmates. The technological tools and the contents representation are the mediators among knowledge, students and teacher.

The Project: Implementation of a Learning Management System (LMS) on a Cluster infrastructure using RENATA has video conferencing and the presentation of human motion videos as one of its main mediation resources. In them, the teacher from anywhere in Colombia and the world will use the high-speed Information network RENATA to show her students the various analyses and intellectual elaborations on the theme. In this way, the teacher closeness to the student is achieved despite geographical distance. It is also possible to carry out synchronous interlocutions through channels arranged in the LMS (Maat G) for communication.



Graph 1: Model Components

Graph No. 1 shows the components of the incorporation model ICT-UAM to be used in the project implementation.

3 Dimensions of the model

The components of the model to incorporate ICT are themselves complex in nature since they are formed from the analysis of different contexts or elements, which is why they have been given the name of dimensions. In the case of the Autonoma University of Manizales six (6) Dimensions were considered: Disciplinary dimension (Dd), Communication dimension (Cd), Political dimension (Pd), Pedagogical dimension (Pgd), Technological dimension (Td) and Methodological dimension (Md).

3.1 Disciplinary dimension (Dd):

It is made up by the following elements: The educational project of each program (PEP) in which all the topics that are intended to be present in the B-learning mode are embedded. It is important to note that while the PEP is defined in the curricular model of the institution, the components of this element in this dimension must be clear because through the PEP the transaction of knowledge between the institutional model and the ICT integration model is possible. Another component of this dimension is the analysis of the epistemological nature of the disciplines and their interrelations. The disciplines theoretically underpin curriculum programs that will be the B-learning mode object and support the profession, guide the course content, provide different representations of knowledge that are relevant to education, provide scientific models and success stories that illustrate the theories used for the teaching of the profession.

[k] *Organización de los estado iberoamericvanos para la educación (Iberoamerican Organitation Stated for the Education)* http://www.educoas.org/portal/ineam/cursos_2007/FTVES-E104_07.aspx?culture=es&navid=241.

[l] *Reference, Galvis (1992)*

[m] *Para Cirigliano, Gustavo.* http://www.uned.ac.cr/sep/aulavirtual/facilitadores/elaboracurso/mod1/concepto.pdf [Fecha de consulta Julio- 2010]

[n] Para Cirigliano, Gustavo. http://www.uned.ac.cr/sep/aulavirtual/facilitadores/elaboracurso/mod1/concepto.pdf [Fecha de consulta Julio- 2010]

3.2 Communication dimension (Cd):

Formed by the different ways in which the disciplinary contents can be presented, i.e. the use of multiple languages that can communicate the discipline to achieve an optimal teaching and learning process. The nature of the discipline (Dimension I of the Model) must be analyzed to develop the design of the contents communication, and the analysis of communication channels of the LMS platform chosen for their administration. Hence, an interactive teaching and learning process can be achieved.

3.3 Political Dimension (Pd):

Elements that make up this dimension: Institutional policies on education, social context analysis in which the profession develops, the guidelines of the National Policy on ICT integration in education, the regulation on royalties and regulations regarding the use of media for teaching in B-learning mode.

3.4 Pedagogical dimension (PgD):

Elements that make up the analysis: The rationale about subject formation in a B-learning mode environment, the teaching-learning theory: social constructivism and collaborative learning, teaching strategies[o] (holders of the subjects and their instructors or teaching assistants, tutors for the B-learning mode), the students' prior knowledge regarding the subject matter of the courses and in relation to the use of multimedia resources. The role of virtual tutoring and assessment processes according to the scientific contents of the course and / or subject to be implemented (Item I of the Model: Disciplinary dimension). This analysis is done by all the curriculum committee members of each college's academic programs.

3.5 Technological Dimension (Td):

Elements that make up this dimension: Analysis of the computing platform (computing cluster and grid) Analysis of the platform functionality (LMS and LCMS if applicable), technological communication channels arranged in the institution (high-speed networks: Web 2, case of Colombia: RENATA), technological resources prepared for teaching and learning (simulation programs, software, virtual laboratories, physical laboratories, computer rooms, academic databases).

3.6 Methodological dimension (Md):

This can be seen as a dimension that is self-contained in the model[p]. The constituent elements are: general heuristics and particular heuristics, which are described later in this article, in the section on the role of this dimension.

3.7 Model Functions

A function[q] in this context can be defined as the "relational role" played by an item or in this case a "dimension" within a model. In order to understand the functions of the ICT-UAM incorporation model, the role of its dimensions relations from the General Systems Theory (GST) perspective is analyzed.

Guidelines Offered by the General Systems Theory (GST) to the model of ICT-UAM incorporation

GST believes that "a system can be identified by its ontology, its origin, or its relationship degree or environmental isolation." (Arnold and Osorio[r], 1998). The real systems, ideals and models can be found within the ontological identification. By raising this theory, the models as systems allow the application of the GST perspective to the ICT-UAM incorporation model.

According to Arnold and Osorio[s] (1998) The GST can be used in two ways that complement each other. A first sense can come close to reality in a scientific and systematic way, understanding it from a "holistic and inclusive" perspective. The second meaning is understood as the "heuristics", useful in the guidance of an interdisciplinary work. Based on these two perspectives, the concept system is defined in this theory as:

"A set of elements that are closely related to each other, which maintain the system directly [sic] or indirectly linked in a more or less stable way and whose overall performance pursues a goal. This definition should allow communication with the environment (open systems), where the system continuity is it ensured through the communication flow with the external environment.[t]"

According to the characteristics of the educational reality represented in the ICT-UAM incorporation model, this definition is adopted in order to understand the model functionality as a system, which is part of a larger system: Curriculum Model UAM.

The six (6) dimensions of the model have the functionality to interact with each other for a purpose, defined by those who

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[o] *The topic assesses the teacher and students skill in field of learning environments and LMS platforms.*

[p] *In this paragraph model means "representation of". In this sense, model must be applied like a method.*

[q] *RAE. Diccionario de la Real Academia de la Lengua española. Edition 22. (2001)* http://buscon.rae.es/draeI/SrvltConsulta?TIPO_BUS=3&LEMA=cultura. [15 September, 2010].

[r] *Bertalanffy, Von Ludwing. (1976). General System Theory. Reference by Arnod Marcelo, Osorio Francisco. http://redalyc.uaemex.mx/pdf/101/10100306.pdf. [Fecha de consulta, septiembre 21 de 2010].*

[s] *IBID*

[t] *IBID*

devised the model, forming a larger group as a whole. In this case the ICT integration model, is made up of: The dimensions, the elements of each dimension, the internal relational dynamics among the dimensions and the external dynamics, i.e. the relationship of the model with the environment. This all makes sense only in their intrinsic and extrinsic relations.

The ICT-UAM incorporation model is an open system that allows its "autopoiesis." The possibility of modifying, creating, or replacing its dimensions is considered according to the demands of the external environment, which are the input that triggers the ICT-UAM incorporation and that emerge from the environment, in this case the curricular model UAM and the social context of citizens training.

Strategy to Define the Functions:

As a strategy to define the function of each dimension in the model, the following guiding question was raised: What is the relational role of the disciplinary dimension (Dd) with each of the other dimensions of the model? This questioning moved to each of the dimensions: political (Pd), pedagogical dimension (Pgd), communication dimension (Cd), technological dimension (Td), methodological dimension (Md).

It is important to highlight how once the model is implemented, or the dynamics of the model takes place, the roles played by the dimensions altering the dimensions themselves, and make them an even greater dimension. This happens because the dimensions are not only made up by their elements, but also by their functions; thus, the GST involves the system or the model as a whole greater than the sum of its parts.

Role of the Dimensions: (Relational Role)

i. Role of the disciplinary function dimension (Dd): it consists of defining the epistemological nature of the disciplines and their influence on the practice of the professions from its analysis.
ii. Role of the political dimension (Pd): it consists of knowing the environmental variations in relation to the educational practice, guidance and legislation.
iii. Role of the pedagogical dimension (Pgd): it determines the type of subject and professional intended to be educated with the objective of living in society and fulfilling the ideals that it demands in a context that favors human aspects. (This dimension has a greater degree of relationship towards other dimensions of the model, which is the rationale and the essence of the model.)
iv. Role of the communication dimension (Cd): It consists of determining the role of communication in teaching and learning. Its analysis allows the choice of communication channels, representations, and multiple languages. The other dimensions are taken into account, especially the disciplinary dimension (according to the nature of the disciplines, appropriate communication modes for learning are determined), the political guidelines of the context, the pedagogical and the technological dimensions as a means of effective communication.
v. Role of the technological dimension (Dt): Its function is to be a mediator, in the sense that it supports the construction of knowledge and leads to its representation and circulation through various communication channels and communication strategies. The definition of technological devices and the identification of the tools and resources that are available for teaching and learning should take into account the other dimensions, especially the pedagogical dimension because the use of technology in education is based on the pedagogical theories that underpin the learning and teaching process. In this regard, the potential of LMS and LCMS platforms arranged for the deployment of educational resources and also the social constructivism theory in which these learning management and learning content administration platforms have been based are considered. 863624
vi. The methodological dimension: As stated above, this dimension is made up of general heuristics and particular heuristics. Heuristics is intended to guide each institution regarding the choice of dimensions and functions, according to the environmental needs identified by the group, resulting in the General Matrix. It thus gives rise to a flexible and scalable model, for this reason the model as a whole is understood as an open system.

The particular heuristics presented each of the procedures, tools and resources that are necessary to implement the model in specific situations. For example, it is used in the implementation of an academic program, of a course, or in the incorporation of ICT into specific teaching and learning processes according to the educational mode (remote or in person, online or off line). It determines the modes, strategies, time, people, resources to be used to stage the teaching and learning in the institution.

From the point of view of particular heuristic methodological dimension, the implementation of the project: "Implementation of a Learning Management System (LMS) on a cluster using RENATA infrastructure" has the following phases: Analysis, Design, Implementation, Broadcasting, Testing (Pilot and Field).

3.8 PARTICULAR HEURISTIC FOR THE IMPLEMENTATION OF THE SYSTEM:

3.8.1 Analysis Phase:

This phase requires the greatest care because it derives and amends the others.

The implementation target courses are chosen from the programs that are to be introduced in the B-learning mode, in this case we refer to the subjects: human motion analysis and biomechanics, from the Autonoma University of Manizales and University of Rosario. These courses provide common topics: Physical Therapy, Biomechanics and Dentistry in which an analysis of educational needs was carried out, led by the members of the Computer Education group, the UAM biomechanics course teacher and the University of Rosario researcher.

Once the academic programs and the courses to be implemented in this B-learning mode are selected, the contents (and their respective hours) of the classroom instruction and the distance learning supported by TIC will be determined.

Once the contents are determined, the LMS or LCMS[u] platform is analyzed, in case there is freedom in choosing it in order to clarify the technical communication advantages and disadvantages, the type of resources that can be implanted in it and the communication channels that can be used in interaction: students, teachers, contents. The purposes of teaching and learning and the foundation supported on social constructivism are the bases of this analysis.

After identifying the platform characteristics, a general description is written in order to relate them to the possibilities offered by the platform, from the educational perspective for the selected courses.

Subsequently, an analysis of the arrival profile of students[v] who will take the courses in this mode is carried out.

The same analysis applies to tenured faculty and tutors who will perform in the virtual support to the student.

An analysis and selection of teaching resources that support the no "presence" of the teacher and students is carried out.

3.8.2 Design Phase:

It starts with the analysis results. Having reviewed all aspects of Phase I, there is a possibility of adding a new topic that, for some reason, had not been taken into account in the analysis; in case of identifying it, we return to the analysis, to add it and make an analysis.

Once completed the analysis phase, in the project aim of this paper, we report as a result that given the characteristics of the subjects: Biomechanics and human motion analysis, an open design that includes different subjects which may have themes common to the various programs (Physiotherapy, Biomedical Engineering, and Dentistry) is proposed. It is to say, the virtual classroom inserted in the platform will host a series of chapters or modules to be used differently by the teachers of the courses, according to their own needs and those of the students.

Once the design has been reviewed and approved by the team of professionals, the features that the platform should have are refined; we compare the design results with the platform possibilities. For our project, we compare the analysis of resources needed for teaching. For example, the issue of abduction, with the technical possibilities of the MaatG platform, taking into account: the type of files, size, types of resources: pictures , animations, simulations, lectures, a medical case monitoring, or a physical examination monitoring, among others.

3.8.3 Implementation Phase:

Each of the modules or designed units starts to be implemented in the selected platform. It is necessary to bear in mind that, as in previous phases, this one considers the chosen pedagogical theory, in this case social constructivism, besides the dimensions of the ICTs incorporation model to education described above.

Two kinds of activities are developed in the implementation: one is the development of material needed but inexistent, and the other is the setting of all the contents, materials, activities and resources defined in the design in the chosen platform.

The project "Implementation of a Learning Management System (LMS) on a cluster using RENATA infrastructure" is in the implementation phase and is expected to be issued in the first half of 2011.

3.8.4 Issue phase of the course:

This phase is one of the most anticipated in the research process because it embodies the ideas raised at the beginning of the project in relation to the implementation of a course that meets expectations of increased coverage, better quality, clarity, sharpness, efficiency, and interactivity.

This phase allows the merging of the two project subsystems mentioned in the introduction to this article: The technological subsystem, i.e. the two nodes: Cluster and Grid with the educational subsystem: heuristic[w] to implement the courses in the MaatG platform, using the high-speed network RENATA.

The issue phase is planned with the same rigor as the previous ones. It is recommended upon completion of phases I to III.

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[u] *This Project use Maat-G for their functionality in GRID.*

[v] *Show didactic science elements, specifically analysis of previous ideas and analysis of students from the emotional affective and technological skills.* http://www.colombiaaprende.edu.co/html/mediateca/1607/articles-106619_archivo.pdf

[w] *The heuristic required the holistic vision proposed in the model incorporation TIC Structure.*

It is necessary to plan activity zero, i.e. the one to "break the ice" among the student, the teacher and the platform in order to help the student to interact with the technological resources, the contents, the teacher, the tutors and the other classmates through communication channels of the LMS tool.

It is expected that in this phase our project allows access to at least 60 college students of the leading universities: University of Rosario and Autonoma University of Manizales, assigned to the subjects: human motion analysis and biomechanics.

3.8.5 Testing Phase[x]:

Pilot Test and Field Test:

These tests can identify the advantages and disadvantages of the process carried out throughout all the course implementation development, opportunities to use the LMS platform, the technological infrastructure (Nodes: Cluster and Grid), and the Web 2 - Colombia (RENATA) in order to perform the refinement and modifications of all the implementation phases of the model teaching – learning system.

4 Results:

This ongoing research has achieved the implementation the computer infrastructure: cluster node and computing grid node, implemented at the University of Rosario and Autonoma University of Manizales. Besides the MaatG platform analysis.

As a result, the structuring and specification of an ICT integration model have been obtained in the Education part.

5 Conclusions

Based on the 10-month project work experience, we can say that the implementation of a teaching-learning system in a B-learning mode requires both processes arising from the computational perspective, provided by the practice of the profession: Systems engineering, and from the theoretical and philosophical foundation to trigger an ICT integration model, which supports the implementation and use of LMS platforms.

In this worldview the use of technology in education brings great benefits because from the beginning of a collaborative project among different profession, in order to contribute to the quality and accessibility of education in Colombia

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Annotation:

Each of the formats is taken from the guidelines designed by Prado Maria del Pilar, adaptation of the document: "The teaching job." González Capetillo Olga and Flores Fahara Manuel. Ed. Trillas: Mexico, 1999, Digital Link Unit, UAM.

[x] *Galvis Panqueva Alvaro (1992).Ingeniería de Software Educativo. Bogotá: Giro Editores, S.A. Biblioclase, Universidad de los Andes.*

Virtual Learning Environment in Primary Schools – Seamless Integration of Pedagogical Learning Values through an Integrated Virtual Learning Model

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Abstract— *Virtual Learning Environments (VLEs) are the new-age educational management technologies that support interactions between learners and teachers. Virtual learning environments focus on employing various resources like online systems and virtual tools to enhance the e-learning experience. The e-learning outcome realized by deploying such a system depends on how well school authorities and teachers use the system in the classroom. The objective of this paper is to describe how Gagne's Conditions of Learning Theory can help instructors transform the e-learning process, from a traditional classroom setting to a dynamic and interactive medium. This paper also demonstrates how the practical model of Gagne's Conditions of Learning Theory and its related strategies could be applied to achieve specific and effective e-learning objectives. Based on these objectives, this paper develops a prototype model for e-learning in primary schools. Lastly, the paper discusses related pedagogical strategies based on the objectives of the prototype and available literature.*

Keywords: Electronic Learning, Primary Schools, Prototype, Virtual Learning Environment.

1 Introduction

Research reports on the active use of Virtual Learning Environment (VLE) in primary schools are scanty. Activity based VLE's (Gonzalez et al, 2003) and project based VLEs (Chu et al, 2011) are the most commonly used VLEs in most of the schools who do use VLEs, but even these are rare. This is unfortunate as VLEs offer a wide range of applications for teaching at all levels of the curriculum, even in young childhood education.

Barriers to successful implementation of VLEs in primary schools are numerous and they depend on a number of factors. Many schools cite direct costs as the main impediment to setting a robust and result-oriented VLE. Another problem cited by schools relates to the preparation of course materials by the school teaching staff. The other factor that inhibits schools from using VLEs is the low-level of enthusiasm displayed by the teachers and other staff. Furthermore, the school authorities and management may not properly introduce the basic concept of VLEs and their benefits to their teaching staff. The amount of additional work involved in implementing VLE could also be a barrier. As VLE is an open medium, where mistakes or errors committed by teachers and other related staff are visible to others; this may act as another barrier to the successful implementation of the program.

VLE is completely technology-enabled. Thus, teachers who handle these programs may not have enough time to see what it is capable of doing. Some teachers need more time to get accustomed to the technology, extra time which may not be possible given the rigorous demands of the school teaching schedule. One of the significant barriers to using VLEs in primary schools is the perceived inability of young minds to master the basics of the-learning program. Sophisticated interfaces, tools and techniques used in modern VLEs may be too much for these learners. This necessitates designing and creating very simple VLE tools and techniques that every child can easily use and learn. Teacher-level barrier to deployment of VLEs is also very significant, as they may find the process of applying learning theories to online instructional design very difficult.

Despite the slow adoption of VLE learning in primary schools, web based and e-learning tools for teaching and learning are becoming an increasingly popular mode of disseminating course curriculum to a large number of learners. Such technological tools can be an excellent way of engaging students and providing learning that is adaptable to various learning styles as well as various curriculum.

Almost all e-learning tools will have e-learning objects in the form of digital or multimedia units (animation, graphics, sound and images). Learning objects in combination with pedagogically empowered instructional architecture could form a powerful learning medium for easy learning process. To ensure efficient learning process and desirable e-learning outcome, instructors may need to ensure a robust pedagogical foundation along with usage of an appropriate e-learning technology (Oblinger and Oblinger, 2005).

To facilitate better learning outcomes, instructors will need to combine appropriate e-learning objects with a practical instructional design theory. Practical learning theories are needed to empower a practical e-learning design. In the context of this paper, an appropriate instructional design theory will help design a desirable and practical e-learning platform. Aligning Gagne's Conditions of Learning Theory with existing e-learning technologies will help promote owner-centered learning and align a strong pedagogical

framework with existing e-learning standards (Orril, 2000).

Gagne's Conditions of Learning Theory describes the basic analysis of learning objectives and their relation to numerous appropriate instructional designs (Gagne, 1985). These e-learning objectives are not only simple and practical, but they could also be applied to achieve numerous e-learning objectives. Before achieving these objectives, in this paper we design and develop a prototype model based on the Gagne's Conditions of Learning Theory. We believe that this model has the capability to overcome several weaknesses and deficiencies that are associated with several e-learning platforms.

2 Using effective VLEs to integrate seamless pedagogical values

With the available e-learning tools in our hand and their perceived deficiencies on record, we will attempt to design a new primary school VLE prototype e-learning model that takes into account *"instructor-learner, learner-learner or learner-content*" side of the VLE implementation. We will also try to assess and evaluate how we can create effective VLEs to integrate seamless pedagogical values into the e-learning system. In brief, this model shows a simple, clear way to apply Gagne's concepts to create rich, effective VLE environment.

Effectively speaking, the launching of VLEs in primary and secondary schools could be extremely effective and result-oriented. BECTA (2004), in its monumental report in the effectiveness of VLEs suggests that: "To set up an efficient VLE to implement school curriculum, the school management may need to think of its effectiveness that in turn is influenced by three important factors: *knowledge management, pupils' approach to learning, and academic performance* (p32)."

In other words, any VLEs used in a primary school should satisfy the above-mentioned pedagogical parameters in a way that eventually leads to success of the e-learning initiative. An effective VLE design should help create seamless knowledge and skill management, and further enhancement of academic standard. Before designing a prototype model, policymakers may need to look at various factors that influence the e-learning outcome. A conclusion to design and create a VLE working model should consider the following questions:

1) Are the current e-learning, VLE and learning management systems (LMS) effective in a primary school setting?
2) If they are useful in a primary school setting, what will be the perceived learning outcome? Do instructors and learners find diverse features of such systems easy and flexible to use? Alternatively, do they find such systems confusing and challenging with their complex interfaces and links?
3) If the e-learning tools are indeed complex to use, could we create an alternative VLE model that considers various issues that relate to learners' mental development stages, cognitive development and user preferences?
4) Will the new VLE model be able to integrate various aspects of e-learning like flexibility, ease of use and effective interfaces?
5) In what manner will the new VLE model address the concerns of instructors.

3 Pedagogical framework to the proposed model

One of the most practical and well-known teaching/learning and assessment theories is Gagne's Nine Instructional Events, also known as Gagne's Conditions of Learning Theory (Gagne, 1985). Widely recognized as one of the most practical event-based instructional strategies supported by the principles of cognition development, Gagne's leaning theory provides educators and policy makers all the required parameters to design a practical VLE model in the context of a primary school.

Gagne (1985) suggests that learning tasks for intellectual skills can be indexed in a hierarchy mode of representation according to the complexity of individual events. The fundamental relevance of this structure is to maneuver instructors and policymakers to detect necessary parameters that are needed to facilitate proper learning at each level of hierarchy or events (Kearsley 1994).

Gagne's theory of learning has several ramifications for instructional technology. Any instructional design that relates to Gagne's theory should have the following design parameters in mind – need analysis, selection of proper media and designing of instructional events for the model. It is critical to see that students acquire the skills, one-step at a time, and each one of them should expand over the previously acquired skills. It also means that all nine events are inter-related and each event provides the student an opportunity to acquire a new skill.

According to Gagne (1985), the nine instructional events that form the basis for a new e-learning model are shown in figure 1.

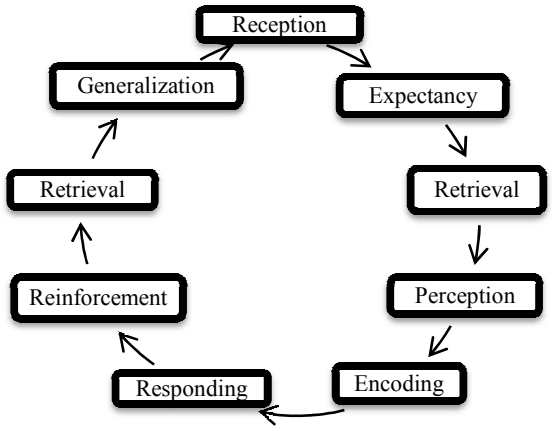

Figure 1 - Gagne's Nine Instructional Events (as cited in Kearsley 1994)

In the Reception event, learners always relate to the processing of perception. Perception leads to the state of reception, when the learner will start to receive the basic ideas of courses. Once the sense of perception is acquired, the learner will start to build the sense of expectancy about the objectives of the course. Expectancy will also help the learner acquire internal motivation to learn. When the instructor stimulates the learner's native memory, he/she can help them focus on perceiving stimulus related to the course objectives. This event helps the learner to retrieve the previously stored information from the brain. Once the instructor drives the retrieval process, the learner will focus on the main objective by using the process of selective perception; this means that the learner will focus on gathering necessary learning materials in his or her brain. Now, the instructor will provide guidance to the learner so that the proper encoding process of the given set of objectives is possible.

Once the learner enters that mode of encoding, he/she will begin to create a set of responses to the underlying problems. Now, the instructor can easily elicit performance parameters from the learner. In the next event, the learner will start focusing on reinforcing his or her mind by deriving a series of responses and later providing feedback on the e-learning process. Later, the instructor will start assessing performance, so that it becomes a cue to help further retrieval of information. Finally, generalization occurs; this is a process of information retention and transfer of previous experiences to the next levels of learning.

4 Description and salient features of the new e-learning model

The proposed prototype uses all the nine events of learning as suggested by Gagne. The model is a practical prototype, where instructors and policymakers can involve a learner in an active e-learning process. The design is quite simple, yet accommodates flexible and adjustable features. The proposed model will engage a learner throughout the e-learning process by using a simple web interface technology. It will employ two basic processes – creation of appropriate course curriculum and usage of a web interface to deliver the content in a real-time manner.

The e-learning model suggested is cumulative and continuous, where there is a connection between each step, and the post and pre-step. Our model ensures that the learner will pick up the basic process of learning through a series of cognitive processes that depend on maximum utilization of skills of imagination, focus, vision, cognition, information gathering and retrieval. Acquisition of learning skills is an important issue with any e-learning environment, learning by itself is a big skill. Our model will help a budding learner to acquire the art of learning content with a series of events that support each other in a holistic manner. This adapted e-learning model also uses the principles of zone of proximal development that was proposed by Vygotsky (1978). With this model, a learner will learn a new task or skill which was not possible in the past. The new model will bridge the gap between a learner's actual level of intellectual development and the future or potential development. This becomes a possibility with an empowered instructor who uses a robust e-model.

Table 1 suggests sequences for the new e-learning environment (Gagne's Learning Theory as adapted from Kearsley, 1994).Each event mentioned above becomes an individual component of the proposed e-learning model. A simple series of web page interfaces will help the instructor to create a delivery platform that will transfer the skills of learning to the learner.

Table 1: Suggested sequences for the new e-learning environment (Gagne's Learning Theory as adapted from Kearsley, 1994)

Instructional Event	Training Activity	Figure
1.Gaining attention (reception)	Distribute course outline	Fig.2
2. Informing learner of the objectives (expectancy)	Discussion of objectives	Fig.3
3. Stimulating recall of prerequisite e-learning (retrieval)	Complete pre-online test	Fig.4
4. Presenting the stimulus material (selective perception)	Web tutorials, online review	Fig.5
5. Providing learning guidance (semantic encoding)	Teach online basics; encode materials	Fig.6
6. Eliciting the performance (responding)	Students practice skills	Fig.7
7. Providing feedback about performance (reinforcement)	Team Interaction and build skills	Fig.8
8. Assessing performance (retrieval)	One-on-one skill and learning assessment	Fig.9
9. Enhancing retention and transfer (generalization)	Transfer learning skills to difficult courses	Fig.10

The model we are suggesting works on three important guidelines as follows:

1) The sequence of instruction depends on the e-learning hierarchies as espoused by Gagne.
2) The type and kind of intellectual skills learned by the learner also depend on the above-mentioned learning hierarchies.
3) Policymakers may need to take note of the requirements for diverse instructions for ensuing different learning outcomes.

The following screen capture figures will provide an idea of how the e-learning model works in a typical situation. The simple-to-use web pages designed here are for instructional purposes only and the method could be adapted for any number of user cases depending on the requirements.

In the example given in Figure 2, the instructor is listing a series of examples from plant kingdom in an eye catching way designed to gain attention. This pack of plants is a mix of shrubs, hedge and trees. The main objective of this learning event is to identify what these leaning objects are. The key question posed here is "What are these?".

For the purposes of demonstration, a classic case of instruction to trees is developed for the course. Figure 3 shows how learners are then encouraged to identify some of the

objects on the screen. The model uses audio-visual learning objects to deliver the course and content by using simple web pages.

Figure 2: Gaining Attention

Figure 3: Identifying Objectives

Once learners identify the objects as plants, the instructor will ask the learners to define what a tree is. This prompts the learner to recall prior information; the learners will provide an answer based on their experience, per Figure 4.

To stimulate interest and spark new ideas, the media now defines the objects itself, providing interesting information.

The instructor will then stimulate the young learner to answer more questions about trees, considering in what manner they differ from a shrub or a hedge, as Figure 6 illustrates. A proper stimulus will guide the leaner towards productive e-learning.

The next step in combining Gagne's approach with VLE's comes when the instructor elicits performance and seeks answers from learners, per Figure 7. Some of the key questions are "Have you seen a tree before? If Yes, Where?" and "Can you give me five examples?" This is designed to engage the learner in the exercise and get them thinking of additional concepts.

Next, the instructor provides some feedback, best done in the form of questions which revisit the cycle, allowing learners to explore the concepts more deeply, per Figure 8.

Figure 4: Recall Prior Learning

Figure5: Presenting Stimulus

Figure 6: Guide Learning

Once a learner acquires the necessary skills, he/she can proceed to the next set of exercises. Alternately, the whole exercise can start again, as indicated in Figure 10. Repeating the exercise can be one way of enhancing retention of the concepts. An experienced instructor can design a slightly different version of the exercise for the repeat performance, to ensure the information is similar and reinforced yet the experience is novel.

Figure 7: Elicit Performance

Figure 8: Provide Feedback

Figure 9: Assess Performance

The next step is to assess and provide feedback, per Figure 9. In case of mistakes, the instructor will correct them. Assessing performance is an important step of this e-learning model. The instructor can engage in a variety of teaching strategies, including asking further questions or facilitating another similar activity.

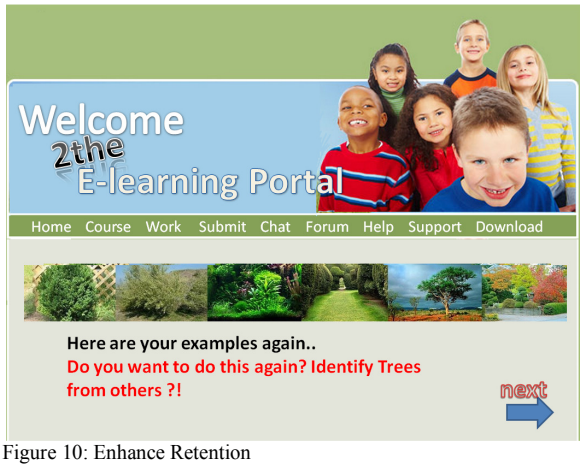

Figure 10: Enhance Retention

All individual events of this model relate to each other and are learner-focused. Each module of course content is separate, while any new course content delivered depends on the transfer of skills at the end of the ninth event. Once satisfactory transfer of skills is recorded, the instructor could proceed to the creation of the next module. In case the e-learning outcome is not satisfactory, then a recommendation could be made to the course developers to create new content that makes the migration easier and more flexible for the user. Performance assessment and feedback should interconnect to each other. Evaluation should be team-based, while feedback could be made on an individual basis. The advantage of this model is that learners can engage themselves in active learning by the processes of inquiry, analysis and evaluation.

The main advantages of this e-learning model are:

1) It is a user-centric model. According to Anghern et al (2001), user/learner should be at the center of the e-learning model and this approach becomes critical for managing individual knowledge capital and competence.
2) It is extremely interactive. The model proposed here is dynamic and interactive. Both the instructor and learners are in constant touch. Primary school learners need constant monitoring and this model helps the instructor to mentor these young learners on a consistent basis.
3) The scaffolding effect allows the learners to use a rich learning environment to try out exploration, manipulation and construction of new ideas and learning fundamentals.

5 Limitations and future implementation

This learning model is a stimulating example of how a learning theory works in an e-learning environment; it is only suitable for young learners (up to K4). In addition, the model will need to consider differing brain developmental stages of young children. In this regard, separate courses could be designed to cater to individual preferences and educational needs.

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LEVEL 0: Learning Theory ⇔ Improvise content	Course Content & Materials
LEVEL 1: Gaining Attention (Attractive learning objectives)	Distribute course outline
LEVEL 2: Informing Learners of the Objective (Summarize)	Discussion of objectives
LEVEL 3: Stimulating Recall of Prior Learning	Complete Pre-online test
LEVEL 4: Presenting the Stimulus (Teach Basics of E-learning)	Web tutorials Online review
LEVEL 5: Providing Learning Guidance	Teach online basics; encode materials
LEVEL 6: Eliciting Performance (Inquire, Probe and Analyze)	Students practice skills
LEVEL 7: Providing Feedback (Group and Individual)	Team Interaction and build skills
LEVEL 8: Assessing Performance (Correct errors) (Face-to-face interaction) (Recommend improvement)	One-on-one skill and learning assessment
LEVEL 9: Enhancing Retention and Transfer (Migrate to new content)	Transfer learning skills to difficult courses

Fig 11- Prototype of the E-Learning Model based on Gagne (1985)

Teaching Cell Phone Forensics and E-Learning

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Abstract - *Estimates are that six out of ten people on the planet own a cell phone. Many of these cell phones hold data relevant to a crime. Many law enforcement and private security personnel have a need to learn cell phone forensics so that they may gather information related to their investigations. However; many of these investigators do not have cell phone forensic training where they live and funds may not permit distant travel to a class. E-learning appears to be an excellent solution to deliver cell phone forensics multimedia instruction to people worldwide. Investigators can also get the practical training they need by using their own cell phone and cable along with downloadable trial versions of digital forensic software. E-learning platforms such as Blackboard also allow an environment for testing and the distribution of a cell phone forensics credentials.*

Keywords: cell phone forensics, e-learning

1 Introduction

As the Director of the Cybercrime Training Lab at Fairleigh Dickinson University, I often get emails requesting both in person and online classes for the subject of cell phone forensics. Many of the requests are from law enforcement officers, private security personnel, and private investigators from around the world need that need to learn to examine cell phones and create reports on the evidence that they find for use in courts or for corporate policy investigations. Occasional requests also arrive from online students in a master's degree program who are also active U.S. military deployed to Iraq and Afghanistan and can only attend online.

Approximately six out of ten people on the planet own a cell phone [1]. Many people who commit a crime throughout the world carry a cell phone and that phone may carry some digital evidence that pertains to the crime in question. We can now see the urgency and scope of the need for online cell phone forensics classes.

2 cell phone forensics taught in person

I presently teach cell phone forensics in person in the Cybercrime Training Lab in Fairleigh Dickinson University in New Jersey [2]. The first half of the class is hardware driven and gives the student a sense of history concerning the cell phone. The material starts with the history of the cell phone and various historical examples are viewed in person.

Then we discuss the various communication protocols such as CDMA and GSM as well as the differences between various cell phone models used around the world. The materials progress to include the various cell phone frequencies used in dual band, tri-band, and quad band phones. The material then progresses to include some of the unique types of phones such as those with two or three SIM cards that allow people to have two or three separate phone numbers and identities.

The second half of the class covers a wide range of important topics such as: the legal issues in cell phone forensics, the examination machine, and then seizing the data and creating the report. Some of the legal issues include: communication data warrants, the chain of custody, fruit of the poisonous tree, and the Fourth Amendment Exception. Communication Data Warrants (CDW) are additional warrants that are needed to read unopened email on a phone or listen to new voicemail messages that were not previously listened to. The chain of custody is an important document that shows the trail of evidence of the a digital storage device, or any other piece of evidence, from the time it was seized until the time it was presented in court [3]. The Fruit of the Poisonous Tree means that seized data from improperly licensed tools will be dismissed for use in courts. [4] The Fourth Amendment Exception allows American Customs and Border Patrol Agents to examine cell phones at ports of entry without a search warrant.

The practical part of the class is when we use Paraben's Device Seizure and Susteen Secure View as the digital forensic software tools to capture and organize the data from the cell phone. The professor connects the cable to the phone, runs the forensic tool from a standard laptop, and then creates a report with the seized data using a wizard to fill in some data about the examiner and the case.

The cell phones are kept in a Faraday Bag to inhibit connectivity and tampering. All methods of connectivity on the laptop are disabled so that outside tampering is not possible. Students are encouraged to disable the Wifi, Infrared, Bluetooth, and wired connections to the laptops. Students are also encouraged to run the latest copies of antispyware and antivirus software on the laptops in order to enhance the credibility of the examination by showing that malware did not spoil the evidence or taint the investigation process.

3 Crimes committed with cell phones

It is also important to educate the students to some of the new crimes that are evolving such as virtual kidnapping [5]. Virtual kidnapping is when someone uses a person's cell phone and says he is holding the victim for ransom. The virtual kidnapper usually mines some data from the phone such as wife, children's names, and various friends. He or she will create a plausible story with the data and demand a small quick payment. The best thing to do in this case is to play along with the drama and contact the FBI immediately. The virtual kidnapper usually only has the phone and possibly a wallet, not the victim. If the FBI is contacted early, an arrest can often be made.

Other widespread new crimes such as Cyberbullying are then discussed [6]. A person may be the victim of having his or her picture taken without consent in a tanning salon, public shower, or changing room where there was an expectation of privacy. The picture may be uploaded to a website for others to view. There may be also accompanying remarks about the victim's weight and private parts on the website. Then others may belittle the victim causing problems from lost self esteem to suicide.

4 Putting the class online – e-learning

The in person class could easily be adapted for an online environment and in my opinion, would work very well online for an e-Learning environment. Students could register for the class through continuing education and then sign in a virtual campus. This class could be easily taught as a webinar too. The students could also download a series of course materials and ask the professor questions. Students could also use their own phones and data cables for the investigation. The company called Paraben has a trial version of Device Seizure and can be used with the student phone if that model is supported. Susteen also has a trial version of their forensic software and students could use their phone with the software provided that the phone is supported.

Tests could be given online and graded using an automated tool or by the professor. A certificate could also be placed online and if the score was above a certain threshold, it would be released for the person to print. There could also be suggested further readings and videos to watch.

4.1 Minor interaction online could inhibit information sharing

In one of my in person cell phone forensic classes, I took a picture from my own cell phone that included my wife in front of a large satellite dish at Camp Evans, in Wall, New Jersey. I uploaded it to www.gpsvisualizer.com and selected an option for google maps. Then it showed a red star on a map of New Jersey. I zoomed down and the label Marconi Road was visible on the map. I zoomed down further on the map and the same satellite on my picture could be seen on the map. However; I remember where I took the picture and it was not exactly where the map showed. Even the view of the satellite in my picture would be different from where it was marked on the map. I guessed there might have been as much as twenty feet inaccuracy.

I had a good rapport with the in person class and then one of my students said something that he may not have said online where there was no trust built. He then told me that if I was in a cloudy city with high buildings, that the GPS metadata in my picture might be inaccurate to as much as one thousand feet because only two of the seven GPS satellites might be obtainable for GPS coordinates.

Another student who was a law enforcement detective then seemed confident to share a personal story too. He told me that he solved a murder investigation because the cell phone camera held the picture of a murder victim and another showed a makeshift grave with the victim in it. The picture contained metadata with the GPS coordinates of the makeshift grave. A forensic team was dispatched to the site and exhumed the corpse before much decay set in. I doubt the student would allow such details to be archived in writing if we used online learning.

4.2 E-learning is outstanding for specialized learning

Perhaps the previous discussion would not have happened in an online environment where sensitive things could be attributed to a person. However; e-learning makes it possible for large amounts of people anywhere in the world to receive a specialized class such as cell phone forensics. They can even post questions, get a credential, and learn how to further their knowledge. This in my opinion makes
e-Learning invaluable.

4.3 Sending the cell phone with data and a cable

The other option for the course is to send the person a cell phone and cable with preloaded emails, phone books, text messages, and call logs in it. Then the person can use the tools, find the data, and write a report of what is seized from the cell phone. The person could be graded on how well they get the scenario. It might be very interesting for the student too, perhaps like reading a spy novel. The only downside is that the cell phone might take as long as a week to reach some parts of the world and the person that needs a quick credential may not have it in time. From my experience, some countries such as Taiwan might also try to collect duty from the student because it might be considered a foreign purchase.

The person who gets the phone would naturally have to pay a deposit before they get the phone and cable. After the course is done and the report is graded, the person would return the phone and cable. Upon receipt of the phone, the deposit would be returned. This deposit would guarantee that either the phone be returned for other students, or that a suitable replacement could be purchased by the school.

4.4 Two options for this type of e-learning

A person who is going to be investigating phones and quickly going to court may need to use their own phone and cable and do the immediate course. The person that wants the more difficult option of finding data and creating a report would use the second option with the understanding that the course will take longer to complete.

5 Examining phones from the Far East

I sometimes have groups of students fly in from the Far East to take classes on cell phone forensics, electronic eavesdropping device detection, digital camera forensics, and take field trips for two or three week stints. The cell phones from the Far East are approximately one year ahead of the American cell phone market and often have features such as increased storage capacity, increased megapixel resolution, and other features not available on cell phones in North America. I have been told by private security contractors that Mobil Edit is the only cell phone forensic tool available to American Law Enforcement and private security contractors that can be used for these new Far Eastern phones.

5.1 Google Translate for foreign language document

Sometimes documents or text messages on a cell phone are in another language. The examiner can use Google Translate for a rough translation of one language into another. I have used Google Translate to change Chinese documents into English. This is very good for cell phone examiners who do not speak the language that is used on the phones they are examining. Google Translate is good because you can also translate from one non English language to another such as Korean to Chinese.

Sometimes documents or text messages on a cell phone are in another language. The examiner can use Google Translate for a rough translation of one language into another. I have used Google Translate to change Chinese documents into English. This is very good for cell phone examiners who do not speak the language that is used on the phones they are examining. Google Translate is good because you can also translate from one non English language to another such as Korean to Chinese.

6 Expanding the education

It is also possible to use Google Translate to translate your scripted data for the phones to thirty or more languages. Perhaps the educational materials could be roughly translated with Google Translate and then proofread and corrected by native speakers. The cell phone forensics class could then be offered in nearly every country on earth thus perhaps standardizing the education for a technical investigative skill.

6.1 Laws and content for e-learning

The content for the phones could not be used in every country. Pictures of people in bathing suits or anything that could be construed as pornography for example most likely cannot be used in conservative countries such as Saudi Arabia. There needs to be a vetting process for the materials with the general counsel at the university and perhaps someone from the embassy of the country or countries you wish to offer classes in.

6.2 From e-learning to networking with professionals

Many students who are private security contractors, private investigators, or law enforcement personnel may want to meet other cell phone forensic examiners or digital evidence investigators when they are done with the course. There are groups such as ASIS International where they could network with others in all areas of digital forensics and investigation [7]. This would help them broaden their horizons and think about expanding into other mobile device forensic examination such as PDAs and digital cameras too.

Becoming a Certified Computer Examiner (CCE) is also a good idea for both instructors and students of cell phone forensics. The CCE gives digital evidence examiners both the practical and theoretical experience examining different types of digital media and is in itself a respected credential [8, p. 448 – 449]. The CCE group is also very active with emails and one can quickly ask questions about smart phones, thumb drives, or any type of digital media needing examination and then receive a timely response.

6.3 Good definitions of technical terms are important

Many of the people who will take the class online will investigate phones and most likely go to court. They may have to give testimony and be asked technical questions. It is very important that students be given a glossary of definitions for technical terms in cell phone forensics that are accepted by their peers and the legal community.

Since the United States vs. Frye in 1923, the methodology of forensics used in the United Courts must meet the scrutiny of the court [9]. The methodology, science, tools, and vocabulary of forensics must be accepted by one's peers and be considered good science for any findings to be used in court.

There are many places to obtain definitions of terms related to cell phones, telecommunication systems, and networks. Some academics have told me that they do not like references with URLs because those links may not be active in the future and then it may not be possible to verify certain facts. When I was completing my doctorate at the University of Sunderland, I was told to only use reference books, journals, textbooks, or any other reliable published paper source.

I once taught a course on cell phone forensics for a county prosecutor's office who was just setting up a cell phone forensics lab. I gave them an extra copy of Newton's Telecom Dictionary to get them started with telecommunication definitions. They could purchase a newer reference later.

7 Pre-assessment and post-assessment e-learning

Today more than ever it is important to assess what was learned in the class and map how those skills help the cell phone examiner do his or her job. I suggest having the person take some kind of pre-assessment to see what he or she knows. Then take the course and perhaps take the same assessment to assess what was learned. In the beginning of the course there could also be a page of learning objectives.

Different countries and states may have different expectations for their cell phone examiners so perhaps some study might be done to assess what skills and learning objectives are needed for various countries in the Middle East, Europe, Far East, various American States, and Canada. Perhaps the university may wish to approach a bar association or legal community for each country and state where the education may be offered to learn what expectations of knowledge they have for cell phone investigators. Daniel Minoli, an author of a distance learning textbook says that, "The quality of the distance learning programs is a function of the selected type of solution and the particular needs of the distance learners." By following Daniel Minoli's advice and having an assessment to see if the students' needs are met, would also be a valid qualitative measurement of the program.

8 Special needs training (blind people)

The cell phone forensics class in my opinion could be modified for the blind examiner who is an online student. I have met one CCE who was blind and she has used screen readers to speak all of the text captured on a digital device such as a cell phone or laptop. I also believe that cell phone investigative kits such as Susteen Secure view have a limited number of cables and if the case was organized properly, a blind person could easily find the cable they need for an investigation. The cable would only need to go from the USB port to the phone. This could be done with feeling for the locations of the connectors and receptacles.

9 Top secret training methods

If there was some type of specialized cell phone forensics training that included questions and answers from a location such as the Green Zone in Iraq, then specialized videoconferencing protocols discussed in Richard Schaphorst's classic book, Videoconferencing and Videotelephony, Technology and Standards could be used for a preliminary discussion of standards [11]. Perhaps something newer such as the United States military's SIPRNet could also be used.

10 Conclusion

Cell phone forensics is an important discipline that needs to be taught to a variety of investigators worldwide. The majority of the planet owns a cellphone. The phones are also often present at crime scenes. These phones may hold some digital evidence to prove a person innocent or guilty of a crime or policy infractions. E-Learning is an excellent platform to provide training for cell phone forensic investigators as well as assess what was learned. The many tools available to the E-Learning community also allow the content to be effectively translated to other languages and be made accessible to special needs populations.

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SESSION

E-GOVERNMENT

Chair(s)

TBA

Is Cloud Computing Appropriate for Government?

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Abstract - *Cloud computing has the potential to transform the use of government services from being basic technology support to innovative technology solutions that are integrated and efficient. In this paper, Cloud computing's advantages and disadvantages to a government are discussed. The risks and opportunities of using cloud computing in government services are presented. The paper also discusses the appropriateness of such a technology to government's electronic initiatives.*

Keyword: cloud computing; e-government; openness; transparency

1 Introduction

The concept of cloud computing is a recent concept that received and still is receiving an increasing attention in both the public and the private sectors. Cloud computing's increasing importance to organizations and governments stems from the fact that it provides highly scalable usage of applications, computational powers, storage, and infrastructures leading to transformation in the Information Technology (IT) understanding and practices. Although it had been receiving attention only in the last few years, cloud computing offers a wide range of services for individuals and organizations, both in commercial and governmental areas. The end user can benefit from using cloud computing in many ways. An individual user can share, store, or process information using the cloud. An organization, similarly, can leverage on the existence of the cloud to manage databases, develop applications, and/or host software on remote hardware [1]. President Obama and the White House Chief Information Officer crafted a vision of moving ahead with embracing cloud computing as a strategic transformation of the Federal information technology platforms [2].

Scholars and practitioners have described many benefits of adopting cloud computing technologies. There are, yet, a number of major disadvantages and risks that are encountered as a result of such adoption. A government, or an organization, that chooses to adopt cloud computing may be subject to security breaches, application failures, or connection unavailability. For this government or organization, mitigating the risks of implementing and managing cloud computing technologies is an essential factor for successful adoption of this emerging concept.

2 What is cloud computing?

The concept of cloud computing has been receiving a great deal of attention during the last few year. Since its emergence, this concept has been labeled different terms. Some of the familiar names available in the literature for cloud computing include on-demand computing and computing as a service [3]. The different names and understandings of this emerging concept made it difficult to develop a common understanding among the public and private leaders of what cloud computing really means.

The most basic definition of what cloud computing is is conducting pre-defined computing services and delivering them over the internet as requested, or when needed. The other element of this basic definition is that these computing services are conducted remotely and away from the request's computers, servers, or mobile devices. The requester could be an individual, a company, or a government. In all these three cases, the computing services are executed and delivered through the internet from the remote location of the service provider based on a pre-defined and agreed upon contract. Examples of could computing services include processing power, storage, or an application, and all are delivered over the internet.

Aside from this basic definition, there exists a disagreement in the literature on what cloud computing is. This disagreement is commonly attributed to the different usages of cloud computing and to the nature of who the requester is. Researchers [4] identified more than 20 definitions based on the usage only. The University of California at Berkeley's Reliable Adaptive Distributed Systems Laboratory defined cloud computing as "both the applications delivered as services over the internet and the hardware and systems software in the Data Centers that provide those services. The services themselves have long been referred to as Software as a Service (SaaS), so we use that term. The Data Center hardware and software is what we call a Cloud" [5]. Gartner, however, defines cloud computing as "a style of computing where massively scalable IT-related capabilities as a service using internet technologies to connect multiple external customers" [6]. Researchers [7] defined cloud computing as "an emerging model of computing where machines in large data centers can be dynamically provisioned, configured, and reconfigured to deliver services in a scalable manner, for needs ranging from scientific research to video sharing to e-mail." Glancing over the sample of the above three definitions demonstrates how differently cloud computing has been described. It is referred to as software and hardware, a style, and a model reflecting how diverse the views of cloud computing among scholars and practitioners are.

Perhaps one of the predominant definitions that has been developed for cloud computing is the definition provided by the National Institute of Standards and Technology (NIST) is 2009 [8]. The Institute's defined cloud computing as "a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, application, and services) that can be rapidly provisioned and released with minimal management effort or service

provider interaction. This cloud model promotes availability and in composed of five essential characteristics, three delivery models, and four deployment models." Fig. 1 summarized the essential characteristics, delivery models, and deployment models mentioned in the NIST's definition.

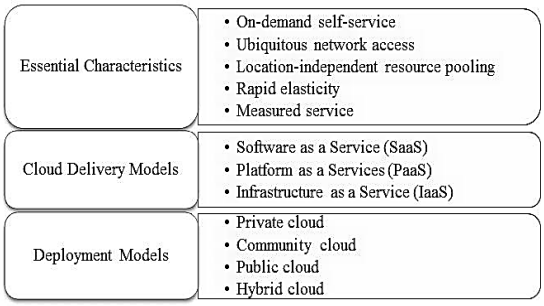

Figure 1. Characteristics, delivery, and deployment models in NIST's definition of cloud computing.

The Infrastructure as a Service (IaaS) is the service that provides virtual servers, with unique internet protocol (IP) address and associates an allocated storage to these servers. An example is the service provided by Amazon Web Services. The end user, being an individual or an organization, has the advantage of control the application(s) she or he wants to store and run on the allocated server. The end user, for the case of IaaS, pays for the processer utilization and the allocated storage only.

The complexities within today's organizations require the use of specific processes and controls to manage risk and increase quality. The Platform as a Service (PaaS) refers to those services that allow end users to build and run their custom solutions and applications. Such services are specifically useful in designing, developing, testing, and deploying applications. PaaS includes software migration tools and change management applications that require a great deal and administration from the end users' side.

The Software as a Service (SaaS) is considered the most common service within cloud computing. In this service, the provider authorizes the end user to run software or the application. The medium of executing these services is referred to as the interface, which could be in different formats, such as the Extensible Markup Language (XML). Examples of SaaS are web emails and LinkedIn services.

According to NIST's definition of cloud computing, the cloud can be public, private, hybrid, or community cloud. The public cloud, sometimes is referred to as the external cloud, is available for the public and is owned by one organization or more. The services provided by the public cloud could be free or for charge. Amazon and Google are examples of public clouds. The private cloud is the one that is made for a specific set of users within one or more organizations. An organization could have one or more private clouds. Private clouds are managed through restrictive access privileges that are granted for the intended users only. The community cloud, however, possesses a distinct feature among all types of clouds in that the community cloud is established to serve a specific community and for a specific purpose. The community could be composed of a number of organizations, individuals, or a group of government agencies. Finally, the hybrid cloud is combination of at least two distinctly different types of clouds while the sub-clouds remain connected to serve a specific purpose or a community [3].

3 How does Cloud Computing work?

The word "could" renders the actual fact of how the service is configured and delivered to the end user. In the technical context, the cloud is a collection of severs, computers, storages, and network devices that are lumped together and availed through the internet. For the end users, these machines are inherently invisible and are augmented within the internet services. For the end users, the cloud appears to be a single application or a file whereas the hardware that runs this application or stores this file stays invisible.

The technical representation of what a cloud computing is and how it works was subject to a number of research studies. There appears to be a consensus on the technical architecture of cloud computing and, interestingly enough, this architecture resembles the definition provided by NIST above. The technical representation of the cloud computing concept is a layered architecture and is presented in Fig. 2. The layers are Infrastructure as a Service (Iaas), Platform as a Service (PaaS), Software as a Service (SaaS), and the End User Layer [9].

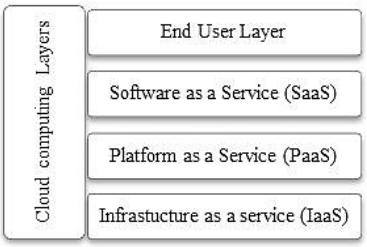

Figure 2. Technical representation of cloud computing.

Researchers [10] described how cloud computing works through comparing it to the Unix paradigm. In Unix platforms, there exist a number of components that are well defined and developed to function and deliver certain outputs. These isolated components work with each other through a set of universal interfaces resulting in a less complex overall platform to manage and administer. Similarly, the could computing concept has a number of loosely coupled components, mentioned above in Figure 2, where each component could be provided by a totally different vendor, on a different technology platform, or is located in another geographical place than the other components.

4 Advantages and disadvantages of Cloud Computing for a government

Before discussing the advantages and disadvantages of cloud computing to the public sector, it is important to understand the benefits cloud computing brings to the individual and the organization levels. The benefits of cloud computing span the following potentials:

- Cloud computing is intrinsically scalable and implementable. Applications, storage, and processing powers are readily available to use.
- The end user, either an individual or an organization, is not responsible of maintaining or upgrading the

software or hardware provided by the cloud. It all falls within the responsibility of the service provider.

- The end user doesn't need to manage the resources' usage. Resources are allocated dynamically and efficiently to suit with the end user's computational loads. This benefit is of a specific advantage to the customers since the total cost of ownership for hardware and software could be significant while the assets are usually underutilized.
- Cloud computing reduces or even eliminates the need for organizations to set up and manage large scale technical infrastructures including data centers and large networks. In its simplest form, the infrastructure requirement, when using cloud computing, is limited to only end users' machines and connections to the internet.
- Another major benefit cloud computing brings to the end user is the reduced need to have redundant sites and verifiable disaster recovery resources and processes [3].

Practitioners and researchers have considered the benefits cloud computing brings to the end user and attempted to describe the advantages and disadvantages this emerging concept could bring to the governments. Vivek Kundra, the Federal Chief Information Officer, said that "by using cloud computing services, the Federal Government can gain access to powerful technology resources faster and at lower costs. Ultimately, this will allow the Government to better serve the American people and focus on mission-critical tasks instead of on purchasing, configuring and maintaining redundant infrastructure" [2].

Researchers [11] posited that cloud computing is advantageous to Federal Government in a number of ways. He suggested that using cloud computing helps the government in establishing and implementing consistent rules and regulations on how to configure and use computing resources across the different agencies and Federal offices. This centralization becomes possible since cloud computing is believed to transform these units and offices from being isolated departments that run their own IT platforms to mere end users of the same infrastructure where rules and policies are centralized and controlled. According to West, there existed more than 1100 Federal data center as of July, 2010. Running and maintaining this large number of centers is financially very costly. Cloud storages and processing capabilities are advantageous to the Federal government in reducing the operating cost and in increasing the efficiency of using the needed levels of resources.

The hardware and software procurement projects have been a major concern to the Federal CIO since his first days in office [12]. Every Federal office traditionally runs its own IT projects and purchases hardware and software for its own uses. The bigger picture of a consolidate Federal Government procurement and project management processes was almost impossible before cloud computing. Researchers [13] described the advantage of using cloud computing to create a government-wide contractual advantage of getting less prices, better manage hardware and software purchase, and get more efficient operating and maintenance contracts.

Despite all the advantages that cloud computing brings to transforming technology management in government and to reducing cost and increasing efficiency, there still exist some disadvantages that could hinder the broad acceptance and use of this emerging technology. First, information security is considered as the main limited factor for governments not to adoption cloud computing. The idea of putting government's and citizens' information and records on external storages outside the data centers' premises does not appeal to many officials who are not technology savvies [14]. Many questions have been posed on the information security of the clouds and amount to maintaining data confidentiality, integrity, and privacy. Some Federal acts existed to protect citizens' privacy, such as the Health Information Protection Act (HIPAA) or the US Patriot act. These acts will need to be revised, or perhaps combined with other acts, to address privacy over the cloud.

Second, there is a concern that cloud computing totally relies on the availability and performance on the internet connection. This dependency raises a number of concerns to the government. Government's officers ask questions like what would happen if the internet connection is lost and how can the government's office ensure that services are available in case of connection loss. The officers do have answers to these questions in the current situation where local data centers are managed and operated by their own offices but may not have convincing answers to their questions when migrating to the clouds. In fact, the migration from the current technical infrastructure to cloud computing architecture is considered a limiting factor for many of the large government's offices with massive data centers' operations.

5 Using Cloud in governments: The case of The USA

The US government, and other governments in the world, started to adopt the emerging concept of cloud computing and began to integrate its infrastructure into the different Federal departments and offices. The Federal CIO considered cloud computing a strategic technology for the Federal Government and stated in his statement before the House Committee on Oversight and Government Reform that "the Obama Administration is committed to leveraging the power of cloud computing in a safe and secure manner to help close the technology gap and deliver results for the American people" [2]. The following section reviews attempts of different Federal agencies in the US to adopt cloud computing.

Cloud computing technologies have been informally used by the Federal agencies, their employees, and vendors [15]. This informal use of cloud computing in the Federal agencies could be thought of as a reaction to the advancement in technology and also as a deliberate strategic direction. The Federal agencies had been little concerned about censoring or blocking personal email and instant messaging tools available on the web, or the cloud, leading to a wider informal use by staff, from the different levels within the government, to use such applications more conveniently at their offices. Due to the increasing security concerns and the fear of computer and network virus outbreak in addition to the fear of being hacked, the view towards these web applications started to change within the Federal agencies which started to consider and exercise more restrictions and control over the access to and use of these web applications.

It was only a matter of time until the Federal government realized that implementing more restrictive controls over the informal use of cloud applications was a temporary solution [3]. The General Services Administration Office (GSA) presented a recommendation to President Obama on how strategically the informal use of the cloud application should be formally framed via a clear and thoughtful policy. The office of GSA suggested that the existing use of social media applications should serve as the initial step towards a roadmap of embracing a wider and a formal use of cloud computing within the Federal offices. The recommendation also stated that the formal use of cloud applications in the government should be conducted gradually and through a limited number of strategic applications that will present a visible value to the government and will not require longer and costly project implementations [16]. For example, the GSA suggested moving some of the Federal portals, such as usa.gov, to the cloud while considering adding more cloud applications to the portals to make these portals more user-friendly, interactive, and richer with government services.

Under the leadership of the Federal CIO, the Federal technology infrastructure has embarked the transformation towards the cloud computing technologies [2]. In fact, President Obama himself supports the IT transformations that will result in opening the government to the American people and that will advance the government to the new era of administration [17]. Being confronted by the financial crisis as he was entering the White House, the President and his CIO found opportunities in cloud computing to reduce cost and increase efficiency keeping in mind the disadvantages the this emerging technology could bring to the government as mentioned above. The GSA's recommendation put forward to the President predicted a 50% cost decrease in maintaining web portal has cloud computing been adopted [18].

President Obama has continued to exhibit his support and commitment to embracing cloud computing technologies. In 2009, he appointed a Federal Chief Technology Officer (CTO), reporting to the GSA, to specifically carry out the migration of the Federal IT infrastructure to the cloud. The CTO, Patrick Stingley, started by creating a development and roadmap plan to implement cloud computing capabilities across the entire Federal agencies. Stingley's plan was later suspended by the GSA due to the need for further planning and careful policy creation [19].

The current implementation of cloud computing in the Federal government spans the areas of information exchange and communication, i.e., the SaaS layer. There is a little effort to use cloud computing for both the PaaS and the IaaS layers. Additionally, many of the Federal portals have links to some famous web applications such as Facebook and Twitter. Creating the social face of the Federal government contributes to fulfilling the vision of the President of having an open, transparent, and collaborative government [17] but doesn't really make a significant use of the advantages the cloud computing brings to end users.

The awareness programs the Federal government, through the CIO's office, has raised the levels of appreciation among the different Federal agencies to further embrace cloud computing technologies [3]. A number of agencies started to have a limited access to the web applications for the purpose of serving their audiences and communities. For instance, the Department of Veteran's Affairs (VA) started to integrate its website with videos that are stored on YouTube. The agency posits that by integrating web applications within its portal, a larger segment of audience, including the younger generations, will be more attracted to the agency and its services [20]. In addition to hosting videos on YouTube, the Department of Veteran's Affairs embarked on availing mobile devices version of their portal and hosts this version on the cloud.

Other examples of Federal agencies that started to adopt cloud technologies is the US Agency for International Development (USAID) and the National Institute of Standards and Technology (NIST). Basically, these two agencies in addition to many others adopted similar usage of cloud applications and portal hosting as what the VA has been doing and that is to store videos on the YouTube, host their portal on the cloud, and add links to social networks on their websites. Embracing cloud computing went beyond the executive part of the government to include the Congress. Both the House and Senate have worked on publishing some of their discussions on YouTube.

The above examples of how the different agencies of the government have embraced could technologies display initial stages of using the emerging cloud technologies for information sharing and communication purposes only. While many agencies stayed at this level of embracement, other agencies went beyond this point of information sharing to information processing. The Department of Defense (DoD) is considered as one of the early agencies that adopted the advance the usage of cloud computing. In 2006, the DoD contracted a number of vendors, including HP and Sun, as providers of SaaS including data storage [15]. By the year 2009, the DoD has managed to transform its business processes into purely transactional whereby end users access specific portals and submit their requests of any type. The request goes through the normal business process cycle of approvals and comments in an automated fashion and entirely on the web.

To address the security concerns, the DoD uses a Public Key Infrastructure (PKI) to guarantee confidentiality, integrity, and completeness of these transactions. It is important to mention that the DoD has created its own private clouds to process the business and administration transactions. There are no signs in the literature that the DoD has plans to consider public and commercial clouds, such as Amazon and Google [21].

The US Army started to embrace cloud computing as a means to enhance it recruitment processes. The Army's effort in this concern has been to integrate its current recruitment capabilities and agencies with social network applications. This integration's objective is to reach as many candidates as possible, especially within the younger generations and college students, and to avail new tools and devices for the recruiters to communicate with each other and with the Army's main recruitment offices. This initiative of embracing cloud applications articulated by Major General Thomas Bostick, who is the head of the Army's recruitment command, as that the Army "is reaching out to Americans, giving them the opportunity to understand their Army" [22].

6 Using Cloud in governments: A glance at other countries

Adopting cloud computing has taken place in other countries around the world as well. The European Union's states are working on establishing a cloud and a common IT infrastructure for the use of the EU's states [23]. Advancements towards embracing cloud computing are undergoing in many other countries including Japan, the United Kingdom, Singapore, and Saudi Arabia. The following section describes such advancements in some details.

The national government of Japan has taken an initiative to create the Kasumigaseki private cloud for the purpose of hosting all the government's computing resources and services [24]. The Kasumigaseki cloud is intended to facilitate sharing of information and promoting higher levels of standardization and control over the Japanese government's technology resources. Additionally to the mentioned above advantages of introducing cloud computing into governments, the Japanese government believes that building the Kasumigaseki Cloud aim to create a green technology that is used and shared by all government offices [25].

The Unite Kingdom's government has made one of its priorities to create the G-cloud, which refers to a government based cloud computing initiative that spans all the different units and departments within the government [26]. An essential component of implementing the G-cloud is to migrate government's services to the web including, but not limited to, the government-wide procurement services. The creation of the G-cloud was planned to be part of government-wide data center rationalization and centralization. As in the case of the Kasumigaseki Cloud, the UK government strategically planned to implement the G-cloud to enhance the levels of standardization with the government's IT functions leading to lowering operating and maintenance cost and improving quality of IT services [3].

In Singapore, the InfoCommunication Development Authority (IDA) views the cloud computing technology is the important next paradigm in IT leading Singapore's economy to a greater reach and improved competitiveness (Hicks, 2009). The IDA has been a main contributor to the Open Cirrus open cloud project that is research-based. Many prominent research centers, such as Carnegie Mellon, and commercial organizations like HP and Yahoo are participants in the Open Cirrus project. Singapore, through its IDA, hopes that the research on Open Cirrus will advance the business, research, scientific, and social computing needs in the country.

In Saudi Arabia, cloud computing is being introduced to the IT landscape through the telecommunication companies and amount, in its general form, to IaaS services only. There are two telecommunication companies in the country. The two companies are publicly traded but the country owns a large portion of the two companies' assets. In the early months of 2010, the two companies have prepared plans to launch cloud computing environments to serve the business communities such as banks and oil companies.

A major concern of large business organizations in Saudi Arabia is to maintain a low cost disaster recovery and business continuity infrastructures and both the telecom companies are primarily targeting offer cloud computing services to fulfill these needs [27]. Experts of banking technology in Saudi Arabia stated that there are no evident initiatives of adopting and embracing cloud computing by the public sectors. However, he believes that an adoption initiative will be prepared as part of the electronic government program which is owned and administered by the government. Experts believe that the initiative may not be easily implemented due to the large degree of bureaucracy that exists in the government's processes and procedures and a higher authority, within the ruling family perhaps, needs to lead such an initiative for it to rapidly be translated into an action plan [27].

7 Risks of introducing Cloud Computing in a government and government reactions to such risks

There exists risk when introducing new technologies to any functional organization. This risk is either associated with the implementation or the usage of the introduced technologies. Risk identification, assessment, and management practices have evolved as the fields of information technology advance. The risk associated with cloud computing technologies are related to how these technologies are implemented and used, the policies that govern these technologies and its industry, and the security aspects of such implementation and usage. In this section, the risks associated with implementing cloud computing in governments are identified and assessed. This section will also inspect how the Federal government's agencies approach these and manage these identified risks. The section will provide an assessment of whether cloud computing risk management practices are adequate to mitigate such risks of implementing and using cloud computing technologies in the Federal government.

The fact that there is no unified definition of what cloud computing is leaves this technology less standardized and controlled. The cloud's underlying architecture has not been standardized in a way that is globally recognized. As mentioned in the earlier sections of this paper, cloud computing could be defined as a style, a model, or as the network of hardware and software. The lack of standardized architecture of cloud computing leads to less effective controls to mitigate and manage the risks associated with this emerging concept [28].

The lack of standards that govern the implementation and use of cloud computing brings a number of problems to Federal government's implementation of this technology. As the different agencies contact vendors to carry out their implementation of cloud computing, the interoperability between the implements cloud becomes questionable. If an individual cloud is built according to architectures and standards that are different than other clouds, the overall Federal cloud will suffer a great deal of integration difficulties, or perhaps an integration failure, when the time comes to consolidate a government-wide cloud for all the agencies to rely on; similar to the G-cloud of the UK or Japan's Kasumigaseki Cloud. The effort NIST is putting forward to provide standards that will lessen the integration difficult is significant but there is a need for leadership intervention to enforce the adoption of NIST's standards. The Federal CIO's appointment only happened less than two years ago while a great deal of different departmental

efforts and initiatives had already existed before his arrive. The government-wide cloud thinking has to be seriously thought of on the highest level in the Federal government before it gets too late and too expensive to benefit from the true advantages of cloud computing.

Compromising government's and citizens' data security is a major risk that adopters of cloud computing should account for and properly mitigate. Securing such data starts with ensuring that only the authenticated and authorized users have an access to the applications and related data repositories on the cloud. All unauthorized requests from outside the cloud have be rejected and logged for further analysis. The challenges that information security has over the cloud is the facility of granting remote access to authenticated users, transferring data over communication media, establishing and monitoring proper and accurate role-based user profiles, and continuous monitoring and protection of the cloud from viruses, worms, hacks, and other harmful software.

Cloud computing service providers must ensure that every access to the cloud is known and legitimate. The providers must have the ability to provide audit trails for their customers, including government agencies, to enhance service transparency and integrity. While not explicitly framed toward cloud computing, the Federal government established a number of laws to protect privacy of citizens' privacy such as the Health Insurance Portability and Accountability Act (HIPAA) [29]. In the absence of Federal laws, the government agencies must depend on service level agreements (SLAs) with cloud providers. These SLAs must include terms that allow the government to retrieve access logs and audit trails as a way of confirming that vendors do provide cloud services that are secured enough. SLAs must also include terms that govern data retentions and backups for pre-agreed upon periods of time.

Other technical methods of securing data should be implemented to prevent data exposure in the case of unlawful access to the data storages. Data encryption methods are to be carefully evaluated and considered as part of the cloud services. While encrypting the entire data storage may be both expensive and performance degrading, the most vital fields of citizens' records, such as name, ID and contact information, must be kept encrypted. According to [30], there are no evidences of Federal laws and policies that have been put in place to govern how information can be access over the clouds.

Organizations, especially the services providers, thrive on deliver continuous and uninterrupted services. Banks and transportation companies have invested significantly in building redundant data centers and information process resources for the purpose of servicing their customers around the clock. While government agencies are not-for-profit, many of their services are very critical to the citizens and are required to be available all the time. Homeland Security Department (HSD) Systems at the US airports are vital to process passengers travel documents. One can imagine the levels of confusion and frustrations that citizens would exhibit at JFK, for example, if they are requested to wait because the HSD systems are not accessible or not working. The literature indicated that the availability of major clouds have suffered noticeable outages during the last two years. Gmail, for example, had a downtime of more than 100 minutes in September 2009 [31].

A crucial risk that could hit cloud computing is having interrupted services. While accidents do happen, there have to be well established and tested measures to account for such availability failures. Causes of cloud availability failures could vary and include overloading its resources or even could be due to databases field insertion locks, which is quite common when large databases are being administered while applications are still running. The end user at one of the government agencies may not be aware of the real cause of the delay in processing request at his or her terminal. Therefore, cloud computing vendors must provide mechanisms to ensure flawless and uninterrupted service availability. Solutions range from having failover strategies, whether hot, warm, or cold, or even an entire redundant cloud that is a precise mirror of the production one in terms of software, platforms, and infrastructure.

The availability of cloud computing services may also be affected by the increasing number of users accessing the network. As in the case of any software design, the more sessions created during the execution mode, the less the performance of this software becomes. Then, there is a time, when the number of users reaches a certain level, at which the software stops running. Estimating the capacity needed to service the end users is the responsibility of the cloud providers while providing the estimated number of users becomes the responsibility of the end user, or the government agency in this case. Government agencies must stress on their acceptable levels of availability in the SLA with the cloud computing providers. Agencies must also establish their own measurement and monitoring practices to benchmark the actual availability against what have been agreed on in the SLA instead of waiting for the vendors to provide such measurements. Aside from building and enforcing strict SLAs and with the exception of NIST's effort, the Federal government is yet to establish laws and regulations to ensure service availability of the clouds.

The above mentioned potential risks mandate the Federal government, if willing to pursue the implementation and adoption of cloud computing, to consider crafting and enforcing policies, laws, and regulations. The government's attention has to be directed towards how to integrate the individual clouds built over the last several years by the different agencies into a government-wide cloud. While doing so and in addition to developing and enforcing well specified SLAs with trustworthy cloud services providers, the government needs to focus of developing policies that control the security and access to the clouds, availability and redundancy of the cloud, the auditability and traceability of services offered by the cloud, the capacity and usage over the cloud, and the data confidentially and integrity when stored in the cloud.

8 Conclusion

This paper aimed to present and describe the concept of cloud computing in the context of the Federal government. The different definitions of what cloud computing could be were provided and the general architecture of this technology was described. The paper summarized the benefits of using cloud computing for the individuals and what advantages and disadvantages it brings to the governments. A glance of the main implementations of cloud computing in the Federal agencies was presented followed by a brief of some cloud computing

implementations in other countries. These countries include the United Kingdom, Japan, Singapore, and Saudi Arabia. The paper then described the risks that could be encountered as a result of adopting cloud computing with an emphasis on the government context. Some suggestions of what the Federal government has done, or should do, to account for these risks were illustrated

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Requirements Practices in E-Government Solution Development

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Abstract - *E-government research and practice have been dominated by concerns with the impact of technology on constituents and public organizations, and with IT project success factors. In this paper, a critical review of the role and implementation of requirements methods and practices in the e-government solution development process is conducted. It is argued that the limited amount of literature on the subject suggests that requirements engineering is largely ignored or haphazardly applied in the public sector, and that this state of affairs has not been sufficiently examined in academic research. Requirements practices must be analyzed specifically in the context of e-government due to the distinctive challenges experienced by government agencies in the areas of user satisfaction with online services, constituent representation in solution planning, enterprise systems implementation, and COTS selection and integration.*

Keywords: Requirements Engineering, e-Government, IT Solution Development, Stakeholder Involvement, Business Process Analysis.

1 Introduction

E-government has gained prominence in the past decade, as a result of the growing importance of information systems solutions for improvements in the quality of life, the efficiency of public institutions and the enablement of increased civic engagement. E-government has also received academic attention due to the distinctive characteristics it manifests as a field of practice and research. Its distinctness stems not only from the bureaucratic and legislative aspects which define and constrain e-government solutions, but from a number of other qualitative criteria, that we argue demand a specialized methodological and pragmatic approach.

Our focal argument concerns the treatment of requirements practices (defined as elicitation, analysis and development of business, non-functional, and other types of system requirements) for e-government systems in current literature and practice. We maintain that although requirements practices and processes are of critical importance for public organizations, the state-of-the-art is that practitioners dedicate very little attention to their methodical application, and researchers focus insufficiently on the unique challenges and demands posed by the public and governmental context.

This paper is structured as follows. We will first examine how e-government differs from other electronic solution domains. We will then review several studies explicitly dedicated to the application of requirements methods and concepts to e-government. As there is only a small number of such studies, recent research on problem areas for public agencies which are indirectly related to the requirements process will also be evaluated. Finally, directions for future research will be derived from our analysis.

2 Distinguishing Characteristics of the e-Government Domain

A number of factors contribute to e-government's qualitative differentiation. Some concern the "what"-s of public information solution production, namely the kinds of applications and features introduced for use by the public, or internally within public organizations themselves. Such applications cover mainly 1) the processes which lead to the issuance of "status documents" such as licenses, permits, certificates, registrations and the like, and 2) constituent requests for the provision of services (e.g. infrastructure repairs, social assistance, logistical services, education, and others). Charalabidis and his colleagues have developed a taxonomy of municipal e-services which exemplifies the standard set of e-government applications [1]. The common element underlying all the IT-enabled government functions is that they are based on political and legislative requirements that may date a couple of decades back, and more relevant to our inquiry – that are typically maintained by some form of legacy system. The historical nature of government systems (and processes) is a key characteristic of e-government, as are the issues of legacy and compatibility, here referred to generally – not just in the sense of IT, but also in regards to business process.

Other factors of differentiation concern the "why"- s, or the motivations and objectives driving e-government projects. Difficult to quantify goals such as satisfaction, trust in government, ease of use, sense of security and wellbeing, etc., are often the impetus for creating and introducing

systems. This implies a different feature selection and prioritization process, one which reflects more closely the "checks and balances" principles in the public sector. This process logically belongs to the requirements analysis and development aspect of a software project. Political considerations can influence selection and prioritization in e-government [2]. "Political" is defined here as ideological, i.e. representative of different societal and social views and interests, rather than as expressive of the agendas of units internal to the organization. Dealing with such influence in a systematic, overt and equal manner is a value shared by both the democratic principles driving public governance and by the tenets of requirements engineering methods. Therefore, the methodical implementation of appropriate techniques from the requirements engineering discipline has the potential to contribute to ethical, principled and accountable government operations. In fact, e-government in itself, as an activity that brings transparency to process, has been characterized as an anticorruption strategy [3].

The procedural aspects, or the "how"-s of systems definition, development and realization also make government information solutions distinctive. Government IT is highly procurement-driven, hence it is affected heavily by bureaucratic procedural barriers. A significant number of Commercial Off-the-Shelf (COTS) products dominate the IT portfolio of public agencies, leading frequently to silos of system families and "shops" within IT departments [4]. In the case of bespoke development, government application teams generally operate within slow development cycles, impacted by project scope creep, by project decisions dictated by a spirit of aversion to risk, and by a reactive stance towards public officials and executives, whose position may easily change the course of a project.

In addition to the exercise of influence from governing bodies and elected officials, e-government applications must represent the interests and preferences of a multitude of stakeholders and constituents. The principles of equal representation and accommodation dictate that government cannot treat certain segments of the population preferentially, yet it becomes apparent that meeting the interests of all stakeholders is usually very difficult to achieve (especially since solutions must be cost-conscious). The intricacies of defining stakeholders in the e-government domain have been well-documented [5, 6]. Sarantis, Smithson, Charalabidis and Askounis, for instance, argue that e-government stakeholder modeling is currently in a "poor" state [2]. Stakeholder involvement has been directly linked to technology adoption and user satisfaction [6, 7, 8], however due to the diversity of constituents' concerns, preferences and backgrounds, reconciliation of their requirements for e-government services is an area that has to be more fully framed in the terms of disciplines such as public administration, systems design and requirements engineering.

While requirements engineering research examines different models of stakeholder inclusion in the requirements process, in systems development practice and IT project management best practices strong emphasis is placed on the adequate identification and representation of business ownership. The "owner" of an application is typically a manager from a business unit, who takes decisions on matters of funding, project direction, scope changes and feature prioritization. In the case of e-government applications, predominately those developed for public use, the issue of ownership becomes considerably more complicated. As requirements are gathered from multiple stakeholders, their selective implementation extends beyond problems of technical design and transcends to choices of social design [9]. It is in the area of collective social impact of information systems, where one of the more salient distinctions of e-government solutions development from commercial technology becomes apparent – namely the notion of "public value" [10]. According to Mark Moore who coined the term, "public value" refers to the achievement of certain holistic benefits for society, benefits which are different that the mere sum of individual (consumer) preferences of society's members. If applied to the information solutions e-government must produce, public value – or, services that advance the quality of communal life, can be achieved only with a holistic view that integrates the applications/systems themselves, the social context of their use, and the organizational context of their development and management. The information-rich medium of requirements elicitation, analysis and development activities has the highest potential for the integration of these perspectives – by means of a thorough assessment of stakeholder needs, improved problem definition, solution feature negotiation and consensus-building – all key determinants of information solution project success [11].

3 The Benefits of Requirements Practices and Methods

A very high percentage of e-government efforts have been reported to "fail" – that is to fall short of achieving their objectives, both in regards to project-centric concerns such as timelines and cost containment, and scope control, but also in terms of positive effects, levels of adoption and usage, constituent satisfaction, etc. [5]. Some studies trace the causes of e-government project failure to factors such as lack of executive support, insufficient staff IT skills, mismatch between the solution and its context of use, and lack of stakeholder involvement [12]. IT projects in other sectors are affected by similar problems. Those dedicated to the development of software systems in particular, are said to be decidedly dependent on proper requirements [13], as requirements engineering is an integral part of the development cycle. The causes of failure have been linked to inaccurate, ill-defined, missing, inconsistent, or conflicting functional requirements. Deficiencies in requirements practices have also been linked adversely to the usability of

applications – i.e. their ease of use, accessibility, end-users' sense of satisfaction [14]. Online services introduced by government agencies are often plagued by usability issues [15] resulting from the excessive representation of the internal agency perspective of services [16]. From a development and design process viewpoint, requirements methods have been instrumental in documenting design decisions [17], improving communications between project participants [18], providing a better understanding of problems of superior complexity [19], improving and automating feature testing practices [20] and enabling the development of formal business process, systems or organizational models. Public agencies experience challenges in these areas as well, most notably in effective business team to technical team communications, systems and organizational practice documentation, and solution knowledge transfer [21].

By and large, the factors singled out as critical to the success of e-government projects are closely associated with the concepts and activities which the requirements engineering process consists of.

4 Requirements Practices Case Studies in e-Government

Despite the recognition of their potential for project and process benefits, there is little evidence for the systematic adoption and application of formal requirements methods to application development projects in the public sector [22]. Khamooshi and King survey public agencies in the UK and conclude that there is "considerable doubt" amongst public sector practitioners in the value of producing requirements specifications. Requirements gathering practices are frequently carried out simply as a form of documenting the "wish-list" of a particular organizational unit. The list's interpretation is left to developers or systems administrators who often make design or configuration decisions based primarily on technical feasibility alone. There is limited recognition in the academic research community of the significance of requirements practices in government agencies and their unique challenges in the context of e-government.

A number of studies have identified the importance of citizen engagement in e-government systems design [15], and a limited subset of them have provided a direct treatment of requirements practices for public sector information solutions projects [23, 24]. Van Velsen et al. have described a comprehensive approach for the elicitation and validation of end-user requirements for the creation of a social services application prototype. Their framework encourages iterative assessments, since designs "based on a requirement from users does not automatically meet all users' demands" [23]. Johanna Krenner's study is a pioneering early example of requirements analysis for a one-stop government portal [24]. Krenner analyses the content of the requirements, and underscores that it is most beneficial to utilize multiple sources of requirements – e.g. interviews, literature review and surveys.

Citizen-facing solutions can differ significantly from support, monitoring or internal operations systems in the way requirements are elicited. In the domain of solution implementation primarily geared towards back-end government operations, Conboy and Lang's analysis of the use of formal requirements management methods reveals how IT staff and IT managers in an e-government development project "nudge" structured techniques and processes to fit and reflect their organizational agendas [25]. Ad-hoc and improvisational behaviors were combined by practitioners with structured techniques to produce a more manageable solution planning process. Conboy and Lang's study is not only an example of one of the few examinations of requirements techniques use in the e-government domain, but also a rare example of a comparison between the outcomes of different categories of methods (derived from separate theoretical traditions) – structured methods, and improvisational techniques.

Norman Sondheimer and his colleagues' work is another case study of requirements engineering methods implementation in an e-government project for the online renewal of licenses in Massachusetts [26]. The authors argue that formal modeling languages can be used successfully to represent complex government processes for purposes of improved requirements definition and clarity. Participatory Design [27] is also presented as a complement to formal modeling in Sondheimer's study, namely as a collaborative validation activity aimed at enhancing stakeholder trust in the requirements process.

As previously discussed, requirements engineering work can benefit the internal dynamics of project teams and organizations. Bresciani et al. study the advantages of requirements practices for knowledge management in a government agency - the Italian Cabinet Office [21]. They argue that valuable organizational knowledge is captured during the solutions development process, if requirements techniques are applied and adhered to. The authors propose a requirements engineering framework – REF - aimed at recording and formalizing knowledge developed in e-government projects, which will facilitate the growth of public agencies into learning organizations. The framework also has the capability to "feed" any existing knowledge systems in the agency, in their role of communications conduits, spreading information about the structure, features, functions and rationale of e-government solutions.

While the above-mentioned studies address different facets of the use of requirements practices in e-government, they all acknowledge that solutions development in the public sector requires flexible, iterative and communications-intensive techniques that emphasize knowledge generation

and dissemination, engagement, empowerment and trust. This somewhat contradicts the expectation that rigid and strictly-defined processes are a better fit for government due to its bureaucratic culture and its monitoring and audit constraints [25]. These studies all focus on e-government projects in North American and European public organizations, which begs the question whether their findings reflect the influence of organizational patterns specific to western bureaucracies, or if, alternatively, their conclusions can be extended to apply to requirements practices in government agencies based on different political traditions.

5 e-Government Problem Areas and their Relation to Requirements Practices

Although little explicit evaluation of the subject of requirements engineering for government technology solutions can be found (we identified and analyzed just a single-digit number of studies) some closely related themes have been researched. Areas such as business process re-engineering and management, project management, enterprise systems architecture and implementation, are pain points for e-government practitioners, which can be ameliorated with requirements, business analysis and business modeling activities.

Project management, for instance, can be considered to be a part of the overall topic group concerned with solution planning. Adherence to project management method prescriptions has been identified as a best practice, vital to the successful delivery of e-government services and to business process automations in government agencies. Sarantis et al. examine the most pervasive issues in project management in e-government and isolate some gaps in the application of certain conventional methods and best practices [2]. While they do not discuss requirements practices specifically, they conclude that traditional project management methods fail because they cannot accommodate the complex and highly emergent nature of e-government projects. Traditional methods focus typically on single episodes of requirements "gathering" at the beginning of a project, and generally provide little prescription for iterative (business) analysis, development and validation of requirements. As a result traditional project management is also deficient in its lack of proactive management of organizational change and of the transformative impacts of new information technologies.

E-government solutions are inherently transformative, or at a minimum they have the potential to change organizational processes and relationships with constituents. Hans Scholl treats e-government as a form of business process re-engineering [28]. He draws analogies between key principles outlined in business process change literature and those of e-government, and identifies a series of insights common to both fields. These include the necessary alignment of information systems design with business process (or organizational) design, the pre-requisite of cultural/social analysis for the analysis and formulation of technical solutions, the requirement for stakeholder consensus, and the need for cross-functional span of both technology and business flow. Such characteristics presuppose that a business process management framework inform and drive requirements practices. An additional implication is that requirements must be "developed," rather than merely "discovered", i.e. they must be formulated after the iterative elicitation and analysis of various stakeholder needs. Formulation (or re-formulation) of requirements must be further carried out with large-scale, and strategic foresight in mind.

The strategic approach to solution development is consistent with the recent public agency organizational trend towards enterprise information technology architecture, governance [4] and enterprise business process policies [29], which require that different business lines within an organization's operational scope function in a synchronized, incentive-driven, cross-engineered manner [30] so constituents can be presented with streamlined and simplified services. Enterprise systems issues in government agencies must be treated as a related theme to that of requirements practices, in that it is at requirements and design time when practitioners must make decisions about the organizational (and by extension societal) models which the technologies they introduce should drive and support [31]. Volkoff et al., for example, explain how technology structures the roles and everyday routines of an organization and thus embeds a "material aspect" [32]. Enterprise systems, the study posits, are known to be carriers of standard pre-defined routines, which impose a particular corporate organizational model, and thus are necessarily transformative. When one considers the procurement-driven nature of technology selection in public agencies, and the disproportionate amount of effort dedicated to administrative issues surrounding new technology acquisition, one realizes that the organizational models vendor-provided systems carry are rarely chosen after thorough business analysis and requirements elicitation. This may result in the cultural clash between new technology and its social environment, lack of technology acceptance, and wasted resources.

The enterprise approach necessitates that information systems features which support interactions with the public and across public agency units be aligned with the overall strategy of the organization, and with the current societal demands and priorities. Such strategic alignment is seldom carried out explicitly during requirements analysis and development, however, and a framework that combines business strategy modeling with systems requirements has been proposed by Bleistein, Cox and Verner to ameliorate potential tactics-to-strategy mismatches [33]. Their approach helps ensure that even low-level feature requirements can be validated for their synchronicity with high-level organizational strategy. Bleistein et al.'s study does not address the e-government domain specifically, but other

studies have highlighted the utility of business process and comprehensive organizational modeling in public agencies [34, 35].

Palkovits and Wimmer have argued that process modeling greatly assists the business process re-engineering of public administration by presenting a holistic picture and a meta-model of the e-government environment [35]. Application requirements can be derived and enriched through this type of model. Chourabi et al. correspondingly describe a technique for business process modeling that is said to improve the e-government requirements development process [36]. The authors elaborate on the benefits of formal modeling techniques for achieving a "common communications background" among project actors and stakeholders, especially where government processes are highly complex. Considering that stakeholder involvement and stakeholder requirement reconciliation are essential challenges for e-government, it is remarkable that modeling of the organizational and social environment of applications is so infrequently carried out. Similarly, models which attempt to assess and define the "public value" of e-government systems – from the level of individual requirements, to entire ecosystems of applications, are strongly needed to enable transparency in technology feature prioritization.

The common thread of the fore-mentioned studies is that requirements practices are of utmost importance in the development and implementation of e-government systems, as they promise a better fit of the systems and their context of use, and because they enable the resulting information solutions to achieve a transformative effect (often in the direction of achieving enterprise systems scope). The works cited also make the case for e-government-targeted frameworks, for example – a Business Process Management framework specific to the public sector [35], project management toolkits for government IT [2], etc., as the issues and challenges faced in government agencies differ substantially from those in the private sector.

6 Directions for Future Research

While the studies reviewed present an advancement in the understanding of requirements engineering practices, and requirements process dynamics in the context of e-government, a number of related issues remain without academic exploration and require further comprehensive research.

Analysis of the fundamental problem of how requirements engineering methods can incorporate "subject world" (or domain) specificity can produce insights into the potential of such methods for e-government. As the requirements engineering discipline has focused predominately on aspects of the software domain, some of its techniques may fall short, by failing to recognize critical elements of the e-government context. The requirements field has defined its constructs as more or less generic concepts and practices which can be applied to software (or engineering) problems that are common despite the particular context, or industry, or organizational situation they occur in. Bergman and his colleagues have recognized, however, the political nature of requirements, and have proposed the explicit modeling of the political ecology for any given requirements engineering effort [37]. Considering that "political" factors are one of the key distinguishing characteristics of the domain of public IT solutions management, such an approach may prove to be highly appropriate. Further investigation is needed to single out similar models and techniques in requirements engineering that are "e-government-friendly."

Next, the degree of utilization of formalized requirements methods, or of requirements management software tools, in government agencies has yet to be examined in an exhaustive, large-scale study. Attention should be given to the conditions in which requirements methods are applied, to the barriers for the establishment of requirements practices, and to the differences between agencies of different sizes, types, and regions in regards to requirements engineering adoption. Moreover, as of now, no direct analysis of the relationship between requirements practices utilization and the success rates of e-government projects has been conducted. The articles reviewed herein focused on individual case studies and did not apply a comparative approach in order to identify whether the application of particular requirements methods yielded more positive outcomes than other methods or approaches.

Another area of interest are the challenges faced by governments in legacy systems replacement projects. Legacy applications define a large proportion of government organizations' current business processes, and requirements for new solutions are often derived from these very legacy-dominated processes [38]. The direct automation of manual processes, or legacy processes, without any re-engineering has been referred to as "manumation" and can occur if requirements are not treated critically, that is without in-depth analysis and alignment to the organization's strategic goals [28], and if the new processes do not lead to a change in organizational structure and roles [4]. Determining whether (and how) the disciplined application of requirements methods can help distinguish essential business requirements from those originating in the constraints of older technologies will be of benefit to both e-government practitioners and requirements engineering researchers.

The selection, implementation and customization of commercial off-the-shelf software products (COTS) exemplify another trend in e-government practice, which calls for a specialized approach to requirements development. Requirements techniques have traditionally been applied to custom, or greenfield, application development. In the case of

COTS, however, requirements must be addressed differently, especially in regards to the interoperability and integrations with other COTS systems in use in the enterprise (which is the norm in many government organizations' IT environments). In fact, the problem of defining requirements for COTS has been highlighted currently as a prominent research theme in the requirements engineering discipline [38]. But it can be argued that the early requirements phases must be agnostic to the source of a new system, or application. The question whether requirements practices can assist government agencies to determine reliably in which cases to implement COTS, and when to dedicate time and resources to bespoke development is still an open one, that could be a fertile topic for research, leading to insights which help achieve much needed IT cost savings.

7 Conclusion

A review of research literature on topics related to requirements practices in the e-government domain has confirmed the premise that government organizations constitute a unique context for information solutions planning and development. While requirements methods are, in fact, used in public agencies, their use is sporadic, informal and not sufficiently documented and studied as the subject of academic inquiry. In-depth research into key aspects of requirements engineering practice in e-government is strongly needed, since essential business process analysis must take place in conjunction with requirements development, with the purpose of achieving public sector transformations aimed at improving government services and operations.

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eGovernment: An Administrative State's Perspective

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Abstract - *In today's virtual world, advanced information and communication technologies have changed how bureaucracies control or otherwise go about the business of government. Introducing information and communication technologies in governments has received a great deal of acceptance and opposition at the same time. Despite the fact that the United States government has adopted major modernization approaches to convert its traditional services into electronic, there exist barriers that seem to hinder such adoption. This paper provides the perspective of the US Administrative State on the development of electronic government initiatives. The paper describes the barriers contributing to limiting these initiatives possible success.*

Keywords: e-government; Transparency; Openness

1 Introduction

In the opening to his *Transparency and Open Government Memorandum*, President Barak Obama stated that "[m]y Administration is committed to creating an unprecedented level of openness in Government. We will work together to ensure the public trust and establish a system of transparency, public participation, and collaboration" [1]. Since the early days of his presidency, Mr. Obama has been ordering the executive agencies to embrace emerging technologies and engage the public. The underlying argument the President has been making is that the government doesn't know everything and the knowledge of citizens must be shared and become a part of the policy making process [2].

The question, then, has become *how emerging technologies would facilitate such an engagement and assist in fulfilling the presidential promise of establishing an open government*. This paper examines how information and communication technology (ICT) would promote the fulfillment of the President's three objectives on *Government's Transparency*, *Public Participation*, and *Collaboration*. This paper will also study the role of ICT in achieving the *Openness* that Mr. Obama envisions will foster democracy and stimulate both efficiency and effective in the government's agencies. The paper will then discuss potential barriers that are believed to hinder the role of ICT in facilitating the fulfillment of the President's vision.

2 The Role of ICT in Government's Transparency

The presidential memorandum sets the expectation, on a high level, to how the different government's agencies should perceive and act on establishing transparency. The underlying idea was to make information about how the government's different offices are doing *available* to the American citizens. Exposing the progress of the different offices to the public is fundamental to establishing accountability and hence holding such offices responsible for their duties towards the country and its citizens. Essentially, current information about spending, progress on different projects, and updated rules and regulations is made available to public to access, view, and download [3].

The advancement in ICT has been playing a core role in facilitating achieving the goal of establishing government transparency. Websites, such as USAspending.gov, RegInfo.gov, Data.gov, and Recovery.gov, provide a wealth of information about how the different executive departments spend the federally allocated budgets during a given fiscal year to the fullest details [3]. The performance of how government's actions are being reviewed and approved is made available through these internet websites. Due to the controversies associated with managing budgets and progress made on ICT projects, the executive office unprecedentedly established an IT Dashboard [4]. The IT Dashboard, which was implemented in June 2009, integrates the different agencies' databases into one consolidated view of the total Federal spending on the ICT projects and makes such information available for the public to review and inspect [3].

The President's objective of harnessing news technologies to promote transparency within the government's agencies was the subject of Section 206 of the Electronic Government Act of 2002 [5]. The purpose of this section of the Act is to "improve performance in the development and issuance of agency regulations by using information technology to increase access, accountability, and transparency". This section was crafted as a part of the Federal promotion of electronic government services.

3 The Role of ICT in Public Participation

President Obama's vision of expanding the public participation into the government's matters was attributed to the argument that the government doesn't know everything and the people's expertise must be part of the policy making process [3]. The pervasive nature of the internet makes it a powerful tool to disseminate information to the public instantaneously, conveniently, and with negligible cost associated. Today, the internet is more accessible than even and is uncontrollably integrated with people's lives. The trends in ICT fueled the internet expansion through the advancements in wireless and broadband connections. A survey conducted in 2009 showed that more than 74% of citizens in the US have an access to the internet [6]. Realizing this internet power, the President's call for a government that is open for the public participation is becoming increasingly realistic.

The internet is not only used to display to the public information and reports after an actual spending takes place, it also creates a platform for interactive communications between the government's agencies and the citizens. Using blogs, for example, government's officials can initiate interactive discussions with the public. Officials can also use YouTube to broadcast contents of meetings and conferences for more engagements with the mass. Broadcasts are powerful tools to open up the government's closed offices and literally show how meetings and discussions in a governmental setting would look like. A number of agencies are now open to and connected with the public through online social networks. The Departments of Justice and Defense, for example, have been present on Facebook, YouTube, MySpace, and Twitter [7].

The advancing ICT has also provided two types of interactive communications between the government and its citizens. It has provided the synchronous and the asynchronous communications. Although the asynchronous may be interactively slow, the two parties don't have to be online at the same time for the communication to take place. Email services and the various posts, for example, are powerful communication tools that promote and broaden the public participation in government. Section 206 of the Electronic Government Act of 2002 called for the government's agencies to "enhance public participation in Government by electronic means" [5].

4 The Role of ICT in Interdepartmental Collaboration

The third constituent of the Open Government envisioned by the President focuses on promoting the interdepartmental collaboration between the different government's agencies. An obvious outcome to collaboration is sharing the resources and hence reducing the agencies costs associated with the implementation of IT projects specifically. The US government has been adopting open source programs, for example, paving the road for a wider use of Web 2.0 platforms for both the individual agencies intranets and for the government's major websites mentioned earlier in this paper [2]. The use of open source application permits the reusability of such applications and the collaborative refinements and improvements of the shared applications.

Another example of the interdepartmental collaboration is the effort for consolidating a number of major datacenters in 2009 into two main centers, one on the East Coast and the other on the West Coast on the US. Establishing consolidated datacenters helped improve the overall operational availability of the various applications and also reduced the associated operational risk as more effort is put forward to run and maintain different datacenters [3]. A third example of how ICT has facilitated the interdepartmental collaboration was the creation of Aristotle by the Department of Defense (DoD). Aristotle is a collaborative networks used by scientists in military who may not be affiliated with the DoD [4].

The Electronic Government Act of 2002 repeatedly encouraged the interdepartmental collaboration and the use of technologies to promote such collaboration. In one occasion, the Act asked for promoting collaboration among agencies to "improve the service to citizens by integrating related functions, and in the use of internal electronic Government processes" [5]. In another occasion, the Act calls for the different agencies to collaborate to "enhance understanding of best practices and innovative approaches in acquiring, using, and managing information resources".

5 Barriers Affecting the use of ICT to Fulfill Governmental Opneness

Despite the growth and increasing adoption rate the internet has been receiving from both government's agencies and the public, there still exist a number of barriers that could hinder a true and complete implementation of President's Obama' vision of the open government. Introducing the IT Dashboard came with an intrinsic problem of keeping its underlying data accurate, complete, and up-to-date. The different agencies are requested to monthly update major projects' costs and schedules. This updation process is a complex one as it entails a careful integration, in terms of time and data contents, between the individual databases and the master database the IT Dashboard uses [4].

Another barrier that could impede the use of ICT to expand the open government is that there are many sources for government information located on many websites in different formats and with different meanings. Developing a comprehensive standard and a governance framework for the different governmental agencies to implement will be needed to ensure a consistent presentation of information across the different governmental portals [4]. Additionally, it was cited that the public finds it difficult, frustrating, and cumbersome to navigate across the fragmented governmental information portals. This is especially recognizable as more agencies adopt the use of information portal and dashboards. There is a clear need to centralize and present information in a manner that resembles the governmental hierarchies [8]. This presentation of information will assist citizens to roll-up as

needed to see consolidated view of information or to and drill-down to the lower level agencies and projects.

6 Conclusions

This paper examined how ICT would promote the fulfillment of the President's objectives on *Open Government*. This paper also studied the role of ICT in achieving the *Openness* that fosters democracy and stimulates both efficiency and effective in the government's agencies. The paper then discussed potential barriers that are believed to hinder the role of ICT in facilitating the fulfillment of the President's vision.

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A Service Oriented Product Line Architecture for E-Government

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Abstract *- The success of an e-government initiative depends on different factors such as economic strategies, countries political and decisions initiatives, etc. Also the siloed nature and technical aspects can hamper progress. We concentrate in this paper on architectural design of e/m-government systems according to a software engineering point of view which among all other considerations promises the success of the final e/m-government operational platform. We propose an architecture based on a systematic, large scale reuse which seems to be appropriate for the so many applications proposed as services to citizens in the context of e/m-government. We specifically adopt the Service Oriented Product Line approach. Existing e-government software architectures consider reuse but not large scale reuse as in Product Line Engineering which promises improvements in productivity, time-to-market, quality, and cost. The Service Oriented Architecture is adopted by a lot of e-government systems and SOPL takes the advantages of both SOA and PLE.*

Keywords: e/m-government architectures, large scale reuse, Service Oriented Product Line (SOPL), high level design.

1 Introduction

E-Government is much more than one simple Web site or portal providing E-Government services. It is a complex system providing an innumerable number of services which are addressed to millions of citizens and handle sensitive data. The establishment of an E-Government system requires, in addition to the adequate infrastructure and governmental strategies according to the countries (developed and/or developing), a software architecture which presents the necessary support for such system. A good design of this architecture guarantees the success of the system to be implemented. We concentrate in this paper on architectural design of e-government systems according to a software engineering point of view and we particularly propose an architecture model for E-Government systems with the focus on the production of services by applying a systematic, large scale reuse approach considering that the domain of E-Government is, in fact, a rich domain of administrative processes which share several common points. In fact, as mentioned in SAGA [1], the reusability is an essential characteristic in the development of governmental applications. However, this reusability, although recommended by the standards, can be more profitable by the adoption of a systematic, large scale reuse approach. Planning for the reuse must begin at the stage of construction of the software architecture of the system itself. We focus in this work on the application of the SOPL (Service Oriented Product Line) approach which promises improvements in productivity, time-to-market, quality, and cost. In section 2, we present our adopted architectural model for E-Government. In section 3, we develop the SOPL reuse based approach. Then, in section 4, we detail the back-end services layer of our architecture. The conclusion summarizes our work and presents our prospects for future work.

2 Architecture model for E-Government

With the aim of proposing an architecture model of E-Government systems, we studied a representative sample of E-Government architectures [2]. This study enabled us to better characterize these architectures and to propose, as shown in Figure 1, our architecture model for E-Government. This architecture is articulated in layers and particularly: the Front-end services layer, the Back-end services layer and the legacy systems layer. We denote EGL the E-Government layer which encapsulates the front-end service layer and the back-end layer.

2.1 The Front-end services layer

The Front-end represents the user interface of the E-Government system. This layer represents a portal including all the governmental services. This portal constitutes a single access point via the Web to the services intended for the users of this system. This portal offers, thus, public services available 24 /24 and being able to be reached of any place by supporting the criterion of mobility. The importance of this portal lies in its capacity to quickly integrate a new application managed by the administration.

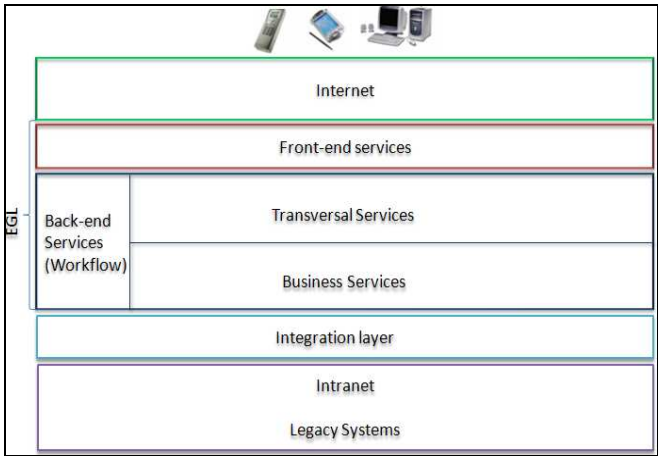

Figure 1: Architecture model for E-Government

2.2 The Back-end services layer

This layer encapsulates various workflow applications responsible for the execution of the workflows materializing the different services offered by the organization. These workflow applications are essentially composed of business services and of transversal services. Business services are the services which offer functionalities relative to the activities of the organization's business processes while transversal services are services present in all the applications such as the services of authentication or notification. A workflow application, as defined in [3], is the application which specifies all the tasks executed by the participants of a process. It defines also the order of execution of the tasks and the exchange of information among the participants. We chose in this work the application of the concepts of SOA for "Service Oriented Architecture" owing to the fact that the latter guarantees the communication and interoperability between the three layers as well as the communication with other systems. In addition, the similarities characterizing the business processes of the governmental services encourage us to use a systematic, large scale reuse approach for the development of these services. Thus, the combination of these two approaches appears promising. This leads us to the adoption of the SOPL approach that we will detail in section 3.

2.3 The legacy systems layer

The legacy systems layer represents the various information systems already implanted within the governmental organizations connected with Intranet networks. This layer is preceded by an integration layer including techniques allowing detection, extraction and integration of the functionalities of the old systems in order to be used in the workflow applications if needed.

3 The SOPL approach

SOPL is a recent approach introduced in a workshop entitled "*Service Oriented Architectures and Product Lines - What is the Connection?*" which was held at the 11th edition of the International Conference SPLC ("Software Product Line Confence") in 2007 [4], followed by a second workshop in 2008 entitled "*Service Oriented Architectures and Product Lines - Putting Both together?*" [5]. This approach is based on the concepts of SOA which offers an answer to the problems of heterogeneity and interoperability of systems. Nevertheless, this architecture does not take into account the changes which can occur for the services. Moreover, it does not have the necessary mechanisms for the identification of the services in the suitable level of granularity [6]. This led the research community in the area of software reuse to opt for the combination of SOA approach with PLE (Product Line Engineering) since the latter is essentially based on the analysis of variabilities and commonalities between a family of applications in a given domain. This promises improvements in productivity, time-to-market, quality, and cost [7]. This concern of integration of the two approaches has led to several studies of comparison [8, 9, 10, 11and 12] and of possibilities of combination of SOA and PLE [10, 13and 14]. To introduce the SOPL approach, we focus on the work of Medeiros & al [14] who presented the life cycle of a service line but they only detailed the domain engineering phase. Note also that even in the domain engineering phase, the steps were presented in a superfluous manner without going through some details such the step of the variability analysis of composite services. We tried in this work to deepen the steps of the domain engineering phase and to establish the steps of the application engineering phase and in the sequel our vision of the SOPL life cycle. We then apply the SOPL approach in the context of E-Government. As we already mentioned, this cycle is based on two phases:

- Phase1: The domain engineering phase that represents the development for reuse. As shown in Figure 2, this phase allows, first, identifying components, services and composite services candidates for reuse. Then there is a variability analysis step to identify and document the architectural decisions in terms of variability. Finally, the reference architecture is specified and assets base is constructed [14].

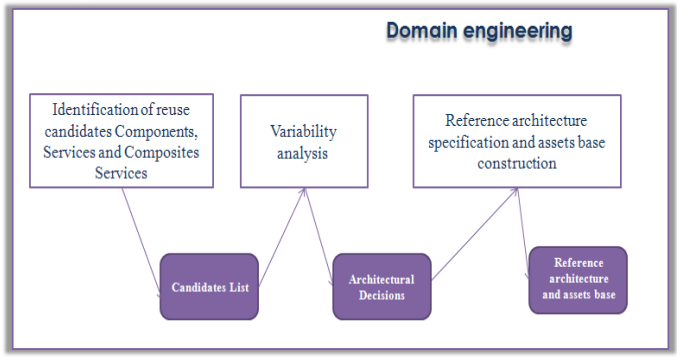

Figure 2: Steps of the domain engineering phase

- Phase2: The application engineering phase that represents the development by reuse. As shown in Figure 3, this phase selects the components, services and composite services specific to a product. These are then subject to a step of configuration and specialization in order to specify and build the product architecture. Note that the term product refers to a software product (or a specific E-Government service in our context).

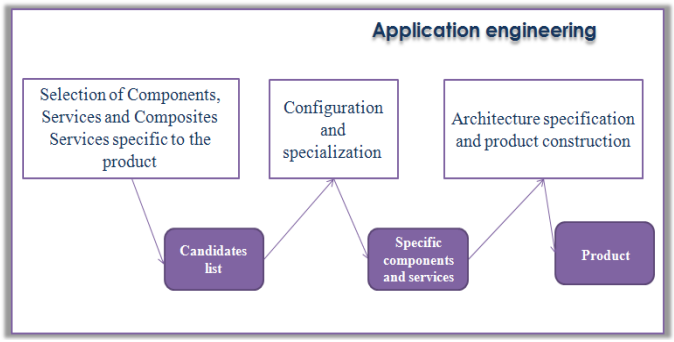

Figure 3: Steps of the application engineering phase

4 SOPL application in the Back-end services layer

Based on the SOA principles [15] and applying the SOPL life cycle steps, we propose, as shown in Figure 4, a reference architecture consisting of orchestrators, services and business components. This architecture is derived to result in workflow applications.

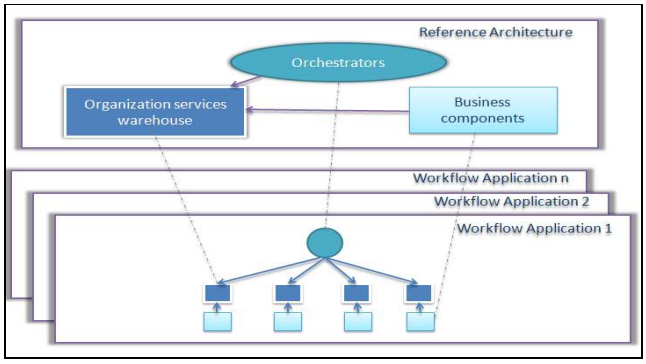

Figure 4: Services line components

4.1 Domain engineering

We chose to study a range of governmental services offered by the Tunisian Ministry of the interior and local development as the demand of National Identity Card (CIN), Passport and Bulletin n°3. As we already mentioned, this phase proceeds in three steps:

4.1.1 Candidates Identification

– Identification of reuse candidates components: to identify the reuse candidates components, we used the Feature Model [14], resulting from the application of the FODA method (Feature Oriented Domain Analysis) which is based on a hierarchy of composition of characteristics (functional, non functional or parameters) where some branches are mandatory, some are optional, and others are mutually exclusive [16]. From Figure 5 illustrating our Feature Model, we could identify 11 components candidates of reuse namely: “check identity”, “By Email”, “SMS”, “CIN Payment”, “Passport Payment”, “B3 Payment”, “passport loss”, “CIN loss”, “Passport Creation”, “CIN Creation” and “B3 Creation”.

– Identification of reuse candidates services: to identify the services candidates of reuse, we used the business processes materializing the studied governmental services [14]. This step enabled us to dress a list of services as “Creation”, “Demand for birth certificate”, “Demand for proof of residence”, “Demand for work certificate, “Authentication”, “Notification” and “Payment”.

– Identification of reuse candidates composite services: composite services are the orchestrators through which a business process is realized. We identify composite services to meet the architectural concept of separation between orchestration treatments and business treatments and especially to guarantee loose coupling between the basic services which is a fundamental principle in SOA.
Composite services can represent business processes or sub-business processes [14]. For our example, we could identify composite services including: “Demand for the first time”, “Demand for loss”, “Demand for modifications”.

4.1.2 Variability analysis

In what follows, we carry out an analysis of variability by analyzing the communalities and variabilities between the services and the components identified with the aim of reducing the list. The analysis of the communalities consists in comparing the functionalities of the services and components in order to gather those with a low variability [14]. Variability in this case can be managed according to one of the mechanisms of variability management.
In fact, variability is the capacity to change or to adapt the software systems and several mechanisms of variability management are present in the literature such as parameterization, the heritage, the information dissimulation, conditional compilation, the aspect oriented programming, etc.

– Components Variability analysis: when analyzed, the list of the already identified components enabled us to detect similarities between some of the components. For example, the two components “SMS” and “By Email” present many similarities and can be gathered to form only one component “Notification” with an internal variability managed with conditional compilation by declaring a constant “SendMail” which takes the value “true” or “false” according to the requirements of the product.

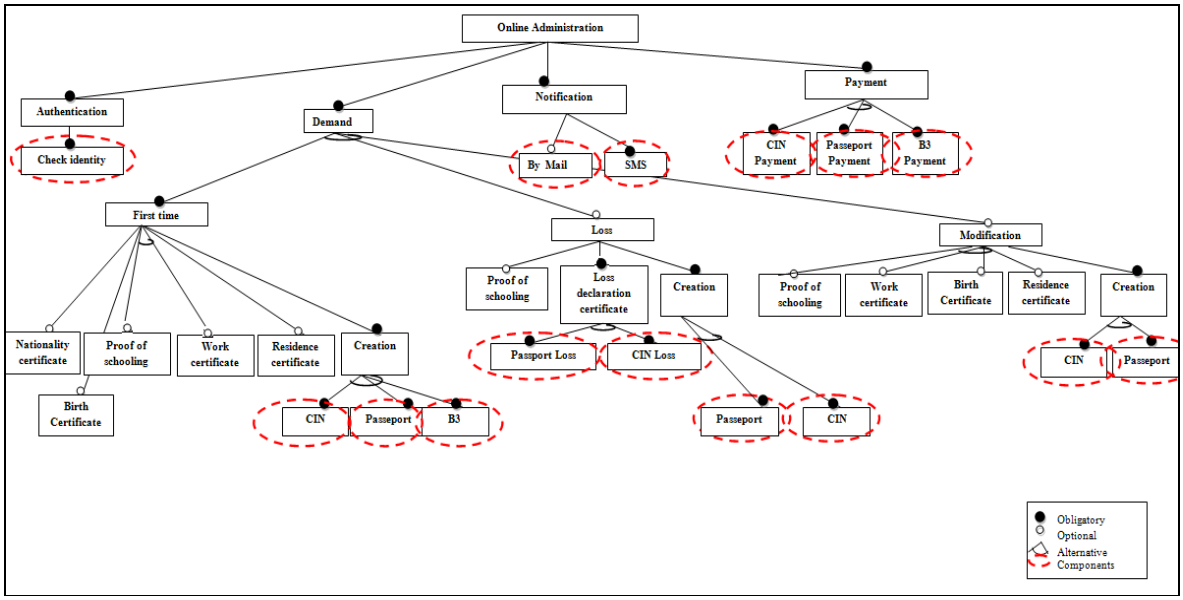

Figure 5: Feature Model of the online administration

For the components "CIN Payment", "Passport Payment" and "B3 Payment", the same treatments are carried out by the same actors with only one difference which is the type of paper to be paid. Therefore, the gathering of these three components in only one component "payment" having for parameter the type of paper to pay, is a possible solution.

The two components "Loss of passport" and "Loss of CIN" present the same treatments and are carried out by the same actors, it is thus better to gather them in the same component "declaration of loss" having for parameter the type of the lost paper.

For the last three components "CIN Creation", "Passport Creation" and "B3 Creation", these three components present as much similarities as variabilities.

The best mechanism to manage this variability is the heritage with a mother class "Creation" including all the similar treatments and three daughter classes with each one containing its specific treatments.

– Services variability analysis: Service variability is its capacity to be changed or configured for use in a particular context [17].

The services variability analysis consists in studying the functionalities of the services, their input and their output.

If some services share similarities, we can consider the gathering by using for example the mechanism of dissimulation of information and this, by keeping the same interface for several versions of a service and variability will be present in the various versions which implement the service. This mechanism ensures compliance with the SOA architectural concept of construction of services with high level interfaces.

By studying the list of the services candidates for reuse in our example, we notice that the entire services share neither functionality, neither input nor output. Thus, no gathering of services will be carried out.

– Composite services variability analysis: The variability of the composite services can be materialized in several forms. The variability can be present in the invocation of services which is focused, initially, on the selection of the service. This selection is carried out either during the development or during the execution [17].

The nature of the messages exchanged within the composite service, i.e. synchronous or asynchronous, can also lead to variability [17].

Variability for the composite services can also appear in the structure of the service. The structure of a composite service is, in fact, characterized by the tasks to be executed, the actors and the order of execution. All these elements are eligible candidates for variability [17].

The three composite services of our Services Line present many similarities, and this on the level of the tasks to be executed ("to fill form", "request for document in "proof of schooling" and "creation") and on the level of the order of execution of these tasks. Thus, it is preferable to gather the three composite services in only one service named "Demand_Orchestration".

4.1.3 Reference architecture specification and assets base construction

– Reference architecture specification: in this part, the reference architecture of the Services line is built while following the architectural decisions taken during the variability analysis step.

Architecture can be modeled according to several views [14], and in order for this to be done, we chose to use a modeling language such as UML 2.0 according to the approach of Ziadi [18] where the dependences of the architecture, for example, could be modeled in the form of a class diagram, illustrated in Figure 6, extended by stereotypes modeling the variability of our Services line.

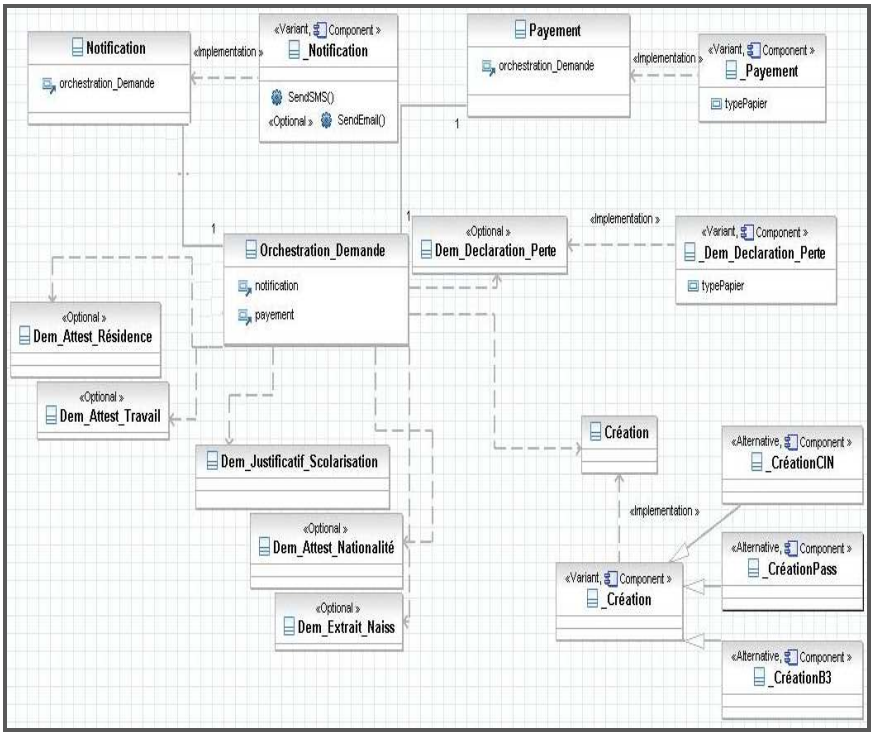

Figure 6: Dependences of the reference architecture

– Assets base construction: the assets base of our line contains all the components, services and composite services identified and analyzed in the preceding steps. To build our base, we used J2E (Java 2 Entreprise), the Web services technology and the BPEL language (*Business Process Language Execution*) for the development of the composite service "Demand_Orchestration".

4.2 Application Engineering

For our case study, we have three products to derive namely the "CIN", the "Passport" and the "Bulletin n°3" workflow applications.
For each one of these products, we applied the three steps of the domain engineering phase of the SOPL life cycle. We present in the sequel, the steps for the derivation of the "Passport" workflow application.

4.2.1 Selection of the candidates specific to the product

From the assets base of our Services line, we select the components, services and composite services necessary for the construction of the product "Passport":

- The selected composite service is: "Demand_Orchestration".
- The selected components are: "check Identity", "Notification", "Payment", "loss Declaration" and "Passport Creation".
- The selected services are: "Authentication", "Demand of proof of schooling", "Demand of loss declaration", "Demand of birth certificate", "Demand of residence certificate", "Demand of work certificate", "Notification", "Creation" and "Payment".

4.2.2 Configuration and specialization of the selected candidates

The configuration of the selected candidates is carried out at the time of the invocation for the components "Payment", "Loss declaration", for the service "Demand of loss declaration" and for the composite service "Demand_Orchestration". Specialization is necessary if we use mechanisms of variability management as conditional compilation. For example for the component "Notification", specialization is carried out by according the value "true" to the constant "SendMail" in conformity with the specifications of the product "passport".

4.2.3 Architecture specification and product construction

The specification of the architecture is carried out by instantiating the reference architecture and that by keeping only the components, services and composite services selected for a given product (software application). A checking of the coherence constraints stated in the domain engineering phase must be done to guarantee the conformity of the product architecture with the reference architecture. The specific architecture of the product "Passport", illustrated by the Figure 7, is built in conformity with the preceding steps.

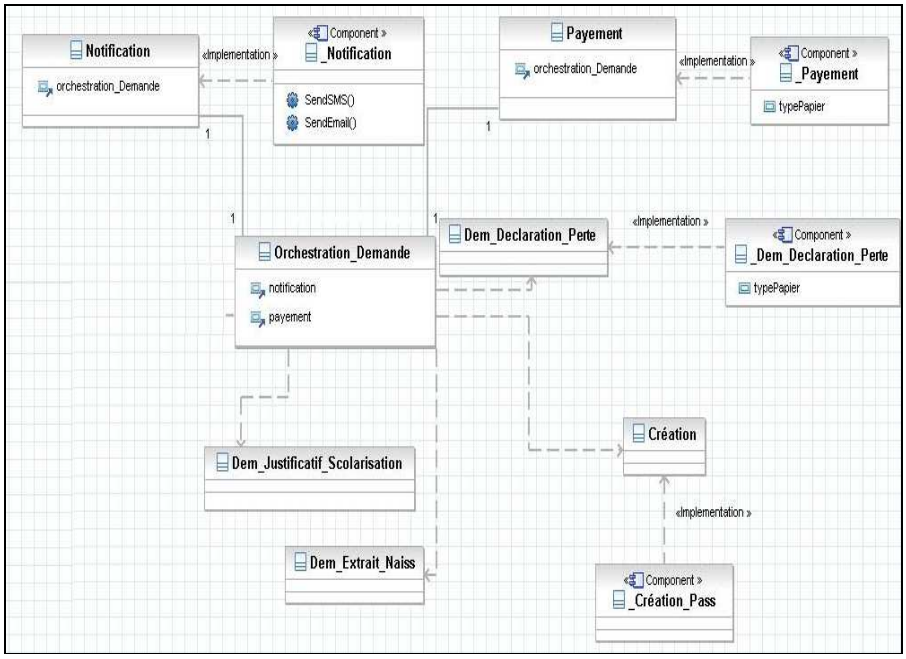

Figure 7: Specific architecture of the product "Passport"

5 Conclusion

The successful establishment of an E-Government system is certainly the result of a good design of its software architecture. We argue that other considerations such as economic strategies, countries political and decisions initiatives, countries readiness to citizen connectivity, governance, etc. are also very important factors for success. Our point of interest in this work concerns the software architecture of an E-Government system. In this paper, we have presented our proposed architectural model detailing its layers while being particularly interested in the back-end services layer. There, we have opted for the application of a systematic, large scale reuse approach for the production of these services. This will enhance reuse with different granularities, permit a better time to market specifically when faced to frequent changes in government laws, hence the need for new or adaptable e-government services (software applications). We have chosen to adopt the SOPL approach which combines between SOA architecture and Product Line Architecture. We have tried to enrich the SOPL life cycle phase's activities. This choice is motivated by our need for reuse and interoperability additionally with other quality attributes for E-Government architecture such as usability, scalability, security, transparency, legality, symmetry and responsibility. We have applied the SOPL life cycle on a case study in the domain of E-Government, a domain characterized by business processes sharing similarities, in order to test its feasibility. The perspectives of our work are to add security activities in the life cycle of the SOPL approach and to extend the number of family of services.

6 Acknowledgment

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"The impact on employment and the attraction of investment through the simulated establishment of online businesses by means of the internet portal of the Government of the State of Puebla, Mexico".

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Abstract - *Some transactional governmental services are now offered to citizens world-wide by means of the internet. Principally, these transactions consist of applications for birth certificates, tax payments, payments of fines, however, very rarely – or never – can someone incorporate a business by means of e-government services. Rare also, are cases in which the consequences of business incorporation can be evaluated through the internet – for example employment creation or the attraction of investments. With respect to business incorporation the internet portal of the government of the state of Puebla is of no help, since it must be done in person in every case.*

Keywords: Investment, electronic government, employment, business, incorporate.

1 Introduction

According to the "State Competitiveness Report-México 2008" issued by the Mexican Institute of Competitiveness, the State of Puebla lost two places compared to the 2006 Competitiveness Index, in other words, in the 2008 report Puebla occupied rank #26, while in the 2006 report it´s rank was 24.

In the 2008 study, in the chapter on "efficient and useful governments" it appears that in Mexico it takes 39 days to incorporate a business on average. The Mexican State with the best results is Nuevo Leon with 31 days, while in Puebla 46 days are required to establish a business. This chapter will evaluate government performance along the axes: (1) The cost of transactions and interaction with civil servants, (2) the quality of sectoral regulation and competitiveness promotion, (3) the sufficiency and efficiency of public finances.

The State of Puebla currently ranks 19% below the national average (46.3% of 100%) in the applicable chapter of the report "Efficient and Useful government" in other words: Puebla occupies place 25 of 32 position – even though there was any improvement of 31% in the reduction of the number of days needed for the incorporation of a business on a national scale – where 20 of the 32 states showed improvements.

The most dramatic aspect of the chapter on "Efficient and useful governments" is the fact that Puebla dropped from 2nd place to 25th place on a national level for lack of improvements and a very low number of positive reforms relative to transactions between business and government – especially when considering the number of days above the national average when opening a business and because also of the 58% increase in the cost of transaction fees charged by the government.

On the other hand, according to Puebla´s "State Development Plan 2005 – 2011, the agenda for efficiency, development and competitiveness of the State of Puebla" one of the principal topics related to competitiveness is that of improvements in the offer of public services in the context of the modernization of public administration.

In the formulation and follow-through of the competitiveness agenda, goals along five axis were established, among which axis two contains three important aspects for the improvement of the state´s competitiveness such as: the corruption index, the cost of e-government and the modernization of the Public Register. In axis three one finds ideas for the rapid incorporation of businesses, among others.

Having identified the above – mentioned factors, the best opportunities for the State of Puebla are in the area of improvements in the efficiencies and usefulness of government which of course, requires leading – edge administration and team work among the three branches of government.

For this reason the incorporation of information and communication technology to achieve the required improvements becomes evident. Those governments at the municipal, state or federal level which remain reluctant to use information and communication technologies (IT&C) in their services will find themselves at a distinct disadvantage when trying to improve their competitiveness [1].

2 Publications Review

The use of the internet as well as IT&C resources in different aspects of personal or organizational life has increased enormously in recent years. This is evident in the workplace, the way in which business is conducted, social life

and in government activities. At the pace in which electronic commerce has grown, so has electronic government , as well, grown in importance as well in recent years significantly changing the relationship between government and its citizens [2]. Governments worldwide are challenged by modernization and the transformation of their systems of transactions and administration [3] which, in turn has brought many governments to implement new bureaucratic models. Across the world there is a necessity to offer efficient governmental services to citizens and business organizations [4].

Electronic government is based on access to and delivery of services through the internet on the part of government for the benefit of citizens, companies, stockholders and employees [5].

Lara [6] defines electronic administration as the relationship of government to its citizens, with – and between functionaries, with company suppliers or other governments by means of internet-based data transfer or other digital means of communication designed to exchange information between the parties and/or provide a determinate public service.

To this end, many governments have opted for providing their services through their own internet portals in order to generate confidence among the users [7] as long as the model functions adequately for which it was planned.

Aydinli [8] recognizes that the needs of different demands on government services have increased notably, compelling government to be more efficient in the furnishing of its services placing greater emphasis on the use of IT&C.

One of the strategic objectives of electronic government is to provide services and support to business – but more importantly helping governments to achieve better governability with greater transparency in the use of public resources for their own economic development [9].

One of the services in great demand is an easy and flexible way to establish new companies by means of the internet. According to Bernhard [10] consequently this process must comply with certain social and economic objectives, outstanding among which is the attractiveness a country can have in attracting investment and start the operation of new business within the framework of public policy in association with the use of IT&C.

One indicator of the commitment toward competitiveness on the part of governments is the attraction of investment capital [11] but also the facilitation of transactions in support of companies and entrepreneurs [12].

In many European countries, the design and implementation of electronic government strategies provide a new vision for the entire public sector. It has frequently been suggested that electronic government should have the potential to transform the relationship between the state, the citizens and business. However as a great quantity of resources are invested in electronic government projects, the results or consequences of the implementation of these projects in terms of cost-benefit are frequently not clear or without evaluation [13] therefore many projects are announced with much pomp and circumstance within the framework of the "information society" while the potential impact of electronic government on society is underestimated.

Similarly, Schubert [14] argues that e-government has 2 dimensions: the first is related to giving an economy a legal frame of reference which is adequate to make e-business possible and the second is concerned with the cost-benefit relationship of government activities.

The IT&C and governability together will intelligent public policy have the potential to help government achieve its objectives. One form of evaluation of public policy project results is through cost-benefit analysis [15].

Derived from the above it is evident that a well-planned strategy for e-government will be the key element for a competitive economy capable of attracting business in the global market place as well as generating new solutions for economic development [16].

Basu [17], for his part, argues that the majority of developing nations do understand the enormous potential of IT&C, not only as a tool in improving governability, but also for employment creation and to facilitate the flow of direct investment.

In relation to the creation of employment opportunities, in the agenda of Lisbon for a European Union in March of 2000, the expansion of the use of IT&C was approved for the development of electronic government which in turn would be the key to permitting subsequent competitiveness, creation of employment and sustainable development [18].

In a similar vein, Janeth Caldow [19], Director of IBM's Institute for Electronic Government, mentions seven ways of success in e-government. In the second element she emphasizes that economic development should focus on the creation of employment and attracting new business through investment when a company contemplates moving its capital elsewhere, with the intent of establishing itself the e-government can be the determinative factor in attracting such capital in that companies demand governmental agility.

For the year 2005 investments and initiatives for the median term for the creation of e-government would be supported only if their effectiveness were to be clearly demonstrated and, according to Baptista [20], the effectiveness should not be calculated in quantitative terms according to self-created characteristics of a government. Therefore governments must abandon the idea of quantitative evaluation and focus on improving the quality of on line services and in person services to the general public.

Kearnes [21] assumes a contrary position, suggesting that the effectiveness and the success of e-government, must be measured by a set of complex criteria, such as: How to improve the delivery of delivered results (whatever they are) and a increased focus on new services that are needed, among others.

Considering all of the above, one could argue that the major part of the reviewed publications do not describe the way in which an evaluation is to be performed with respect to the economic impact of the establishment of new businesses by way of the internet, however, some social objectives of e-

government are recognized such as the creation of employment and investment attraction.

Lucio Picci [22] for his part, proposes a structural model for the quantitative evaluation of the economic impact of e-government. The model he proposes represents an advance over the narrative investigations conducted up to now in that it presents with clarity the relation between theory and obtained results.

The model constructed by Picci will form the basis for the development of a model which will permit the evaluation of the impact on labor-related aspects and the attraction of capital derived from the opening of businesses on line by means of the internet portal of the Government of the State of Puebla, Mexico.

3 Objectives, variables, hypotheses and data.

3.1 Objectives

The evaluation of the economic impact of a model for the establishment of companies by means of e-government in the State of Puebla, will be dual-track. The first will focus on the number of jobs created and the second will focus on new investments.

3.2 Variables

H Number of inhabitants of the State of Puebla

H_G Number of workers in the public sector of the State of Puebla

H_P Number of workers in the private sector of the State of Puebla

D Number of unemployed workers in the State of Puebla

FFL Number of persons outside the labor force in the State of Puebla

$\bar{H}_P$ Fixed proportion of workers in the private sector

SF Company-oriented services

SC Citizen-oriented services

Egob Over-all e-government after consideration of lag factors

CS Capital stock

AS Represents service life of capital goods

Inv Private Investment

K Private capital stock

Y_P Private production

KP Public sector capital stock

A Technology

3.2.1 Parameters

δ Persistence effect of employment in public administration on the private sector, $0< \delta <1$

ϕ Lag parameter of services dedicated toward companies

ξ Lag parameter of services dedicated toward citizens

π Effect of e-government on private sector employment

τ Rate of capital production

α, β, ν Elasticities in inputs for production with constant yields at a scale consistent with $\alpha + \beta + \nu = 1$

3.3 Hypotheses

H1. The establishment of companies on line by means of the Internet Portal of the State Government of Puebla will contribute to an increased attraction of additional investments [23] in Puebla, Mexico.

H2. The establishment on line of companies by means of the Internet Portal of the State Government of Puebla will contribute to employment creation [24].

3.4 Data

A database was established with reference to each of the six State-of-the State addresses of Puebla State Governor Mario Marín delivered during the years 2005 to 2010. The third axis, denominated: "Competitiveness and Progress" in each address lists the total of new companies created, investment captured as well as new employment created. It is important to point out that the data obtained refer to the creation of new companies by means of personal registry and not virtual, on line, registry.

4 Descriptive statistics

A In keeping with the analysis of the information contained in the Government's State-of-the State addresses one can argue that in the six years of the Marin administration 3 new enterprises were created with a value of $12,509'863,500.00 pesos creating in turn 11,107 new jobs.

The sectors which benefitted from the above-mentioned variables were: Food and beverages, automotive parts, construction, machinery assembly and equipment, basic metals, plastics, textiles, others, agribusiness, clothing and dresses, gas generation, chemicals, mining, non-metallic minerals, printing and associated industries, furniture and

related products, catle raising, paper industries and computer equipment production.

The average annual investment during this administration was $2,084'977,250.00 pesos, while the annual average of new businesses created was 19 and the average annual job creation was on the order of 1,851.

2006 was the year in which the most investment was generated and the most businesses were created: $4,315'113,200.00 pesos and 28 companies respectively.

2005 was the year with the highest job creation at a level of 3,577.

2009 was the year with the lowest resource generation at a level of only $156'408,900.00 pesos, while only 10 companies were founded with 486 jobs as can be seen in table 1.

TABLE 1

Business		Total investment (thousands mxp)		Jobs created	
Absolut	%	Absolut	%	Absolut	%
15	100%	$1,229,443.00	100%	3,577	100%
28	100%	$4,315,113.20	100%	2,919	100%
22	100%	$4,237,928.30	100%	2,204	100%
25	100.%	$1,705,058.00	100%	1,429	100%
10	100.%	$156,408.90	100%	486	100%
11	100.%	$865,912.10	100%	492	100%
111		$12,509,863.50		11,107	
AVERAGE	19	$2,084,977.25		1,851	
DEVIATION ESTÁNDAR	8	$1,771,467.06		1,275	
MAXIMUM	28	$4,315,113.20		3,577	
MINIMUM	10	$156,408.90		486	

5 Methodology

Before describing the model used for the simulation of the impact described above, it would be important to point out that the Development Plan of the State of Puebla for the period of 2005-2011 is characterized by five main axes upon which the development of the State is based. These 5 axes are: Puebla, State of Law and justice, the new generation of Government, Competitiveness Progress for everyone, Social Policy and the Fight against Poverty and Sustainable Regional Development. Axis number 3 has action plans which refer to the electronic creation of new companies.

In other words, the government of the State of Puebla does contemplate the development of a model for the creation of companies by means of its portal, but not the evaluation of any impact which it might have on the creation of employment or investment.

Picci states that there are opinions according to which IT&C's have a vast potential for improving public administration and can positively influence the economy and the society in turn.

These positive expectations for e-government are well founded but not supported by serious quantitative evaluation. Even if governments offer evaluations of e-governments policies they have to be taken with great caution because the experiences mentioned above demonstrate that good intentions are not sufficient to render good results [25].

In other words, therefore: how must governmental projects be evaluated? In every case, public policy makers must fulfill certain requirements which are expressed in generic terms, such as: "social cohesion" or "sustainable development".

Some problems appear because of the characteristics of IT&C's in that it is particularly difficult to quantify the magnitude of the information society and if one adds to that the lack of historical records of e-government, one cannot apply quantitative methods such as inferential statistics: simply stated, there are no historical data upon which to base a statistical model. However, one can apply econometrics as a comparative medium of a previous situation and a present/future situation.

The model will represent important variables to relate to them those different properties and characteristics important to public administration, of the policies adopted by the e-government of the State of Puebla, and the existent relations, relative to the variables of employment. According to Picci [26] one utilizes a structural method, that is: one uses a system of equations, each of which trying to quantify important aspects of the relationships between the policies of e-government public administration and relations which are external to them.

For example:

The labor force of the private sector in the State of Puebla there is a certain number of inhabitants (H) another number of persons are employed in public administration (Hg) another number are employed in the private sector (Hp) and a certain number in unemployed but are part of the labor force (D) and FFL who are not part of the labor force.

$$H = H_G + H_P + D + FFL \quad (1)$$

One supposes that it is a variable given and constant throughout time. Therefore the employees in the private sector would be:

$$H_{P_t} = \bar{H}_P - \sum_{j=0}^{\infty}\left(1+\delta^j\right)\Delta H_{G,t-j} + \sum_{j=0}^{k}\phi_j SF_{t-j} + \sum_{j=0}^{h}\xi_j SC_{t-j} + \pi Egob \quad (2)$$

Formation of capital stock

Capital stock would be the result of the accumulation of investment flows-whether past or present. The relation would be:

$$CS_t = \sum_{j=0}^{AS} Inv_{t-j} \quad (3)$$

An adjustment mechanism guarantees a constant ratio between the private capital of the State of Puebla and the production of the State of Puebla, followed by acceleration mechanism for capital investment.

$$K_t = \tau Y_{P,t-1} \quad (4)$$

Formation of private production.

The formation of production on the part of the private sector is achieved through a production function of the Cobb-Douglas type in the following manner:

$$Y_P = AK^{\alpha}KP^{\beta}H_P^{\nu} \quad (5)$$

6 Conclusions

It is important to emphasize that this investigation in partial in nature (a working paper) and only considered data related to the opening of businesses in person-to-person transactions, however a theoretical model for the use of these data is being proposed by way of a simulation process one may obtain data relative to the probable opening of businesses via e-government.

The model developed for the evaluation of the performance of e-government in the State of Puebla is a tool which will permit an improvement in the competitiveness generated by different institutions.

For public policy makers alike it is of fundamental importance to recognize the different scenarios which may present themselves in the simulation of government processes.

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SESSION

E-BUSINESS

Chair(s)

TBA

On the e-valuation of certain e-business strategies on firm performance by adaptive algorithmic modeling: An alternative strategic managerial approach

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Abstract

This paper describes an innovative adaptive algorithmic modeling approach, for solving a wide class of e-business and strategic management problems under uncertainty conditions. The proposed methodology is based on basic ideas and concepts of four key-field interrelated science, i.e. Computing Science, Applied Mathematics, Management Sciences and Economic Sciences. Furthermore, the fundamental scientific concepts of adaptability and uncertainty are shown to play a critical role of major importance for a (near) optimum solution of a class of complex e-business/services and strategic management problems. Two characteristic case studies, namely measuring e-business performance under certain environmental pressures and organizational constraints and describing the relationships between technology, innovation and firm performance, are considered as effective applications of the proposed adaptive algorithmic modeling approach. A theoretical time-dependent model for the evaluation of firm e-business performances is also proposed.

Key-words and phrases: *adaptive algorithms, algorithmic modeling, e-business problems, e-service strategy management methodologies, hybrid algorithmic modeling, strategy management (SM) methodologies, time-dependent performance evaluation model*

1. Introduction

A physical (computational) problem can be e-solved by constructing three distinct simulation stages, namely the mathematical model, the numerical model and the computational model. The mathematical model contains corresponding mathematical expressions/equations (mainly non-linear PDE's), the numerical model contains simplified numerical expressions/equations, while the computational model contains the corresponding code (program). By executing this program we can obtain an (approximate) solution of the original problem, provided that this solution satisfies certain conditions set in the successive stages. The first stage can be achieved by using the process of mathematical modeling, the second one by using computational methods and algorithms, while the final stage by using programming techniques.

The algorithms can be easily converted in the so-called 'pseudo-algorithmic' form, that is also called 'pseudoalgorithm' or 'pseudocode'. A 'pseudocode' (derived from the words pseudo and code) is a description of a computer programming algorithm that uses the structural conventions of programming languages, but omits detailed programming elements as subroutines or language-specific syntax. It can also refer to a high level language whose aim is to generalise the logic and program flow of a computer program.

Every pseudocode can be described by a general type template including the following: (i) a characteristic name followed by a series of input/output parameters, (ii) the purpose of the algorithm, (iii) the input parameters (data), (iv) the output parameters (results), (v) the computational procedure with successive computational steps.

In view of these facts the usage of the pseudoalgorithms, with their previously mentioned advantages in section 1 and the additional important features of compactness, adaptiveness and incorporation of singular parameters that allow the computation of (near) optimum solutions, can be extended for the efficient solution of E-Business and Strategic Management (SM) problems and in a wide area of corresponding applications, a part of which is presented in the references and bibliography section [2, 3, 5, 7, 13, 14, 24, 29, 32, 33].

In this section the important issues of adaptive algorithmic approach and singular perturbation concept for e-business problems and

strategic management methodologies in various Digital Information Management (DIM) applications including e-services, are synoptically presented. Certain e-business technologies and performance indicators are also described.

The Algorithmic Approach

The basic concepts of the adaptive algorithmic approach on e-business problems and strategic management methodologies have been recently presented in [17, 18, 19, 20]. It is known that an algorithm can be simply defined as a finite set of rules which leads to a sequence of operations for solving specific types of problems, with the following five important characteristic features: *finiteness, definiteness, input, output and effectiveness,* as described in [15]. The algorithms can be easily presented by the so-called *'pseudo-algorithmic*' form, that is also called '*pseudoalgorithm*' or '*pseudocode*' in the case of preparation computer programs/codes.

In view of these facts the usage of the adaptive algorithms, with their previously mentioned advantages and the additional important features of compactness, adaptiveness and incorporation of singular parameters that allow the computation of (near) optimum solutions, can be extended for the efficient solution of e-business and SM problems and in a wide area of corresponding applications, a part of which is presented in the references and bibliography section [4, 6, 7, 8, 9, 12, 13, 22, 23, 29, 31, 32].

The term '*adaptive algorithm*' denotes here an algorithm which changes its behavior based on the available resources. The adaptive algorithm functions provide a way to indicate the user's choice of adaptive algorithm and let the user specify certain properties of the algorithm. The concept of adaptive algorithm is closely related to the corresponding concept of *'adaptive'* or *'variable'* choices of the parameters (input elements) of the algorithm. Adaptive algorithms are algorithms that adapt to contention, often have adjustable steps that repeat (iterate) or require decisions (logic or comparison) until the task is completed, are simple and easy to program. The general technique of adapting simple algorithmic methods to work efficiently on difficult parts of complex computational problems can be a powerful one in the algorithm design, evaluation and practice [1, 2, 3, 10, 11, 16, 24, 28, 33].

The Singular Perturbation Concept

During the last decades research has been directed in the study of a class of initial/boundary-value problems and the behaviour of the approximate solutions of the resulting linear systems by considering a small positive perturbation parameter, affecting the derivative of highest order, cf. [30, 21]. The singular perturbation (sp) parameters have been firstly used by Tikhonov [30] for solving numerically certain classes of initial/boundary value problems. Following this approach, a class of generalized fully parameterized singularly perturbed (sp) non-linear initial and boundary value problems can be considered and the way that the sp parameters variation affects their numerical solution can be studied [21].

In this article we show that suitable adaptive algorithmic procedures can be efficiently used for solving a wide class of complex computational problems, including e-business and strategic Management problems. Furthermore, we point out that the selective usage of both algorithmic and sp-concepts, i.e. the usage of adaptive algorithms in combination with the dynamical choice of sp-parameters, can lead to (near) optimized solutions. The applicability of the proposed adaptive algorithmic approach and sp-concept methodology is demonstrated by considering characteristic case studies in e-business problems and related applications.

e-business technologies and performance indicators

Most of the organizations using internet based technologies adopt several or all of the following e-business technologies:

Online purchasing; Online sales,
Enterprise resource planning (ERP) system,
Customer relationship management (CRM) system,
E-learning; Knowledge management system (KMS),
Supply chain management (SCM) system.

The e-Business Market W@tch is a large scale observatory, initiated by the European Commission DG Enterprise and Industry, focused on monitoring the adoption, development, impact of electronic business practices in different sectors of European Economy. Its main purpose is to provide reliable and consistent empirical information about the extent, scope and several factors affecting the e-business development speed at the sector level in an internationally comparative framework [14, 10, 11].

The main performance indicators of a company may include the following seven binary (yes or no) variables [14]:

Profit; Turnover increase; Turnover unchanged; Turnover decrease

Employment unchanged; Employment increased; Employment decreased.

Further information about e-business technologies and performance indicators and related matters can be found in recent papers [14, 8, 2, 3, 5, 6, 7, 26, 27, 28, 29, 31].

2. On the measurement of organizational performance and how technological innovations can affect firm performance

The subject of measuring organizational performance and the metrics of strategic management research methodologies, where the organizational financial performance is the critical issue, is an interesting new field of research study [29,23,24]. In particular the computation of the considered *best* performance measures in the fields of strategic management, e-business and entrepreneurship, finance and organizational theory, is a challenging field of research [3, 4, 6, 9, 10, 11, 27, 33].

In the following section our proposed adaptive algorithmic approach will be applied for computing the performance evaluation measures of characteristic e-business problems and strategic management methodologies.

Measuring Organizational Performance

An overview of a model of organizational financial performance has been presented (Carton & Hofer-2006 [3]) in order to determine which financial measures discriminate between high and low performing firms.

The value of managerial beliefs in turbulent environments, with emphasis to managerial orientation and e-business advantage, is described in a conceptual model of a recent research study (Coltman et al, 2008) [8]. The way that certain managerial beliefs influence the quality of firm performance in a turbulent environment based on e-business is investigated and their effect on firm performance is computed by using a sample of 293 firms. It was found that managerial beliefs have a significant positive effect on firm performance. Furthermore, the affect of e-business on firm performance is shown to be not structural, but is reflecting of the strength of the managerial beliefs. The term *managerial belief* represents an aggregate of interrelated information about the perceived value of e-business and the strength of managerial beliefs with resulting strategic orientation could be effective.

The proposed model uses as information criteria the following four distinctive segments: (i) *segment 1:* the highest performing group, firms are most affected by pressure to move online and managerial beliefs, (ii) *segment 2:* firms are driven almost exclusively by current e-business reality and an ability to overcome operational implementation issues, such as network performance, info security, customer privacy, special protection, (iii) *segment 3:* although the direct effect of pressure to move online is insignificant and managerial beliefs are strong, (iv) *segment 4:* the role of managerial beliefs becomes less relevant within environments, where there is a dominant mode of operation, the skills sets are well defined and the organizational imperative is clearly understood [8].

How technological innovations can affect firm performance?

The relationships between technology, innovation and firm performance, with evidence from e-business in Europe have been presented in Koellinger's recent study (Koellinger, 2008). The relationships between the usage of Internet based technologies, different types of innovation and performance at the firm level by using data for the empirical investigations from a sample of 7302 European enterprises, are positively associated with turnover and employment growth.

The importance of new technologies and innovative practices for competitiveness and growth is well known to managers, policy makers and researchers. It is of major importance to know which different types of innovative activities and technologies, in particular information and communication technologies, are most clearly associated with improved competitiveness and growth.

The organization performance can be measured in terms of turnover development, employment development and profitability of the company. The innovative activities can be classified into four different types, i.e. product/process innovations enabled by internet [and computer network principles] based technologies (e-business technologies) and product/process innovations not related to the use of internet based technologies.

According to the economic theory the performance outcomes depend mainly on the following factors:

(i) type of innovation; (ii) intensity of competition
(iii) timing of innovation; (iv) price elasticity of demand
(v) absolute size of the market
(vi) negotiation power of the innovating firm and suppliers/customers

The innovative practices can be combined by various appropriate tactics, such as secrecy, patents, lead-time, particular sales and service efforts, fit of technology related innovations and complementary assets of the firm (Teece, 2006).

It has been reported that there are also other influential factors (determinants) for the organizational performance, such as (i) the market in which firms operate, (ii) presence of economies of scale and size of the firms, (iii) market share and market structure, (iv) firm internal structures and resources, (v) organizational structure, (vi) human

resources, (vii) managerial competence (Lenz, 1981, Dunne et al. 1989).

Several models have been proposed for computing the firm performance. In such a simple model the performance $y_{i,j}$ of a firm i in a market j is defined as a function of several firm specific characteristics, i.e.

$$y_{i,j} = f(x_{i,j}, u_j, \varepsilon_{i,j}), \quad (2.1)$$

where $x_{i,j}$ includes several observable firm characteristics for a market j, while the index i corresponds to innovation activities (i=1), firm size (i=2), market share (i=3), employees with university degree (i=4), number of e-business technologies in the firm (i=5). The u_j depends on unobservable market and $\varepsilon_{i,j}$ depends on unobservable firm effects (Koellinger, 2008) [14].

The e-Business Market W@tch database was used on randomly selected firms from 10 sectors (i.e. textile, chemicals, electronics, transport equipment, trade and crafts, retail, tourism, ICT services, health services, business services) and 25 European countries [14].

The efficient solution of certain classes of e-business problems in a wide area of related applications and the evaluation of e-business strategies on firm performance can be obtained by following certain strategic planning methodologies, performance evaluation models using selected performance measurement variables and corresponding mathematical models [26, 27, 24, 25].

3. The Adaptive Algorithmic Approach for e-business strategies

In order to demonstrate both the flexibility and efficiency our proposed adaptive algorithmic approach, we consider in this section certain characteristic case studies concerning respectively the following e-business problems and Strategic Management applications in Digital Information Management methodologies and the so-called *Smart Environments*:

(i) Measuring Organizational Performance (Coltman et al, 2008 [8] and

(ii) How technological innovations can affect firm performance? (Koellinger, 2008) [14].

Case Study 1: *Measuring Organizational Performance*

A conceptual model for the computation of the organizational performance has been proposed by Coltman et al, 2008 [8]. The proposed conceptual model, computing methodology and the measures of managerial belief systems affecting the e-business performance including certain environmental pressures and organizational constraints are shown in the following adaptive pseudoalgorithmic scheme:

Algorithm MBS-EBP (OCC, EXE, MBE, EBUP, EPOC-MMB)

Purpose: This algorithm describe the measures of managerial belief systems affecting the e-business performance including certain environmental pressures and organizational constraints

Input: organizational conditions and constraints OCC, external environment EXE, managerial beliefs MBE, e-business unit performance EBUP

Output: environmental pressures and organizational constraints combined with the measures of managerial beliefs affecting the e-business performance (EPOC-MMB)

Computational procedure:

Step 1: consider the organizational conditions and constraints OCC (FECO, OITC)

Step 1.1: consider the feasibility constraints FECO (NBS, FC-CDM-CWI, OIeB)

Step 1.1.1: consider organizational inertia (new business strategies) (NBS)

Step 1.1.2: consider financial constraints (cost of infrastructure, cost of IT personnel), customer data management and customer web interaction (FC-CDM-CWI)

Step 1.1.3: consider operational implementation issues of e-business (network performance, info security, customer privacy, protective measures) (OIeB)

Step 1.2: consider the organizational IT conditions OITC (BUKH, CITI, CLOL)

Step 1.2.1: check business unit know-how (BUKH)

Step 1.2.2: check IT infrastructure (CITI)

Step 1.2.3: check level of online (CLOL)

Step 2: consider external environment EXE (MTPO, EPMO)

Step 2.1: determine market/technological pressures to move online (MTPO)

Step 2.2: determine environmental pressures to move online (EPMO)

Step 3: consider managerial beliefs MBE (CSF, RPC, NVC, JPP, LVF)

Step 3.1: current competitive standing of firm (CSF)

Step 3.2: relations with major partners/ customers (RPC)

Step 3.3: creation of new value for partners/ customers (NVC)

Step 3.4: opportunities of creating joint profit with partners (JPP)

Step 3.5: long run value of the firm (LVF)

Step 4: consider e-business unit performance EBUP (FIPE, OSPE)

Step 4.1: consider financial performance FIPE (RIN, MAS, AGR, TSA, ROC)

Step 4.1.1: return of investment (RIN)

Step 4.1.2: market share (MAS)

Step 4.1.3: annual growth in revenue (AGR)

Step 4.1.4: total sales (TSA)

Step 4.1.5: reduction in operating and production costs (ROC)

Step 4.2: consider operational and strategic performance for the ability of e-business to- OSPE (NCI, MPC, WOF, BMF, GPC)

Step 4.2.1: offer new customer insights (NCI)

Step 4.2.2: target the most profitable customers (MPC)

Step 4.2.3: work faster (WOF)

Step 4.2.4: be more flexible (BMF)

Step 4.2.5: have greater precision and control (GPC)

Step 5: Use the proposed model and present the environmental pressures and organizational constraints combined with the measures of managerial beliefs affecting the e-business performance (EPOC-MMB)

The algorithm MBS-EBP can provide certain measures of managerial belief systems affecting the e-business performance including certain environmental pressures and organizational constraints.

It should be noted that in the framework of our proposed algorithmic approach the given pseudo-algorithms describe the corresponding successive algorithmic steps in a general descriptive form and each of the used input (output) parameter variable names, depending on the complexity of the original considered problem, could be a (complex) computational procedure or a set of such computational procedures, which in turn may contain several other related computational modules and sub-modules that can be further refined.

Case Study 2: *Relationships between Technology, Innovation and Performance*

Certain relationships between technology, innovation and firm performance, with evidence from e-business in Europe have been presented by Koellinger 2008 [14]. The relationships between the usage of Internet based technologies, different types of innovation and performance at the firm level by using data for the empirical investigations from a sample of European enterprises, are positively associated with turnover and employment growth.

The relationships between technology, innovation and firm performance (which can be measured in terms of profitability and growth of the firm) are shown in an adaptive algorithmic scheme.

In order to demonstrate the flexibility and efficiency of both *adaptability* (algorithmic theory) and *uncertainty* (singular perturbation theory) several sp-parameters at first step-level have been used in the following adaptive algorithm leading to an (near) optimized determination of the required relationships between technology, innovation and firm performance:

Algorithm ORETI-FIR (ε_{FP} FPO, ε_{FI} FIF, ε_{FE} FEF, ε_{UF} RTIFP)

Purpose: this algorithm describe the relationships between technology, innovation and firm performance

Input: main factors of performance outcomes FPO, Firm Internal Factors (FIF), Firm External Factors (FEF), sp-parameters ε_{FP}, ε_{FI}, ε_{FE}

Output: (Near) optimized relationships between technology, innovation and firm performance (ε_{UF} RTIFP)

Computational Procedure:

Step 1: Determine the sp-parameter values ε_{FP}, ε_{FI}, ε_{FE}

Step 2: Consider the main factors of performance outcomes ε_{FP}FPO (TYIN, INCO, TIIN, PEOD, ASMA, NPIFS)

Step 2.1: type of innovation (TYIN)

Step 2.2: intensity of competition (INCO)

Step 2.3: timing of innovation (TIIN)

Step 2.4: price elasticity of demand (PEOD)

Step 2.5: absolute size of the market (ASMA)

Step 2.6: negotiation power of the innovating firm and suppliers/customers (NPIFS)

Step 3: Consider the Firm-internal factors ε_{FI} FIF (FSR, APT)

Step 3.1: consider Firm-specific resources FSR (TEC, INN, PER)

Step 3.1.1: Technology (TEC)

Step 3.1.2: Innovation (INN)

Step 3.1.3: Performance (PER)

Step 3.2: consider the appropriate tactics APT (SEC, PAT, LTI, SSE, CAS)

Step 3.2.1: Secrecy (SEC)

Step 3.2.2: patents (PAT)

Step 3.2.3: lead-time (LTI)

Step 3.2.4: sales and service efforts (SSE)

Step 3.2.5: complementary assets (CAS)

Step 4: Consider the Firm-external factors ε_{FE} FEF (MRE)

Step 4.1: consider the market reactions MRE (COM, CUS, SUP)

Step 4.1.1: check competitors (COM)

Step 4.1.2: check customers (CUS)

Step 4.1.3: check suppliers (SUP)

Step 5: Determine the sp-parameter (uncertainty factor) value ε_{UF} and form the requested relationships between technology, innovation and firm performance ε_{UF} RTIFP

The values of the singular perturbation parameters affecting the corresponding input variables of the optimized algorithm ORETI-FIR can be determined experimentally or approximately from corresponding proper mathematical models. Note that the algorithms ORETI-FIR can be considered as special case of the algorithm RETI-FIR for the choice of sp-parameters $\varepsilon_{FP} = \varepsilon_{FI} = \varepsilon_{FE} = 1$. The adaptive algorithm ORETI-FIR can provide certain optimized relationships between technology, innovation and firm performance.

It should be noted that a positive feedback mechanism may be activated between technology investments, innovation potentials and performance (algorithmic steps 3.1.1, 3.1.2 and 3.1.3) (Koellinger, 2008) [14].

4. A time-dependent model for the evaluation of a firm e-business performance

Since the repetitive computational procedure for the evaluation of e-business Performance P over a certain period of time is by nature a time-dependent problem, the following conceptual model for computing the performance P, can be proposed:

$$\partial P_{i,j}^{(t)} / \partial t = f(m_{i,j}^{t}, u_{i,j}^{t}, e_{i,j}^{t}) - P_{i,j}^{(t)} + Q_{i,j}^{(t)}, \quad 0<t\leq T \quad (4.1)$$

where i=1,2,…, N, j=1,2,…, J, with N the number of heterogeneous firms and J the number of different markets.

The performance $P \equiv P_{i,j}^{(t)}$ is a function of the independent variables, namely the observable firm characteristics m, and the unobservable error terms u and e. Specifically, $m_{i,j}^{t}$ includes several observable firm characteristics for a market j, while the index i corresponds to innovation activities (i=1), firm size (i=2), market share (i=3), employees with university degree (i=4), number of e-business technologies in the firm (i=5), over a certain time-period t.

The unobservable error term u_j is equal for all firms operating in market j (but they can vary and can be dependent on the firm specific effect $e_{i,j}^{t}$). The unobservable error term $e_{i,j}^{t}$ captures all relevant firm specific unobserved effects, is independent of all observable factors $m_{i,j}^{t}$ by assumption, on certain time-period t, while Q is a source term (with Q=0 when t=0). In the case that t=0 (steady-state) the proposed firm performance model (3.1) reduces to a static model of firm performance (Koellinger, 2008) [14].

The efficiency and validation of the proposed theoretical time-dependent performance evaluation model requires further empirical evidence from a class of e-business organizations and extensive numerical experimentation with corresponding statistical analysis for computing the firm performances.

By considering the evaluation of a firm e-business performance as a time-dependent problem the investigation of the performance stability over a certain period of time, seems to be a challenging future research problem.

5. Conclusions

This research work was based on key-field concepts of three interrelated sciences, i.e. Computer Science (adaptive algorithmic theory), Applied Mathematics (singular perturbation theory and partial differential equations) and Management Science (strategic management and e-business).

The adaptive dynamic algorithmic approach and singular perturbation concept have been applied for solving efficiently several e-business problems. A class of characteristic case studies has been presented and their corresponding adaptive algorithmic schemes are given. Furthermore, the adaptability and compactness of the proposed algorithms through the choice of singular perturbation parameters lead to an (near) optimum solution of the considered e-business performance case studies.

It is envisaged that future empirical evidence from the proposed e-business adaptive algorithms by using the extensive numerical experimentation and corresponding statistical analysis will show the full advantages of the adaptive algorithmic modelling and the relationships between e-technology, product and process innovations and e-business performance. The study of the stability of e-business and e-services performance could be also a significant related research topic.

The choice of the singular perturbation parameters, leading to efficient solutions, is an interesting *open problem* of future research work.

The proper choice is closely related to both quantitative and qualitative nature of the input parameters (data) of the given problems and their corresponding dynamical algorithms can lead to (near) optimum solutions of a wide area of e-business problems, e-services and related applications.

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OPTIMISING PERFORMANCE WITH BUSINESS INTELLIGENCE

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Abstract - *Today, BI systems and applications, which generate information and knowledge from the data in information systems, are a priority for companies called upon to invest in ICT technologies that can contribute to the implementation of an effective competitive strategy determine a change in the processes and culture of a business. After defining the concept of Business Intelligence, this work attempts to explain how it is different from Knowledge Management by highlighting its structural characteristics. It illustrates the types of BI that can be applied, discussing benefits and strategies. Finally, it lists the critical success factors and their evolution in relation to the availability of technologies capable of integrating data and text.*

Keywords: *Business Intelligence, Knowledge Management*

1 Introduction

In the early 1970s, decision-support systems were the first applications designed to support decision making. They were a contrast to transaction-processing or operational applications, such as order entry, inventory control, and payroll systems. Over the years, various decision-support applications—executive information, online analytical processing (OLAP), and predictive analytics— have emerged and expanded the decision- support domain. In the early 1990s, Howard Dressner, then an analyst at the Gartner Group, coined the term business intelligence. BI is now widely used, especially in the world of practice, to describe analytic applications. BI is currently the top-most priority of many chief information officers.

The progressive digitalization of processes and information, the availability of increasingly powerful and less costly data warehousing technologies and the broad diffusion of connectivity are some of the factors that have made it easier and more economical to store and access large quantities of data: commercial, financial and administrative transactions, Web surfing itineraries, e-mails, text and hypertext and clinical test results.

Business Intelligence (BI) systems generate information and knowledge from the data in company and government information systems to improve the quality of decision-making processes through flexible extraction logics, analytical methods and mathematical prediction and optimisation models that, in their entirety, are called "business analytics."

Despite the economic downturn, the volume of business passing through BI systems has grown significantly in recent years [Orsenigo C., Vercellis C., 2010]. The reasons for the higher than average growth of the ICT are to be found in the critical role played by BI applications: the need to make more timely and effective decisions assumes growing importance in a highly competitive economic context that requires optimising performance, increasing revenues and reducing costs.

The numerous acquisitions of vendors by some of the main players in the information sector, have led to an intense concentration of the offering of BI systems that, in many cases, are already integrated into ERP suites for the management of operational systems. This phenomenon has, in part, reduced the distribution of independent and autonomous BI platforms, even if new vendors are appearing on the market and achieving significant results with offerings characterized by low entry costs combined with a relative ease of integration from the point of view of reducing the "total cost of ownership (TCO)" for companies that adopt BI systems. This work lists the ways of using Business Intelligence as governance innovation for innumerable industrial applications.

2 Business Intelligence e Knowledge Management

A critical component for the success of the modern enterprise is its ability to take advantage of all available information. This challenge becomes more difficult with the constantly increasing volume of information, both internal and external to an enterprise. It is further exacerbated because many enterprises are becoming increasingly "knowledge-centric," and therefore a larger number of employees need access to a greater variety of information to be effective. The explosive growth of the World Wide Web clearly compounds this problem. Enterprises have been investing in technology in an effort to manage the information glut and to glean knowledge that can be leveraged for a competitive edge. Two technologies in particular have shown good return on investment in some applications and are benefiting from a large concentration of research and development. The

technologies are business intelligence (BI) and knowledge management (KM).

Business intelligence technology has coalesced in the last decade around the use of data warehousing and on-line analytical processing (OLAP). Data warehousing is a systematic approach to collecting relevant business data into a single repository, where it is organized and validated so that it can be analyzed and presented in a form that is useful for business decision-making [Kimball R. 1996].The various sources for the relevant business data are referred to as the operational data stores (ODS). The data are extracted, transformed, and loaded (ETL) from the ODS systems into a data mart. An important part of this process is data cleansing, in which variations on schemas and data values from disparate ODS systems are resolved. In the data mart, the data are modeled as an OLAP cube (multidimensional model), which supports flexible drilldown and roll-up analyses. Tools from various vendors provide the end user with a query and analysis front end to the data mart. Large data warehouses currently hold tens of terabytes of data, whereas smaller, problem-specific data marts are typically in the 10 to 100 gigabytes range. [Cody W.F. et al., 2002]

Knowledge management definitions span organizational behavioral science, collaboration, content management, and other technologies. In this context, we are using it to address technologies used for the management and analysis of unstructured information, particularly text documents. It is conjectured that there is as much business knowledge to be gleaned from the mass of unstructured information available as there is from classical business data. We believe this to be true and assert that unstructured information will become commonly used to provide deeper insights and explanations into events discovered in the business data. The ability to provide insights into observed events (e.g., trends, anomalies) in the data will clearly have applications in business, market, competitive, customer, and partner intelligence as well as in many domains such as manufacturing, consumer goods, finance, and life sciences.

The variety of textual information sources is extremely large, including business documents, e-mail, news and press articles, technical journals, patents, conference proceedings, business contracts, government reports, regulatory filings, discussion groups, problem report databases, sales and support notes, and, of course, the Web. Knowledge and content management technologies are used to search, organize, and extract value from all of these information sources and are a focus of significant research and development [Sullivan D.,2001; Nasukawa T.,2001]. These technologies include clustering, taxonomy building, classification, information :traction, and summarization. An increasing number of applications, such as expertise location,[Pohs W., 2001; Pohs W. et al, 2001], knowledge portals, customer relationship management (CRM), and bioinformatics, require merging these unstructured information technologies with structured business data analysis. It is our belief that over time techniques from both BI and KM will blend. Today's disparate systems will use techniques from each and will, in turn, inspire new techniques that will seamlessly span the analysis of both data and text.

3 - BI Value

As shown in Figure 1, BI is a process that includes two primary activities: getting data in and getting data out [Watson H.J., Wixom B.H., 2007].

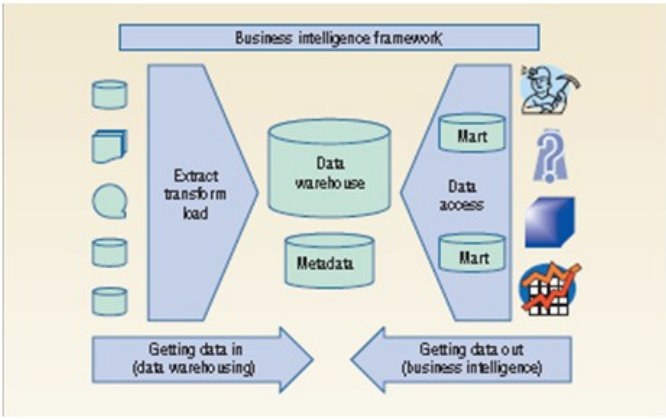

Figure 1

Recent studies have shed light on empirical evidence of significant interest for the supply and demand of Business Intelligence systems [Orsenigo C., Vercellis C., 2010].

BI systems provide the greatest benefits when used to optimise the performance of a business's "core" processes, contributing to reducing costs or increasing revenues. In particular, the negative business cycle is forcing the majority of businesses analyzed to expand the use of BI systems to increase efficiency by reducing costs. BI systems and applications are a priority for CIOs, called upon to invest in ICT technologies that can contribute to the implementation of an effective competitive strategy and determine changes in a business's processes and culture. The main advantage provided by BI systems with respect to cost reduction has to do with the control of performance and the monitoring of Key Performance Indicators, followed by the optimization of the Supply Chain.

The main benefits of BI systems for increasing revenues involves, instead, the targeting and optimization of marketing campaigns. The main obstacles to the adoption of BI systems are cultural resistance to change and the lack of commitment of C-level executives, especially in small to medium-sized businesses. Business Performance Management tools, in the form of both ad hoc query and reporting and dashboards and scorecards are the most used BI functions, especially for financial analysis, planning and control and sales analysis. Business "analytics", in the form of predictive, forecasting

and optimization methods, are expanding their presence in relation to decision-making processes that are highly complex in both interactive and operational terms, contributing to the implementation of relational marketing strategies and supply-chain optimization.

In addition, a maturity model has been developed for the classification of businesses with respect to their effective degree of use of BI tools into four quadrants (Fig. 2)

1. Basic BI, corresponding to just query and reporting functionalities primarily used by a single company function;
2. Targeted BI, associated with companies that business analytics, even if only in a single function;
3. Integrated BI, corresponding to companies that make a pervasive use of Business Performance Management for the majority of company functions;
4. Strategic BI, associated with companies that make a pervasive and intensive use of BI systems, with performance management analysis and business analytics.

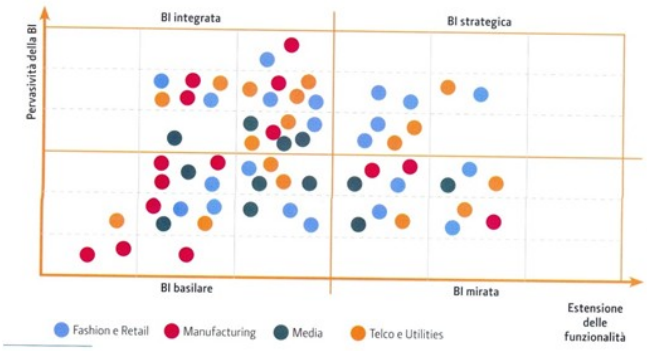

Figure 2

The study indicates that BI systems are playing an increasingly strategic role in businesses whose performance requires complex, multi-dimensional indicators that must be monitored with agile and powerful tools. BI systems are, therefore, a potential source of competitive advantages and tend to assume a mission critical role that can effectively preserve investments in BI even in unfavourable business cycles. The main advantages perceived by companies have to do with the greater effectiveness of decision-making processes, the speed of reaction, the possibility of having a unified view of information and a greater sharing of knowledge.

4 Critical success factors for BI systems

On the basis of the empirical study, we can identify several critical factors that contribute to the success of a Business Intelligence system. These include:

Strategic vision. It is necessary to develop a vision of BI projects as activities that regard the business in its entirety and not just single user functions or, at the limit, just the ICT function. The overall architecture must be designed in the preliminary phases and the various parts are implemented latter following an incremental approach. In this way, the uncertainty of the outcome of the project is reduced and its robustness is increased through prototyping, testing the system in the initial phases, ease of use and evolutive implementation.

Communication and collaboration. Promoting the involvement of decision-makers and users during the development process turns out to be of fundamental importance for avoiding their tendency to reject a tool that they perceive as alien. It is also necessary to promote informal communication processes, especially during the phases and designing and producing prototypes.

Leadership. There must be a strong commitment by management, starting from the C-level executives. Management must perceive a Business Intelligence project as a resource with strategic value and the "champions" of change that guide the process of adopting BI tools must be motivated and rewarded.

Flexibility. A Business Intelligence system must be flexible and adaptable in order to easily incorporate the modifications necessary for representing changes in the environment or in decision-making processes. It must also guarantee ease of use and provide easy-to-read graphic representations for the presentation of information to users.

Culture and change management. The ability of knowledge workers to assimilate information and translate it into concrete action is one of the factors that facilitate the adoption of a Business Intelligence system. This latter element enhances the personal skills of the knowledge workers who are called upon to interpret the results of the analyses, imagine creative solutions and develop effective action plans.

Innovation. The most sophisticated Business Intelligence systems and, especially, advanced analytics, play an essential role in enhancing the value of information and extracting knowledge from the available data, transforming it into better decisions and competitive advantages.

Data quality. The ICT function must constantly monitor the quality of the data in the data warehouse and data marts, ensuring its accuracy, completeness, consistency, topicality, lack of redundancy, relevance, interpretability and accessibility. The documentation provided through the metadatas must be constantly updated to reflect variations in the structure of the system. It must be directly accessible by users through a browser.

5 Current Trends

Despite the last two years being among the most difficult for the world's economies, investments in Business Intelligence systems have grown significantly. Prospects for development also continue to be favorable, with three-year forecasts of growth in both software licenses and integration, consulting and training services. The volume of business relative to cloud architectures is also growing for Business Intelligence systems. Business Intelligence applications continue to be considered a priority for CIOs because of their ability to contribute the development of a competitive strategy by optimizing performance, increasing revenues and reducing costs.

5.1 Advanced analytics

In general, the study revealed a progressive spread of advanced analytics, represented especially by predictive and optimization methods that allow the effective management of highly-complex decision-making processes. For example, business analytics allows analyzing historical series to determine trends and seasonal behaviors; revealing correlations in the data; forecasting the future value of numerical and categorical variables; performing scenario analyses; deriving customer segmentations; performing text and web mining activities; optimizing production and logistics decisions; dynamically determining optimal prices.

The use of advanced analytics produces significant results especially in relation to strategically important company processes, providing benefits in terms of competitive advantages through innovative solutions developed ad hoc. In many decision-making processes, the available alternatives (production plans, marketing campaigns, distribution channels and determinants of customer behavior) are so numerous as to preclude their analysis and precise comparison. In addition, problems must be dealt with in rapidly evolving contexts: the best decision in one period may no longer be so in the next period. Problems are often subject to constraints that must be taken into account in the choice of the optimal alternative. Finally, there may be partially conflicting goals whose presence require the automatic generation of different alternative solutions in order to choose the one that offers the best compromise between the various criteria.

From a technical point of view, there is increasing use of in-memory analytics, which allow the fast analysis of huge masses of date, overcoming inefficiencies due to access to data on hard discs. In addition, in-memory analytics allow the development of more flexible predictive models, suitable for dynamic parameterization and, thus, able to more quickly reveal changes in the trends that characterize the phenomena being analyzed. Finally, we note that the skills of analysts and decision-makers and the commitment of management play a very critical role as successful drivers in the adoption of advanced analytics.

5.2 Web Intelligence

Today, the Web and social networks are a channel for communicating and promoting the images of important businesses, if not the main one. In addition, e-commerce sites are an increasingly important sales channel. So, it seems natural to use Web Intelligence methods to analyse data about the consultation of company web sites by visitors and, more generally, data regarding forums and blogs and the messages and e-mails sent to the contact centre. On the one hand, they allow monitoring to assess the web reputation of the company's products and services; on the other, they allow targeted marketing optimized for social communities.

In this context, an increasingly important role is being played by social analytics, i.e., tools for measuring, analyzing and interpreting the interactions and associations between individuals, topics and ideas that take place in the context of social networks. Social analytics includes a variety of methodologies such as social filtering, social network analysis and opinion mining. These latter, also known as sentiment analysis techniques, allow the processing of opinions exchanged by users through the network about a given product or brand and automatically and statistically attributing them a positive or negative connotation.

In the context of Web Intelligence methods, usage mining analyses are undoubtedly the most important for the support of relational marketing strategies, allowing the exploration of the itineraries followed by surfers and their behaviors during their visits to a company's site. Usage mining techniques mostly refer to the analysis of click streams, i.e., the sequences of pages visited during the same session. Through the development of sequential associative rules, which allow the derivation of correlations between the pages visited, or the use of models of historical series, one can then process data referring to the use of a site according to a temporal dynamic. In some cases, such as for e-commerce sites, it is possible to identify a visitor and recognize him during subsequent sessions; this occurs if the site requires an access key or if the enablement of cookies allows keeping track of the sequence of visits.

5.3 Analyses of unstructured data

In the past, BI systems have largely used structured data in the form of whole numbers or fractions and character sequences, generally organized in fixed positions in relational databases. One of the trends indicates a marked increase in the integration between Business Intelligence systems and unstructured data, which appears in heterogeneous formats, primarily textual, coming from diverse sources. In some cases, it involves analyzing e-mails sent by customers to the contact centre, which are useful for intercepting market opinions and

identifying recurring critical situations. In other cases, textual information comes from forums, blogs and social networks and is connected to the use of the social analytics described above. Sundry unstructured data can, then, come from sources inside the company that has to do, for example, with contracts, invoices, documentation, reports handled manually by decision-makers, project specifications, marketing documents, claims and multimedia files. It is estimated that at least 85% of the available information falls into the category of unstructured data.

One difficult in processing unstructured information has to do with the nature of the media that contains it, which is not necessarily an electronic format; think, for example, of invoices or contracts that are normally on paper and that first must be acquired in electronic form using digital scanning devices. Once the data is made available in digital format, methods are required for analysing and identifying regularities or anomalies. Among these, the most common are certainly text mining for the analysis of documents, which is applicable to data originally provided in text form or made such following scanning and OCR recognition. In other cases, it is necessary to use models suitable for handling BLOB (Binary Large Object) files, such as images, video and audio.

5.4 Cloud computing

Cloud computing is a distribution model for computer resources such as software and services that consists of a server and repository for storing data, which is provided to businesses on-demand through a web browser. It is still too early to tell if coming years will see a significant migration of Business Intelligence systems to cloud mode; there are, however, many reasons that lead one to believe it plausible that some BI applications can find an adequate placement in cloud computing architectures.

In fact, on the one hand, users of the cloud can extend the potential of their ICT systems and, in particular, their BI applications, without having to incur the initial expenses for acquisition and implementation, which are usually high, paying, instead, a usage fee that is generally based on parameters such as the number of users, the volume of data managed and security requirements. In addition to the absence of software purchase licenses and the lower hardware investments, other cost reductions can derive from fewer specialized ICT personnel for the configuration, maintenance, monitoring and updating of BI computer architectures. In fact, as part of cloud computing solutions vendors often provide customers support for the ICT function, relieving the company of several responsibilities linked, for example, to data backups.

The principal factors that could stimulate the integration of Business Intelligence solutions in cloud computing environments include the difficulty and cost for the company of creating the powerful architectures consisting of clusters of servers for parallel calculations that are necessary for using advanced analytics to process huge masses of data. Another advantage has to do with the possibility of sharing data and information between different organisations through previously defined access methods in order to be able to perform BI analyses suing one's own data together with data coming from outside sources available from the supplier of the cloud services.

Despite the potential benefits, many companies still have doubts and resistance towards cloud computing models, primarily due to critical issues having to do with the ownership and security of the data. For this reason, vendors are articulating solutions intended to ensure clients greater procedural control in managing and accessing the data.

The components that comprise the varied structure of cloud computing include the Software as a Service (SaaS) model, which provides users applications that reside inside the cloud infrastructure. Users access virtual versions of the software, personalized to meet the needs of each client but that, in reality, exist in only one copy on the server. In addition to SaaS, cloud computing systems contain have other components, such as Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). PaaS provides clients an entire software platform, which is an application development environment complete with services, applications and libraries. Instead, IaaS allows users to access hardware resources in the cloud, which are, from time to time, assigned to a specific client based on its effective needs, allowing the vendor to optimize the allocation of its own resources.

5.5 Operational BI is oriented to events

Operational Business Intelligence applications, oriented to real-time or near-real-time events, are becoming increasing popular. In a rapidly-evolving market it is important to act in a timely manner by automating decisions at an operational level. BI applications can, thus, adapt to these needs by using event-oriented interaction schemas, possibly communicating with each other and with other applications through loose coupling interfacing methods. This includes Complex Event Processing (CEP) technologies that can support Business Intelligence system through the automated management of events with the intention of identifying and correcting possible anomalies. In this context, the term event refers to a piece of information that represents codes and records an activity that occurred. For example, events include the receipt of a purchase order, the execution of a company process, the reading of an RFID (Radio Frequency IDentification) tag and transactions recorded by ERP, CRM and financial systems. The processing of an event involves the automatic execution of a series of operations such as reading, deletion and transformation according to predefined rules or the creation of a new, complex event through the aggregation or composition of simple events.

In the context of Business Intelligence systems, CEP applications can detect, in real-time, recurring patterns in sequences of processed events and respond to the event identified with a suitable notification or through the creation of a new event that involves an automatic reaction following an event-driven logic. For example, purchase and sales orders can be combined to form a transaction; one possible pattern is the set of events that comprise a complete sales transaction.

The use of CEP systems is taking root in various sectors and different company functions. In a financial context, for example, it is being used to recognise anomalous patterns in transaction data that could hide fraud to the harm of credit cardholders or suspicious money transfers; or the real-time monitoring of stock market transactions to control market trends and verify observance of the law.

A second application regards the Large Organized Distribution and Manufacturing sector, where the combination of CEP systems and RFID sensors provides information about products and their location along the distribution channel; the monitoring and analysis of events through CEP applications allows the timely identification of any inefficiencies in the distribution system, such as unforeseen shipment delays and the taking of suitable corrective actions. With reference to performance assessment, CEP systems are used to monitor KPIs with the goal of identifying, in real-time, deviations of a parameter from its expected value and sending suitable alerts in the case where significant differences are detected.

Finally, in relational marketing activities, CEP systems are used to manage interactions with customers at call centers and service centers or to dynamically determine the on-line prices of products and services.

6 Conclusion

The main advantage with respect to reducing costs has to do with the control of performance and the monitoring of Key Performance Indicators, followed to optimization of the Supply Chain. In the manufacturing sector, it plays an important role in production planning. Business Performance Management tools, in the form of both ad hoc query and reporting and dashboards and scorecards are the most used BI functions, especially for financial analysis, planning and control and sales analysis. The analysis of unstructured data is increasing: customer e-mails, useful for intercepting market opinions, information coming from forums, blogs and social networks, for assessing web reputation and for marketing activities.

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A study of trust in business and management by using co-citation analysis and social network analysis

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Abstract—**This research presents the analysis of trust by using co-citation analysis and social network analysis. Co-citation is a form of document coupling the frequency with which two documents are cited together. In this study we make an experiment by using data from ISI database system to identify clusters of highly inter-related documents in the subject of trust. The study ranks the trust documents by times cited and collects first top 100 articles. We discover five distinct sub-domains and circle them out on social network graph. Trust-related field focuses on Strategic Alliance, Marketing, Organizational Behavior, E-Commerce, Economics, Society and Trust. This analysis results are help guide for future research.**

Keywords- trust, co-citation analysis, social network analysis

I. INTRODUCTION

Bibliographic citations and co-citation in research papers have been used by researchers to establish relationships among documents. In this paper we make an experiment by using data from ISI web of knowledge to identify clusters of highly interactive documents in the subject of trust in business and economy domain. Unlike bibliographic coupling, which links source documents, co-citation links cited documents which are acceptable indicators for the different information sources used.

The purpose of this paper is to define the coupling of trust document references cited in the research works. The analysis of these references can be used to study the research fronts [1] and to explore its relationship to other citation measures for identifying relationships by using an actual example from the trust documents. The more the two documents are cited together, the closer the relationship is between them, as perceived by the citing subjects, and the closer they would appear in the graphic rendering of groups of documents [2].

In our case, social network analysis provides a conceptual framework and methodology for examining group connection of trust documents [3]. Network centralities of individual document provide insight into the individual's location in the network [3]. The present article uses UCINET 6.0 and Network Workbench to apply the interrelationships by using core trust documents.

From the viewpoint of trust, it can be observed from the importance to the organizational effectiveness. In the realm of organizational behavior, results of many previous studies all pointed out that trust can enhance teamwork [4-7], create and organize the collective goal of members in the network and strengthen cohesion[8]. It can inspire individual creativity, initiative spirit and can also facilitate the appropriate shape of organization such as network relations [9]. Studies have also indicated that trust can effectively deal with crisis [10]. Another studies show that trust can reduce conflicts and transaction costs between organizations [8, 11]. As a reduction in the incidence of opportunistic behavior, trust will bring down the control costs. Thus, from these, modern organizational behavior considers trust as very important in human relations within organizational effectiveness. Furthermore, in marketing, evidences showed that trust will lead to constructive and cooperative behaviors, this is essential for the development of long-term relationship.

II. LITERATURE REVIEW

A. Trust

Trust is the basic connection in human society[12], the essential factor between interpersonal cooperation[13], and is also the primary mechanism in many economical activities[8, 12, 14]. As far as business relationships are concerned , the extent of the trust influence mutual commitment in relationship , the processing pattern in conflict while interacting with others , the uncertainty in decision making and the transaction cost [11, 15].

Practitioners often call trust the most importantly successful factor for their business [16]. Researchers also acknowledge the informal trust relationships are wide-spread and important for business [17-20] and furthermore, to survive under a highly dynamic and uncertain environment[12]. The gap in time and space, cultural and language difference may bring failure to cooperation. Trust can be served as the lubricant and factor increasing organizational or interpersonal efficiency[5]. Trust reduces complex realities efficiently and economically [18]. Trust is seen as a necessary antecedent for cooperation [21, 22] and leading to constructive and cooperative behavior vital for long-term relationships [23, 24].

Because trust is so central to human relationships, lots of its definitions have been offered. For examples, it has long been acknowledged in social science and psychological literature [13, 25], Besides, there is still a good deal of conceptual confusion [26, 27] that there has been no real conceptual development regarding trust. As a consequence, it is difficult to construct under such diversities.

B. Co-citation Analysis

A co-citation analysis study begins with the selection of the co-citation objects, together with the selection of approaches, which can be based upon either document co-citation or author co-citation. The document co-citation approach [28-30] is founded on the premise that the most valid and reliable indicator of a school of research and its scientific assessment or method are its documents in organs or publications with peer-review procedures [28, 31].

Bibliographic co-citation is a popular similarity measurement used to establish a subject similarity between two items. If A and B are both cited by C, they may be related to another, even though they don't directly reference each other. If A and B are both cited by many other items, they have a stronger relationship. The more items they are cited by, the stronger their relationship is [32].

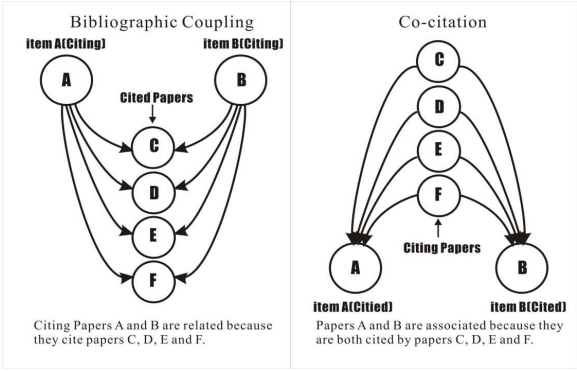

Fig 1. Bibliographic Coupling vs. Co-Citation

The fundamental difference between bibliographic coupling and co-citation is reflected in Figure 1. Papers are bibliographically coupled when different authors cite one or more papers in common. On the other hand, co-citation analysis is based primarily on identifying pairs of highly-cited papers [32].

The notion of citation is fundamental to both the scholarly enterprise and hypertext networks where it provides the primary mechanism for connection and traversal of the information space. Citation analysis was developed in information science as a tool to identify core sets of articles, authors, or journals of particular fields of study [33]. The study analyzed subject of trust in ISI to discover the most closed for the trust documents.

C. Social Network Analysis

A social network is a collection of people, each of whom is acquainted with some subset of the others. Such a network can be represented as a set of points (or vertices) denoting people, joined in pairs by lines (or edges) denoting acquaintance [34]. Social network analysis is the mapping and measuring of relationships and flows between people, groups, organizations, animals, computers or other information/knowledge processing entities. The nodes in the network are the people and groups while the links show relationships or flows between the nodes [34]. It usually provides both a visual and a mathematical analysis of human relationships.

Social networks have been existed in the subject of both empirical and theoretical study in the social sciences for at least 150 years. Stanley Milgram conducted a famous early empirical study of the structure of social networks [34, 35]. Social network researchers measure network activity for a node by using the concept of degrees the number of direct connections a node has. The relationship between the centralities of all nodes can reveal much about the overall network structure[34].

Network analysis is distinguished from traditional social science by the dyadic nature of the standard data set [36]. Moody argues that predicting the specific content of ideas is

often not possible; we can link the shape of an idea space to the structure of a network [37].

Social network analysis is the study of social relationships between individuals in a society. Obviously, the more relational data is, the better the network analysis is [38]. The theory emphasizes patterns of relationships among individuals and interprets the behavior of individuals in reference to their positions within social networks. A primary task of social network analysis is to use the interactional patterns among individuals to identify clusters or cliques within a network of individuals [3].

III. DATA COLLECTION AND ANALYSIS

We select top 100 documents ranked by times cited in ISI web knowledge database, and compute the first author co-occurrence frequencies from the citing articles between any pair of topics (Garfield, 2001; Acedo, Barroso and Galan, 2006). The selection of those source documents that make up the core data of a theory or discipline is a critical stage in the process. To cover all the developments within the theory, the objective is to form a core as large as possible, while ensuring that this core is made up only of documents that can be truly considered as shaping the theory..

In this study, selection of the core set documents is derived from a set of initial searches. There are no hard and fast rules, but the subjectivity inherence in the selection of trust documents should be limited to their significant contributions to the field. A list of 100 papers is determined after examining initial citation data retrieved from ISI files. The 100 source articles produced a total of 25192 citations (documents selection period before May 2010).

Basic citation counts on trust documents are collected form ISI databases. Searches using the keyword/subject are conducted to determine which documents are the most cited fellows. Determining a core paper set poses an initial difficulty. Once this core set of trust documents was identified, it is necessary to limit searches to avoid retrieving misty subjects.

The core documents allow a delimitation of the area under study on the basis that a scientific paper can be included when it cites one or more such source documents [39]. It seems likely that many of the documents we shall read about define the cognitive or intellectual structure of trust and the trust area's specialties. The most widely used criterion is the number of cites, and so we take the most significant works representing the study field to be the core documents during the factor analyzed. The core documents represent assemblies' documents that share trust subject, theory, or common methodology and describe current investigation. We often cite the same documents that have the same collective representation of their investigating activity; consequently, the higher the co-citation is among them, the more coherent and integrated is the scientific community determined by the method is.

In our study, we chose the top larger citation times to be our initial core documents [32, 39]. These nodes may serve as a central document in connection with others and form a subgroup or cluster. The result is illustrated below in Figure 2. The point here is due to these central documents, other nodes can stick together and form a group. It's like rolling a snow ball, which each node or document gives their contribution to form the shape. That is why we chose the larger citation times as our initial core, which this can make things easier and give a more visualized result.

The set of cited authors chosen for analysis is determined by citation frequency. Co-citation analysis can be applied to different levels of aggregation: on the level of single publications, it can be used to study relationships among specific conceptual ideas or empirical findings [28].

Co-citation is counts of the frequency which two existing documents are cited together in a new document and their analysis enables us to say something about the way ideas support and interact with each other and also to plot the structure of intellectual disciplines [2, 31].

All of the citations are imported into a Microsoft Office Excel and subsequently processed using Java program to calculate the first author co-occurrence frequencies. We address such issues by performing various analyses on the co-citation matrix. The result is the basis of all future analyses used in this study.

After the computation of Java program, it generates a lower triangular matrix. The number of each cell represents the first author co-occurrence frequencies. A matrix shown in Table 1 is constructed with recorded document titles. Here we only show part of the result since the whole table would be out of the range. The matrix is then subjected to a factor analysis to extract latent structures from the pattern of documents citations. The names of each factor were given by the documents after investigating the titles themselves. The raw co-citation matrix is entered into the SPSS system for the further analyses. It is first converted to a correlation matrix.

Factor analysis is regarded as a natural development in a field in which large sets of correlated variables arise, as a means of examining and describing the internal structure of the covariance and correlation matrices concerned [40]. It has an underlying theoretical model that it also seeks to study correlations among a number of interrelated variables and to group them into a few highly descriptive factors. In this case, documents can contribute to more than one factor and usually load most heavily on a single factor, with documents loadings of 0.7 or greater as likely to be the most useful for interpretation. SPSS is commonly done to determine the number of factors with the most explanatory power.

IV. DISCUSSION

Eight factors are extracted from the data. The results of the factor analysis are summarized in Table 2 which shows the factor loadings for the documents in the eight factors. The eight factors are derived from those Eigenvalue bigger than one. We list the percentage of each component below. The accumulated percentage is listed at the bottom of Table 1. The total variance equals 93.821. This is the sum of the eight components. We drop the rest because their Eigenvalue was

less than one. The result shows that the 100 documents can be classified into eight groups.

Table 1. Factor Analysis Result

	Strategic Alliance		Marketing		Organizational Behavior		E-Commerce		Economics, Society, and Trust		Knowledge Management		Partnership and Trust		Organizational Trust	
	Doc No.	Factor 1	Doc No.	Factor 2	Doc No.	Factor 3	Doc No.	Factor 4	Doc No.	Factor 5	Doc No.	Factor 6	Doc No.	Factor 7	Doc No.	Factor 8
	Y43	0.978	Y11	0.968	Y56	0.946	Y36	0.910	Y9	-0.963	Y76	0.768	Y63	0.635	v95	0.447
	Y68	0.974	Y1	0.957	Y41	0.902	Y49	0.889	Y50	-0.950	Y12	0.563	Y99	0.623		
	Y47	0.974	Y38	0.951	Y32	0.835	Y17	0.886	Y45	-0.946	Y55	0.561	Y51	0.558		
	Y60	0.972	Y4	0.943	Y7	0.832	Y80	0.878	Y15	-0.939	Y97	0.518				
	Y16	0.970	Y70	0.942	Y44	0.827	Y46	0.874	Y77	-0.936						
	Y94	0.967	Y85	0.932	Y24	0.806	Y21	0.853	Y28	-0.914						
	Y90	0.966	Y75	0.909	Y48	0.791	Y65	0.837	Y22	-0.913						
	Y6	0.963	Y39	0.904	Y2	0.783	Y88	0.821	Y69	-0.603						
	Y3	0.963	Y25	0.903	Y83	0.782	Y87	0.819								
	Y10	0.960	Y5	0.900	Y8	0.780	Y57	0.802								
	Y78	0.950	Y86	0.893	Y42	0.743	Y23	0.767								
	Y81	0.949	Y91	0.884	Y34	0.741	Y92	0.757								
	Y72	0.947	Y67	0.882	Y33	0.728	Y71	0.666								
	Y20	0.945	Y100	0.879	Y31	0.712	Y58	0.613								
	Y18	0.945	Y53	0.813	Y37	0.696										
	Y40	0.939	Y19	0.802	Y66	0.605										
	Y14	0.931	Y79	0.735	Y82	0.594										
	Y30	0.927	Y52	0.687	Y35	0.576										
	Y29	0.923	Y84	0.652	Y27	0.517										
	Y26	0.886	Y61	0.624	Y96	0.472										
	Y93	0.873	Y64	0.617												
	Y98	0.774	Y74	0.600												
	Y13	0.756	Y54	-0.466												
	Y73	0.723														
	Y62	0.645														
	Y89	-0.529														
	Y59	-0.512														
Total		27		23		20		14		8		4		3		1
Original %		37.668		20.873		16.337		8.074		5.247		2.276		1.819		1.527
Accumulated %		37.668		58.541		74.878		82.952		88.198		90.474		92.294		93.821

Figure 2 is the result after running the social network analysis by Ucinet 6.0. We can see that most of the size of symbol is different. This is caused by their degree counts. The degrees are calculated by the co-citation of pair articles. When the co-citation numbers get larger, the size of node gets larger, too. The size of node represents a relative standing. In other words, the bigger size means a more core and more important status. Thus these nodes can be more helpful to construct the intellectual domain.

There are five clusters circled out in the graph and this is mapped from factor analysis. Basically, there are eight factors that are discovered. This may due to the field of the articles that is not specified clearly enough or the citations are not large enough for identification.

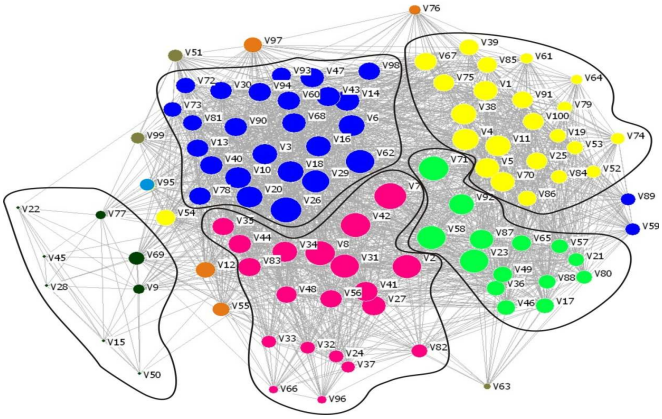

Fig. 2 Social Network Analysis Result

Another graph shown in figure 3 is the mapping of five clusters and their intellectual domains. As we mentioned above, some of the articles' fields are not clearly specified or the citation times are not larger enough. We can figure that most of their labels are large numbers (V89, V95, V97, V99, etc). Large number means a low citation times and there might be lack of information to form the intellectual domain. On the contrary, small numbers like V1, V2 ,V3 etc, all posed a very important and central status for each cluster.

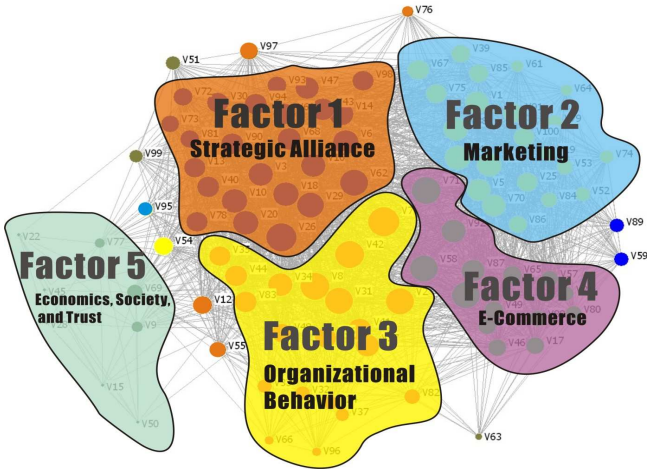

Fig. 3 Social Network Graph with Factor Analysis

Figure 3 depicts the graph with the visualization of the semantic space derived from 100 core papers. Our interpretation for the analysis result is that trust is composed of five different subfields: Strategic Alliance, Marketing, Organizational Behavior, E-Commerce and Economics, Society, and Trust. The five factors help in understanding relationships for those in the businesses and management domain.

A. Factor 1: Strategic Alliance

Factor 1 includes 27 papers; the topics are mainly about trust in the alliance, inter-organizational relationship, joint venture, buyer-supplier relationship, franchises, research consortia, and various forms of network organizations. Actually, an unprecedented number of business firms in many industries have been entering into a variety of inter-organizational relationships to conduct their business deals. Previously, these transactions are often concluded through either discrete market transactions or internal hierarchical arrangements [41, 42]. The study of trust between organizations has long been a very popular issue.

B. Factor 2: Marketing

The core concept of this factor is marketing. The topics here are mostly about buyer-seller relationships, customer relationships, customer evaluations, dealer attitudes, commercial friendships and brand trust. Rapidly changing competitive environments are forcing business marketing firms to seek more creative and flexible means for meeting competition. Many firms have responded to these challenges by building collaborative relationships with customers and suppliers [43]. Such collaborative relationships rely on relational forms of exchange characterized by high levels of trust [24, 44]. The high levels of trust characteristic of relational exchange enable parties to focus on the long-term

benefits of the relationship [45] ultimately enhancing competitiveness and reducing transaction costs [46]. Therefore, establishing, developing and maintaining successful relationship are critical for marketing research.

C. Factor 3：Organizational Behavior

The view of trust as a foundation for social order spans many intellectual disciplines and levels of analysis. Understanding why people trust, as well as how that trust shapes social relations, have been a central focus for psychologists [47, 48], sociologists [49], political scientists[50], economists [51, 52], anthropologists [53], and students of organizational behavior [54]. Scholars have seen trust as an essential ingredient in the healthy personality [55, 56], as a foundation for interpersonal relationships [57], as a foundation for cooperation [58, 59], and as the basis for stability in social institutions and markets [18, 60, 61]. Factor 3 consists of many topics, including interpersonal trust, citizenship, philosophical ethics, psychological contracts, commitment, attachment and procedural justice. The factor addresses a multidisciplinary view of trust in organization. How does trust influence organizational operation? Obviously, trust changes an organizational behavior from inner to the outer. .

D. Factor 4：E-Commerce

In e-commerce, some issues like e-loyalty, commitment, frictionless transaction, TAM, supply assurance and security, can all be considered in this field. Evidence suggests that consumers often hesitate to transact with Web-based vendors because of uncertainty about vendor behavior or the perceived risk of having personal information stolen by hackers. Trust plays a central role in helping consumers overcome perceptions of risk and insecurity. Trust makes consumers comfortably share personal information, make purchases, and act on web vendor advice—behaviors essential to widespread adoption of e-commerce [62].

E. Factor 5：Economics, Society, and Trust

The topic here is mostly about the issue related to social capital and economic performance. Including the relationship between interpersonal trust, norms of civic cooperation, and economic performance, and some of the policy and other links through which these dimensions of social capital may have economic effects. Studies view trust or social capital as a propensity of people in a society to cooperate to produce socially efficient outcomes and to avoid inefficient noncooperative traps [49, 63-65].

V. CONCLUSION

This study applies the co-citation and social network analysis in trust that provides a picture for researchers and practitioners. This analytical result has not been discussed before. As such, those can be one of several tools used to help individuals access and visualize scholarly communication within the field. Those help identify the most productive and prominent document in the field, the documents that are cited, the amount they are co-cited with other informatics documents, and the documents that appear in similar subject areas.

This paper introduced documents co-citation analysis relying on ISI databases, based on bibliographic analysis and co-citation matrix to produce the results. The study combines a content-similarity analysis, a factor analysis, document co-citation analysis, social network analysis. The factor analysis extracted eight factors, which may be the roots of many new specialties to be identified in future work. By combining co-citation analysis and social network analysis, the clear factors result has been identified. However, five factors can only be mapped to social network graph. Because of low citation times, some of the articles may not be domain specifically. As a result, some of the nodes cannot be clearly classified.

The most clarified factors are factor one, two and three standing for Strategic Alliance, Marketing and Organizational Behavior. For factor four and five, they stand for E-Commerce, Economics, Society and Trust. These five factors are the main trends in business and economy field. Other factors like six, seven and eight are not marked out here because they are too separated. For instance, V12 includes psychology, knowledge management, organizational behavior, healthcare, nursing, leadership and marketing. This distribution made it hard to define which field it belonged to. Thus, the topic of this article may be considered to be a cross-domain issue. In the future, we will observe the change of these articles and find out the trend of the trust research.

VI. ACKNOWLEDGEMENT

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Developing Approach for Conception of Appropriate Business Model for Federated ERP Systems

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Abstract—**In the last few years, business in internet become more and more significance. On other hand new development of internet technology is rapid and changed every day. Thus Business models have to be continually adapted to meet the requirements of new business ideas. One of these new and important business ideas is; how to supply the needs of small and medium sized enterprises (SME) with business software (E.g. Enterprise resource planning System (ERP)).**

Keywords-*ERP system; FERP system; ERP web service; Business model, Developing approach.*

I. INTRODUCTION

An ERP system is a standard software system which provides functionalities to integrate and automate the business practices associated with the business process of a company. The integration is based on a common data model for all system components and extents to more than one enterprise sectors [2], [12], [18] and [19]. The increasing number of the small and medium companies' employees, extended the need for flexible functionalities in ERP systems. SMEs face different problems when they buy the ERP systems, like [1] and [7].

- Not all installed components are needed.
- The usage of licenses, Administration, and maintenance of these products are too expensive.
- Normally, ERP systems are complex and overloaded with stuff, functions and options, therefore it is hard for new user to learn.
- High-end Hardware is required.

Therefore, in the last few years the idea of the Federated ERP-System in the basis of Web-Services has evolved. A federated ERP system (FERP system) is an ERP system which consists of system components that are distributed within a computer network. The overall functionalities are provided by an ensemble of allied network nodes that all together appear as a single ERP system to the user. Different ERP system components can be developed by different vendors [1], [7] and [8]. Through the FERP system, companies pay only for components deemed necessary. Also, the needed End-Hardware is made available by the service provider which in turn, reduces costs [7].

An ERP system component in this case is reusable, closed and marketable software module which provides services over a well-defined interface. These components can be combined with other components in an unpredictable manner [25]. Those components are described, published and used as Web services.

A web service is a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (specifically WSDL). Other web systems interact with the web services in a manner prescribed by its description using SOAP-messages typically conveyed using HTTP with an XML serialization in conjunction with other web-related standards [27]. The search for these services by FERP Systems is covered by the functionality which is considered as the logical and stable construction stone in ERP system [7].

The phases of FERP scenario are divided into tow processes:

- Production process includes the isolation of ERP components, description, publishing those components as web services through the web standards and the integration of these web services in FERP workflows.
- Marketing process includes the Exchanging of ERP components as web services need through a suitable business model. Therefore, businesses should be adopted to fulfill the new idea's need.

A Business model involves [24]:

- The architecture for the product, service and information flows.
- The business actors, their roles, their potential benefits from the business model, and the revenue streams.

In the second section of this work we will define five relevant characteristics and their attributes and summarize it in one table. In third section we will present a developing approach which can lead us to an appropriate business model for distributed ERP systems. This approach runs over three phases; Characterization, adapting and goal phase. In this paper we will focus on the first phase; Characterization This work will be summarized in the fourth section.

II. CHARACTERISTICS AND ATTRIBUTES

By researching the literature on this topic, we have identified three relevant characteristics and their attributes that are suitable for the partial economical characterization of this

business model. Through these characteristics and their attributes, one can answer the following questions (see table 1) [3]:

- *In which domain is this business model applicable?*
- *Which type of goods can be exchanged through this business model?*
- *To which extent will this business model integrate into the Internet-economy?*
- *To which type of basis model does this business model belong to?*
- *What is the source of revenue of this business model? And what are the forms of this revenue?*

There are many business models, e.g., business to business (B2B), business to customer (B2C), customer to customer (C2C), customer to business (C2B), administration to administration (A2A), administration to business (A2B), business to administration (B2A), etc. In this paper we will focus on the most popular models which are (B2B), (B2C) and (C2C) (for more details [3]. Not all products or goods can be traded alike through E-markets. There are many factors (related to the vendor or to the customer) that could effect the trading process [22]. These goods are divided into tow categories: Material goods and Immaterial goods [15], [20] and [22].The integration's degree in the internet's economy depends on the ability to implement the transaction phases electronically.

TABLE I
THE SELECTED CHARACTERISTICS AND THEIR ATTRIBUTES

Charact-eristics	Attributes					
ID in IE	Full		Partial			
Business Field	B2B		B2C		C2C	
Basic-BM	Content	Context	Commerce	Connection		
Offered Goods	Tangible Goods		Intangible Goods			
	Physical Goods	Physical Services	Digital Products	Digital Services	Information	Special Goods
Revenue Sources	Products		Contacts		Information	
Revenue Forms	Direct and Transaction-dependent	Direct and Transaction-independent	Indirect &Transaction-dependent		Indirect and Transaction-independent	

Two forms are distinguished here: full and partial integration [3]. The relevant 4-basic business models types are "content", "connection", "commerce" and "context" [23] and [26]. The fact is that most of business models belong to one of the 4-Basics types. a business model could be a hybrid of more than one type. 4-Basic types [16].

The sources of Revenue of business models fall into three categories: Products, contacts and information [21] and [26]. The forms of revenue were classified by Wirtz on one hand according to the players (i.e., buyers and sellers) into direct and indirect revenue and on the other hand according to the pricing conditions into transaction-dependent and transaction-independent [26].

In the next sections we will present approach for developing of appropriate business model for distributed ERP systems through logical steps.

III. DEVELOPING APPROACH FOR FOR COSEPTION OF APPROPRIATE BUSINESS MODEL FOR FEDERATED ERP SYSTEMS

Through the characteristics of business model which has been shown in the second section we present in the flowing figure a developing approach which lead us to the appropriate concept for the exchange of FERP components as web services (see figure1). This developing approach consists of three phases every phase involves one or more of steps with the considering of the existent models, architectures and the special requirements of an FERP system.

The first phase is the characterization phase. In This phase we should answer the flowing three questions:

- Which business model type nowadays is existed and more suitable for FERP as a new Business idea?
- What could be provided in the expected business model?
- To which business fields belongs this business model?

These three questions can be answered and analyzed by using the characteristics “Business Fields”, “Basic Business Models” and “Offered Goods” defined in table 1.

Then this developing approach in figure 1 is derived from the table 1. Table 1 serves information for classifying the existing business models. In contrary, the approach in figure 1 presents basics phases for developing a new business model for a new business idea. The second phase (adapting phase) is added to identify the roles of the actors of the new models with considering the minimizing of the expected risks and problems which may be arise with these new ideas.

The expected results of this developing approach are a character-concept, role-concept and revenue-concept of an appropriate business model for FERP systems. In the flowing under sections we will present the first phase of this developing approach and we let the other phases as future works.

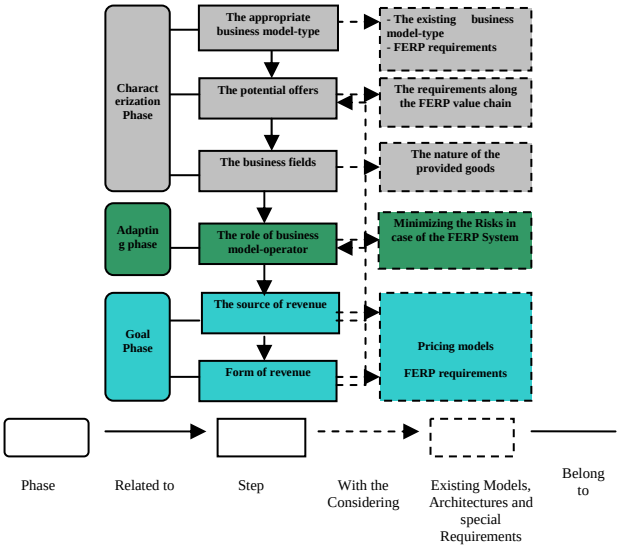

Figure 1. The developing approach for conception of business model for FERP systems.

A. *Appropriate Type of business model for marketing of distributed ERP Systems*

An Enhanced and customized categorization of the business of the provider and facilitator in relation to the marketing of professional services and functionalities as Web Services in five forms [17]:

- The business model of software-companies, which offer services with obligatory fee for the direct revenue generating.
- The business model of software-companies, which offer in addition to the distribution and licensing of their software products free web services.
- Business models of companies that are not software vendors, but they offer free Web services to support their core business.
- Business models of companies whose core business is not in the production of software, but builds know-how solutions in these areas. These companies offer their Web services with obligatory fee.
- A new and customized business intermediaries for Web Services marketing is the broker (or brokerage), which mediates between Web services providers and the customer (enterprises, individuals,…) and supports the customers to find suitable Web services through online directory of services as a clear database. The Intermediary is an entity which stands between the seller and the customer and he can act towards both, in known or unknown ways. The importance of this element comes from reducing and facilitating the

commercial and practical cost and the tow most famous examples are the E-mall and E-auction [5].

There are more than one customer and provider of the ERP components in case of FERP system. Due to the lack of pre-defined communication channels and areas of responsibility from enterprises and customers point of views, the determination and the direct contact of customers with multiple FERP service providers for adoption, customization and maintenance of such federated systems is very difficult and problematic. Therefore, this business model services as a commercial intermediary between the providers and customers. This intermediary presents the ERP components (ERP web services) of different providers and organizes a cross vendor to satisfy the functionality demanded by the customers [4].

In case of ERP auction, customer (user or company) should sign several contracts, if his/its requirements are covered by different ERP WS providers. That means that each provider is partially responsible to the user and there is no single "one" responsible party which customer could deal with in case of failure or any accident. As a result of this Problem, beside the high prices of ERPs software, we consider this possibility practically inapplicable. Then we can say that an ERP-mall as an intermediary business model between the providers and the end-customer (enterprise) is the reasonable and appropriate business model type [4].

After this primary determination we will characterize suitable offering form for this intermediary (mall), which can fulfill the needs of (SMEs) through an appropriate adaptation.

B. *The possible offers through FERP mall*

To characterize the FERP Mall, we will define the possible offers in case of FERP system. These offers depend on the requirements of FERP system. Figure 2 represents the requirements of FERP system along the value chain. In this context, we can distinguish between two categories of requirements [28]: Main and supporting requirements of FERP system. The characteristics of our FERP Mall could be achieved through the determination of the possible offers along the presented FERP value chain. We must determine who can offer which requirements of these?

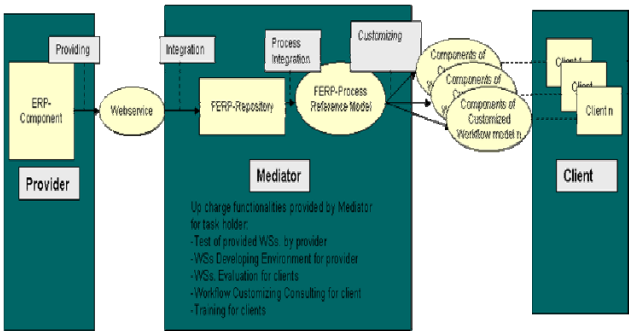

Figure 2. FERP Scenario (or FERP value Chain)

To determine that, we should classify all the requirements among the parties, that act in the market to exchange the ERP component. In the next sections we will present the possible distribution of offers between the three parties (providers (or developers), intermediaries and other parties). For the simplification here, the other parties represent other potential

participants in the FERP market, who can offer just as the intermediary can do.

1 The Main requirements of FERP system

The main requirements are the necessary parts for the realization of FERP systems. This could be derived through the FERP scenario (or FERP value chain) to:

- FERP Web Services (FERP WSs): This web services are implemented by the suppliers (developers) and their interfaces are described by the WSDL-standard (WSDL = Web Services Description Language). These services are reusable and offer the FERP functionality as operations, which are required by user companies. The development of FERP WSs is open for all; therefore, any player could be as a FERP WSs developer in the market. The providers are responsible for the quality of FERP web services.
- WS-publishing: The WSs developers publish the WSDL interface descriptions in the online directories (repositories), which are structured by the UDDI standard (UDDI = Universal Description, Discovery and Integration). The main role of the FERP malls is as online directories provider, where providers can publish their FERP WSs and the customer enterprises can find the appropriate FERP WSs. FERP WSs in these repositories are classified based on the functional enterprise sectors (Accounting, Logistic… Sector) and every sector represent a different shop in our FERP Mall.
- ERP Workflow-Definitions (WF-Definitions): Workflow is a plan of sequential or in parallel chained functions as working steps in the mining of activities which lead to the creation or utilization of business,, [6]. By standardizing these types of activities in a workflow language (e.g. BPEL: Business Process Execution Language), it is possible to use workflow definitions in different companies, and to market it separately. FERP workflow combines Web services from different providers FERP for the support of the whole of FERP business process in user companies. Therefore, our FERP Mall appears as a provider of workflow reference model, which represents all possible scenarios (workflow descriptions) of a company. FERP mall can customize, through this reference model, the suitable workflow for each enterprise. FERP workflows can also be described by the user companies themselves, but in this case, FERP Mall is not responsible for the qualitative aspects of these workflows.

2 The Supporting requirements of FERP system

The supporting requirements here mean requirements which can support the FERP WS developers and the customer companies along the FERP value chain. These requirements can be offered either as fee-based services or as a free service to support the core business. In case of FERP systems, we can distinguish the following requirements:

- Web Services Developing Environment (WSD-Environment): Because of the importance of Standardized Web Services description in case of the FERP systems, we can support the developers with tool which help them by the implementation of Web services. This tool (or development tool) could be used by standardizing the specification to describe functional and non-functional (qualitative) properties of Web services and to manage the development process for the reduction of development time and the potential errors by the WS development [11] and [14]. This tool is offered in FERP as service to be used by the developers, who seem to be costumers in this case.
- The Testing Services (T-Services): The intermediary (FERP Mall) offers web services test and Integration test for the user to find the error in the cooperation of various FERP Web Services [11]. This increases the intermediary safety in his relationships with the large number of FERP Web Services providers and increases the customers' trust in the reliability of the FERP systems. This test service could be offered by partners (third party) too.
- WS evaluation information (WSE-Information): FERP WSs are reusable products and every one could be provided from different developers with different prices quality levels. In our case the market is open to small and private developers for the development and offering of individual FERP WSs. In this situation the intermediary meets many risks because of the large number of foreign suppliers (developers). Therefore, the reputation of these developers has relevant role in increasing the trust and security between the intermediary and the providers (developers) and for the continuous assessment of the quality of a service. This has been considered in [10] and [8] through a secure protocol for exchange of the evaluation information between the provider, the customer, and a trusted third party. This collection and summarizing of historical evaluation information of FERP WSs is offered by intermediary (FERP mall) as trusted party as a quality - and safety information
- Consulting service: After the decision of the company to be a costumer of our FERP mall, we offer supporting advices to this company by selecting and adapting an appropriate FERP workflow. This consulting could play also important role for solving of the possible problems by the using of FERP system.
- Training service: the decision of the company to be a costumer by our FERP mall, the employees, who can use the FERP system. FERP Mall offers

in FERP training courses to cover the lack of knowledge by using the new offers by external parts either.

In the last step in this phase we will discus the business field of this business model according to the nature of the offers.

C. Business fields of FERP Mall

Table 2 shows a classification of the goods which are exchanged through the aimed FERP Mall between the actors. „X"-letter in the business field column of this table refers to anonym developer who develop the web services. We call it "Anonym developer" because the market in the case of FERP system is open for all the developers independent of their personalities.

TABLE II THE BUSINESS FIELDS OF FERP MALL

goods	provider	costumer	Business field
FERP WSs	WS Developer	User-Enterprise	X2B
WF Definitions	Mediator	User-Enterprise	B2B
WS Publishing	Mediator	WS Developer	B2X
WSE Environment	Mediator	WS Developer	B2X
T Services	Mediator	User-Enterprise	B2B
WS Evaluations	Mediator	User-Enterprise	B2B
Consulting	Mediator	User-Enterprise	B2B
Training	Mediator	The Employees of the user-Enterprise	B2C

The goals of all the relationships through FERP Mall are business goals. Every costumer invests by making business through buying of the offered goods from the provider. Therefore, all the relationships through this mall belong to B2B field. The relation by the offering of training for the employees of the customer enterprise seems as B2C but no cash flows because the user-enterprise pay for the training curses as part of its investment. Then this FERP mall is absolute B2B business model.

IV. CHARACTER-CONCEPT OF FERP BUSINESS MODEL

As a result of this work is an FERP Mall. This mall offers FERP Web service through the online directory and work as an integrator of FERP WSs in FERP processes through workflow reference model, which provides all the possible scenario of business in an enterprise. This integrator can fulfill the needed FERP functionality as one hand and he is responsible to the user companies for the quality of ERP processes. The all FERP shops in FERP mall appear as single shop to the costumer companies, which supports all phases of transaction, but only the using of WS functionality execute directly between the FERP WS providers and the end-user. This mall also offers services (as service providers) which are needed for the marketing of FERP Web Services. These services appear in other shops (see Figure 3). All shops in the FERP Mall have a single shopping and payment system.

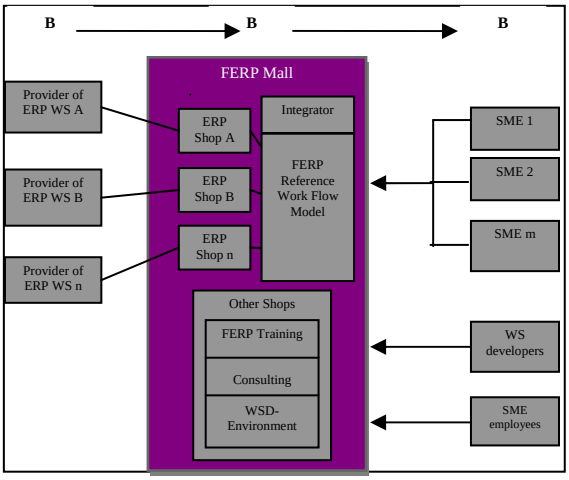

Figure 3. The character-concept of FERP Mall

In this work we have presented the first three steps from our developing approach. These steps represent the first phase (characterization-phase). Therefore, as feature work, we will discus the role-concept of the FERP mall as mediator (intermediary) between the other parties and after that we can present the revenue-concept of this FERP mall as the last part of the presented developing approach for the conception of FERP business model.

V. CONCLUSION

In this paper, we presented the FERP system as a new idea which cans fulfill the needs of the SME with low costs and solve more problems by these SME. After that we presented a developing approach which lead to the realization of the appropriate business model for exchange of FERP systems. This developing approach based on suitable characteristics and their attributes which has been chosen through the business model definitions by the literatures review. We have realized the first phase of this Approach that open the door for the farther developing of the other phases in the feature works. And this approach could be considered for the conception of appropriate business models for the new business idea especially for distributed information systems.

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SESSION

E-COMMERCE

Chair(s)

TBA

Modeling and Simulation as a Quantitative Pedagogical Approach to Teaching E-Commerce to Diverse Audiences

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Abstract - *Simultaneously teaching a vast and complex subject like e-commerce to a diverse audience of undergraduate and graduate students in computer science and management information systems in face-to-face and online environments is a daunting challenge due to the many conflicting needs and expectations. This work describes a stochastic discrete-event simulator grounded to a pedagogical framework, which together seamlessly expose students to an end-to-end process of analyzing, designing, building, evaluating, and refining e-commerce models, as well as reporting on all these aspects. It especially focuses on analytical and communication skills. The simulator provides the basis for designing and executing controlled experiments on almost any aspect of e-commerce. It generates quantitative results that allow students to make informed, justifiable, and persuasive decisions, from which they can not only solve actual problems, but also learn from the experience.*

Keywords: modeling, simulation, analytical methods, pedagogy

1 Introduction

E-commerce is a subject of great breadth and depth. As such, it often draws a variety of students from disparate programs with different—and often conflicting—needs, expectations, skill sets, and even prerequisites. In the case of this work, the programs are Computer Science (CS) and Management Information Systems (MIS) at Western New Mexico University, the students are undergraduates and graduates, and the delivery is face to face and online. The course is also designated as writing intensive, which imposes composition requirements.

Teaching such a complex subject to such a diverse audience is extremely challenging. Furthermore, any realistic e-commerce solution would likely be too large and complex to implement to a reasonably functional degree, even for a CS-only audience. It is thus not uncommon for e-commerce courses to take a predominantly non-technical approach by having students read and write about the subject, but not actually do it [1,2,3]. Unfortunately, many students, especially undergraduates, lack the analytical and communication skills to benefit from this approach [4,5,6]. They also lack a quantitative basis for making, evaluating, and justifying their decisions.

This paper describes a prototype software system that combines the technical concepts of modeling and simulation with a pedagogical framework targeted to the needs of the students, the requirements of the course, and the expectations of the real-world work environment.

2 Pedagogical framework

Technical courses tend to teach in a bottom-up manner, in that they introduce a vast array of discrete solutions without necessarily considering their contextual application to overall problem solving [7]. As a result, in the top-down process toward an e-commerce solution, it may not be clear to students, given all the alternatives in their toolboxes of resources, how to get from the problem (*what* to do) to the implementation (*how* to do it). The pedagogical framework of this work helps bridge this gap. It addresses the progression of holistic understanding of e-commerce subject material over time as students accumulate *data*, *information*, and *knowledge* throughout their studies, and eventually *wisdom* over their careers. This DIKW model in Figure 1 helps students connect the dots within the subject of e-commerce and throughout their curriculum [8,9]:

a. Data: no associativity or context
b. Information: associativity within one context
c. Knowledge: associativity within multiple contexts
d. Wisdom: generalization of principles based on knowledge from different sources over time

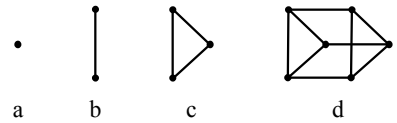

Figure 1: Data, Information, Knowledge, and Wisdom

2.1 Relationship to teaching philosophy

The pedagogical framework derives heavily from the way experienced professionals—those having achieved "wisdom" in Figure 1—commonly solve real-world engineering problems [10]. The goal is to decompose a problem in both a top-down and bottom-up manner into its isolated components with well-defined behaviors, connections, and interactions. This breakout facilitates clearly addressing the independent, dependent, and interdependent multidimensional roles of *who*, *what*, *when*, *where*, *why*, and *how* (W^5H) [11]. Professionals can often

address multiple roles simultaneously, but students appear to benefit more from a targeted, piecemeal approach that avoids conflation and the resulting confusion, misunderstanding, and impediment to learning [10]. To this end, the following subsections touch on how assignments associated with this system reflect a carefully staged introduction of new material while circularly revisiting and strengthening previous material from both this course and others. Individually, assignments consist of a series of relatively small, focused questions on a specific topic for depth of coverage, and collectively they provide a representative cross-section of the general subject matter for breadth. Section 4 will address how the system aligns with this philosophy.

2.1.1 Problem analysis

Analyzing a problem involves establishing a holistic understanding of what needs to be solved and why. The running example here is to estimate the number of servers and their processing delay, or latency, to satisfy a supply of customers at a hypothetical online bookstore when no supporting data are available. Students must define in their own terms what customers are, how many there could be, how they behave, what their effect is on servers, and so on. In support of their decisions, they are expected to draw upon resources like use cases, case studies, related solutions and research, and their own experience.

2.1.2 Solution design

Designing a solution involves proposing and specifying the abstract components for a hypothetical working system. In this context, abstract means describing in English what the necessary components are and what they can do without addressing the concrete technical details of how to make them actually function. Given reasonable justification, there are no right or wrong answers at this point. However, there is also rarely a defensible basis or degree of confidence behind them due to the lack of quantitative supporting data. For example, students estimated needing from 1 to 10 servers based on contrived numbers of customers. The range itself is indicative of coarse understanding because nobody estimated hundreds of servers, but a finer understanding of the differences within this range is lacking.

2.1.3 Solution virtual implementation

Implementing the design involves creating a corresponding representation that can actually be executed. Ordinarily, in a CS-only environment, this step would incorporate a variety of web-application technologies, with programming as the glue logic. However, given the constraints of the audience, this approach is not a viable option. Nevertheless, realistic execution in some form is still critical to understanding an e-commerce solution holistically. Modeling and simulation bridge this gap. A well-designed virtual implementation of the solution captures the essence of its lower-level operation while keeping its programmatic and technical aspects at a higher level.

The model is a concrete, computable definition of the abstract components in the design. Mapping from the abstract to the concrete is a complex thought process, which this framework facilitates. The key concept is similitude, or the bidirectional correspondence between the components in the real world and the virtual world [12]. No model of any kind ever perfectly reflects its real-world counterpart; it is always an abstraction. Deciding what to include (the breadth) and to what degree of realism (the depth) is a skill that students need to develop because most fields, especially CS and MIS, actually work with the virtual world, not the real one [12].

2.1.4 Solution simulation

Executing the model involves running a rich set of simulated experiments on it to observe its operation and establish ranges for its performance with a reasonable degree of confidence. For practicality, especially as this work is still in progress, students are not expected to implement the model or simulation, or even run the simulation. Rather, their role is in carefully articulating—as nominal subject-matter experts and consultants—how someone else (here, the instructor) can actually build and run it. This opportunity gives them valuable first-hand knowledge of how communication can directly affect the outcome of a project, for better or worse.

2.1.5 Solution evaluation

Evaluating the solution involves answering questions of interest related to the problem analysis. At this point, for example, students can actually see the performance of their estimates for the number of servers and their latency. They can then iteratively refine their decisions based on justifiable, quantitative grounds. There are also countless other analytical opportunities, such as determining maximum operating loads, bottlenecks, critical paths with single points of failure, redundancy requirements, up-time expectations, and the effects of simplifying assumptions on the model.

2.1.6 Reflective inference and reasoning

Evaluating the solution involves more than just answering questions of interest; it also involves learning from their relationships so next time students can pose better questions. As a result, they can perform better analyses and designs earlier in the process, with less need for later refinement. This reflective meta-analysis meshes well with the DIKW model by helping students connect the dots with respect to the many and varied facets of an e-commerce solution. It also helps them address not only current questions like server count, but also future questions like the scalability and extensibility of their solution based on projected growth.

2.1.7 Solution reporting

Solving a problem and learning from the process are important accomplishments for individual students, but in a real work environment, they would also be expected to communicate among many other stakeholders about all aspects of their work. They must therefore understand their audiences and target their writing appropriately. For example, a report to other team members is usually far more technical and detailed than one to managers or clients.

2.2 Relationship to Bloom's Taxonomy

This teaching philosophy developed in both an ad hoc and empirical manner over significant time spent by one of us (Tappan) in industry and academia. Although it is not a formalized pedagogical approach, it nevertheless aligns very closely with the classic Bloom's Taxonomy, which considers the following ordered stages of learning [13]:

- *Knowledge* is applying learned facts, terms, concepts, and existing solutions to the current problem in a relatively direct, bottom-up manner. For example, the online bookstore is obviously a web application, and therefore it needs a web server and network connection.
- *Comprehension* is interpreting and understanding the significance of the knowledge-based decisions to refine them in context. For example, based on what students know about their bookstore model, one to five servers is a reasonable estimate, whereas 500 would not be.
- *Application* is using existing knowledge in new ways based on a new context. For example, connecting the servers through a network switch is an obvious requirement, but there are many ways to do so beyond what students may have ever seen in the classroom.
- *Analysis* is reasoning over the holistic combination of everything involved in a solution to make informed decisions. For example, three servers might be currently adequate, but the projected peak traffic might suggest an additional server to buffer against demand.
- *Synthesis* is combining existing and new aspects of a solution to satisfy the requirements that students determined for it. This solution could be the actual e-commerce site, but in this work, it is a model of it.
- *Evaluation* is determining the success of a solution, and then communicating it in a justifiable and persuasive manner to the stakeholders. For example, adding the fourth server may provide valuable additional processing at relatively little extra cost.

3 Related work

This work is based on analysis of e-business processes through modeling and simulation under an umbrella of pedagogical considerations. All these elements have a long history of study and usage. Even a superficial review of related work would be beyond the scope of this paper. Nevertheless, several were of particular value in framing it. Pateli and Giaglis [14] and Ree [15] provide a comprehensive comparison of frameworks for understanding and analyzing e-business models. Parker and Swatman [16] bridge this view of practical application to the educational environment. From this point, Pastor, et al. [17] serves as a technical transition into conceptual aspects with respect to modeling and simulation. Dort [18] then offers an extensive literature review of pedagogy-oriented simulation. Although dated (1989), its overall analysis applies equally well to today's technology, which Guralnick and Levy [19] and Gilliot and Rouvrais [20] address. In addition, Bouhadada and Laskri [21] consider distance learning, and Cao, et al. [22] formally studies the educational value of simulation in terms of measurable learning outcomes.

4 System description

The system is a general-purpose simulator for any interconnected components that can be modeled in a network of propagated events. While the emphasis in this work is on high-level processes like e-commerce, nothing precludes lower-level processes like software and hardware architectures, or even digital circuits. This flexibility allows the same pedagogical foundation to be applied in, or connected with, other courses.

The implementation is in Java, with JavaCC for parsing the modeling language. The portability of Java is especially useful in the online teaching environment, where supporting students' computers remotely would be troublesome. The entire system, including examples and documentation, will be available as open-source software at `shelby.wnmu.edu` once it is stable.

4.1 Model

The model defines the components of a solution and their interconnection network. The pedagogical emphasis is on their data aspects (what components are in terms of their inputs and outputs) and their control aspects (what they can do in terms of their processing). Figure 2 illustrates the example client-server model with the following informal definition:

- The *customer generator* (CG) issues a customer event at random intervals.
- The *network switch* (NS) distributes the customer to the next server in a round-robin manner.
- The *arrival logger* (AL_n) records the customer's arrival at the designated server.
- The *server* (S_n) holds the customer for a certain time.
- The *departure logger* (DL) records the customer's departure from the server.

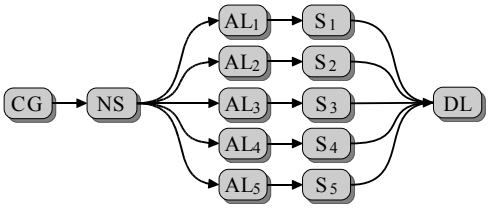

Figure 2: Example Client-Server Model

4.1.1 Language description

The formal definition of a model uses a hybrid functional language within templated programming structures for each component and the network. The functional approach allows almost any aspect of a definition to be evaluated dynamically, which results in powerful, yet small, clean, and easily understood, pieces of the overall solution. It supports a wide range of typical programming constructs such as assignments, conditionals, arithmetic and logical expressions, set operations, loops, input and output, and logging.

4.1.2 Components

The templated programming structure for any component reflects the input, processing, and output model in Figure 3. There are any number of inputs from other components, each of which feeds into its own input queue (IQ_n) and then to a processing unit (P), which, in turn, produces any number of outputs, each into its own output queue (OQ_n). The inputs and outputs can be untyped or typed as integer, real, boolean, string, or enumeration. They can also have optional ranges. The queues play the customary data-structure role of holding events, as well as imposing timing constraints by retarding flow through the component. The processing unit has access to a local symbol table (ST) to hold state information as variables and manage recursive function calls.

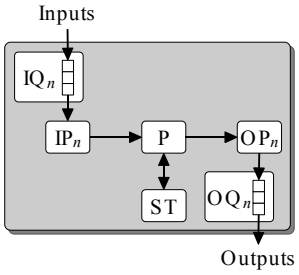

Figure 3: Component Framework

Between the queues and the processing unit are optional input and output perturbers (IP_n and OP_n, respectively). Their role is to introduce probabilistic errors into the event stream to model realistic operating conditions. In this client-server model, however, they are not used, and they are beyond the scope of this paper.

Figure 4 shows an abridged definition of the round-robin switch that distributes one input to one of five outputs.

```
(COMPONENT switch_round_robin
  (ARGUMENTS $server_count)
  (INPUTS
    (INPUT $input1))
  (OUTPUTS
    (OUTPUT $output1)
    (OUTPUT $output2)
    (OUTPUT $output3)
    (OUTPUT $output4)
    (OUTPUT $output5))
  (BEHAVIOR
    (SET $server_index (ADD $server_index 1))
    (LOG 'switch' 'arrived' $input1 'sent_to' (CONCAT 'server_' $server_index))
    (SET $output1 $input1)
    (CASE $server_index
      (1 (SET $output1 $input1))
      (2 (SET $output2 $input1))
      (3 (SET $output3 $input1))
      (4 (SET $output4 $input1))
      (5 (SET $output5 $input1)))
    (IF (EQ $server_index $server_count) (SET $server_index 0))
  )
)
```

Figure 4: Abridged Round-Robin Switch Definition

4.1.3 Network

The network defines the interconnections between components as links from their outputs to inputs. It also propagates configuration and instantiation arguments from the simulation to the components, such as `$server_count` in Figure 4. Figure 5 shows an abridged definition that corresponds to Figure 2.

```
(NETWORK arch_server_switch_round_robin
  (ARGUMENTS $customer_rate $server_count $latency)
  (COMPONENTS
    (COMPONENT g  customer_generator $customer_rate $server_count $latency)
    (COMPONENT sw switch_round_robin $server_count)
    (COMPONENT a1 arrival   'a1')
    (COMPONENT s1 server    's1' $latency)
    (COMPONENT d1 departure 'd1' $customer_rate $server_count $latency)
  )
  (CONNECTIONS
    (CONNECTION g.$output1  sw.$input1)
    (CONNECTION sw.$output1 a1.$input1)
    (CONNECTION a1.$output1 s1.$input1)
    (CONNECTION s1.$output1 d1.$input1)
    (CONNECTION sw.$output2 a2.$input1)
  )
)
```

Figure 5: Abridged Network Definition

4.2 Simulation

The simulation provides the behavior, or operational context, to complement the data and control of the model. It provides a vast array of fine-grained flexibility in addressing different analytical aspects of the same network. For example, simulations of the client-server model can determine the maximum number of customers per hour, average wait time per customer, optimal switch strategy, optimal server count, and any bottlenecks.

4.2.1 Controlled experiments

The basis of simulation is controlled experiments in the scientific sense. The first execution of the model establishes its baseline performance, against which subsequent test executions allow direct comparison. The

difference between each execution should be one—and only one—change to the model, such as modifying a parameter or substituting a component. This single perturbation demonstrates a clear cause-and-effect relationship in the results. This Monte Carlo methodology is extremely powerful in that it simultaneously helps a student refine a model, learn about it, and develop wisdom about running thoughtful experiments in general [23].

4.2.2 Overview of execution

Executing a simulation is a process of propagating events throughout the network from the outputs of components to the inputs of others. For some models, like the client-server example, propagation is end to end with no loops; i.e., from customer generator to departure logger. More complex models may propagate outputs back into earlier inputs for feedback. The trickiest part of execution is usually in setting the initial conditions and allowing the network to ramp up to a stable operating mode before logging its performance data. In addition, a simulation needs terminating conditions to stop it after a fixed amount of time or when an arbitrary logical expression is satisfied.

A single system clock coordinates the propagation of events. Each tick corresponds to an arbitrary, fixed period of real-world time; e.g., one minute in the client-server model. It also updates independent countdowns on all input and output queues, which forward their pending head event only at a specified threshold. This triggering mechanism allows for great flexibility by controlling the processing time of components; e.g., the latency in a server.

5 Model evaluation

The purpose of simulation is to make the model perform under controlled conditions of interest. From its quantitative results, students can evaluate whether the model works at all, and, if so, how well, and then they can iteratively propose and test refinements.

5.1 Data logging

The quantitative results for evaluation derive from judiciously placed log statements in components, such as in Figure 4. The choice of what to log and how is nontrivial, but the system accommodates the process in a flexible manner. For example, it supports any number of synchronized logs. It also automatically tags each log entry with meta-information like the identifier of the component making it and the clock tick. Log statements can also call user-defined Java code to manage complex data structures and formatting of file output. Export formats for Excel and the freely available gnuplot are built in.

5.2 Presentation of results

Appropriately presenting the vast, multidimensional breadth and depth of quantitative results from a simulation is a difficult process. Even a relatively simple simulation like the client-server model produces far too much raw data to present without additional processing. Therefore, part of the students' learning process is first to decide what to include and exclude, and then to decide how to refine and present what remains. This task is both a mathematical science and an art [23].

Figure 6 illustrates equivalent tabular and graphical representations of the results for customer throughput on a single server. Server latency, as the independent variable on the *x*-axis, varies from 1 to 10 minutes. Throughput, as the dependent variable on the *y*-axis, is the percentage of customers who left within the hour of simulation time. The customer-generation rate is fixed at a 10% chance of a customer arriving during any minute.

Rate	Latency	Arrivals	Departures	Throughput
0.1	1	6	6	100%
0.1	2	6	6	100%
0.1	3	6	6	100%
0.1	4	6	6	100%
0.1	5	6	6	100%
0.1	6	6	6	100%
0.1	7	6	5	83%
0.1	8	6	5	83%
0.1	9	6	4	67%
0.1	10	6	4	67%

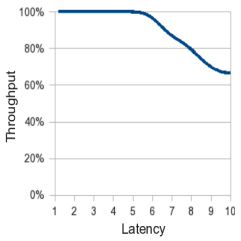

Figure 6: Single-Server Throughput Based on Latency

This presentation is adequate for one independent and one dependent variable. However, any reasonable simulation has many such variables. For example, the client-server simulation actually varies the customer rate from a 10 to 100% chance per minute (by steps of 10), the number of servers from 1 to 5, and their latency from 1 to 10 minutes. This combination produces 50 variants of Figure 6, which are obviously excessive in a report. Distilling them into a three-dimensional graph with gnuplot, however, as in Figure 7, with two independent variables (latency and customer rate) presents all the combinations in only five such graphs; i.e., one for each server count.

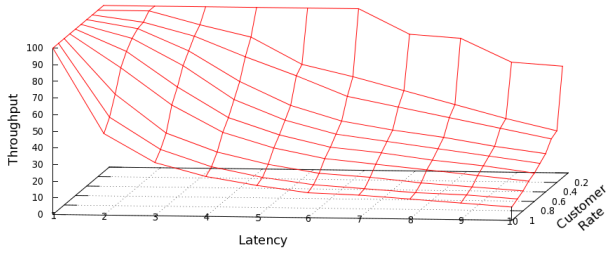

Figure 7: Single-Server Throughput Based on Latency and Customer Rate

5.3 Analysis of results

The purpose of presenting results is to be able to analyze them to make informed decisions about the problem to be solved, to understand the model, and to learn from the process of modeling and simulation. To this end,

students are expected to interpret what they see. For example, Figure 6 (and the far line in Figure 7) shows that throughput is 100% (six of six customers) until latency exceeds six minutes, after which there is a somewhat shallow drop-off in performance. The same analysis with a customer-generation rate of 1.0 (one per minute) has a severe drop-off, as shown in the nearest line in Figure 7. Such inspection and pattern discovery help students to see what happens and then to reason about when, where, how, and why it happens. This process of connecting the dots between data, information, knowledge, and wisdom provides a valuable multidimensional. holistic educational perspective [7,9].

5.4 Reporting of results

The purpose of analyzing results is to be able to report the observed patterns and conclusions. Writing concise and coherent professional reports is a skill that very few graduates with technical degrees truly possess [5,6]. Part of the problem is that most of their educational time is spent on *solving* problems, but not on *communicating* about the solutions [7]. This situation is understandable, given the limited time available in most courses. However, it is a major liability in a real work environment, where quality communication skills are essential. This system and its underlying pedagogical foundation attempt to strike a balance between problem solving and communicating by seamlessly integrating the two.

6 Results and discussion

This system is a work in progress. Its preliminary results are perhaps best considered as part of a pilot study at this point because they derive from only one semester of student contact. Nevertheless, it is based on countless experiments to develop, refine, and test its capabilities, and its underlying pedagogical framework has been in successful use for years.

A diverse audience presents challenges, but it also provides a valuable synergistic opportunity. In an educational setting, students are normally isolated within their own fields. In the real world, however, they are also usually expected to work with other fields. The breadth and depth of this system exposes everyone to every aspect of all the stakeholders to some degree. Formal and anecdotal student feedback definitely shows that they are learning to appreciate these roles in this holistic view.

Students are also learning to connect the dots within their own curriculum. The MIS students, for example, are seeing how modeling and simulation relate to operations research, supply-chain logistics, process optimization, and many other business concepts [23]. The CS students are seeing connections to software engineering, computer architecture, networking, web applications, and databases, for example. For both groups, the process of formulating questions, answering them, evaluating their answers, and iteratively refining their solutions is proving to be very educational, enlightening, and practical.

Among the notable observations is a curious lack of true understanding of commonplace technical terms and concepts by many students within their own fields. Faculty may take it for granted that students understand them, and students may not recognize or acknowledge such deficiencies. Nevertheless, this system has brought them to light and provided an opportunity to discuss the situation. One example involved the role of the power supply in a server. The scenario was to estimate and model the collective power requirements for an entire e-commerce site in order to specify its primary and backup electrical needs. A number of interesting misconceptions arose about the relationships between software and hardware, and the overall concept of power was almost universally misunderstood. A similar situation occurred with networking.

7 Future work

As a work in progress that is being iteratively developed, tested with students, and refined at the same time, this system has known deficiencies in its design and usage. The main limitation is that students do not know how to use the modeling language, which therefore requires the instructor to perform some of the pedagogical functions that should be their own tasks. A graphical user interface will make the system much easier to manipulate. In addition, it will also incorporate some of the visualization for presenting data internally to reduce the effort of exporting to external tools like Excel.

Another limitation is the lack of prebuilt components. The instructor must build everything from scratch on demand, which hinders the flow of teaching. A library of low-level support components like servers and loggers should reduce design time and increase students' creativity by allowing them to entertain more alternatives to their models. Similarly, a library of high-level components like e-commerce subsystems and even full, working e-commerce models should allow this system to integrate more tightly in the classroom, thereby increasing its effectiveness.

8 Conclusion

E-commerce is a vast and difficult subject to teach to a diverse audience. This system provides students with balanced, manageable exposure to its breadth and depth. It is based on a pedagogical approach of what to do and why, which then seamlessly flows into a practical approach of how to do it. It derives from broad industrial and academic experiences, as well as established educational foundations. It walks students through an iterative process of analyzing a problem, designing a solution, implementing and simulating a faithful model of it, analyzing, evaluating, and communicating the results, and reflecting on the experience. Every step of the process is orchestrated to

build upon the previous steps and lead to the next steps. Not only are students performing the steps, but they are also learning why they are performing them. This process results in knowledge and experience that they can apply for themselves in countless other contexts throughout both their studies and careers.

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Barriers to Implementing B2C Method of E-Commerce for City of Yazd in Iran

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Abstract *- The potential of internet has been expanded rapidly toward using e-commerce in many countries. E-commerce has become popular as many people come to understand its convenience and its quick respond to requests and as more products and services become available. This inductive interview-based study aims at identifying and assessing the significant barriers in business-to-consumer (B2C) electronic commerce in city of Yazd in Iran and addresses the proper solutions for its improvement. An exploratory study was conducted to investigate the barriers to implementing e-commerce. The basic work for this study was done by interview and distributing questionnaires in addition to books and journal reviews. A questionnaire was designed for use of regular people as users of e-commerce. Data were collected through a questionnaire distributed to different people. Implications of the findings were discussed and recommendations for future studies were included for this research work. The results obtained show that required knowledge (Internet, computer, education and English) toward B2C e-commerce are the main barriers of the intention to shop on the Net. On the contrary, trust to suppliers (Vendors) and low speed of internet are other major problems.*

Keywords: Electronic commerce; Developing countries; Barriers; Yazd

1 Introduction

Electronic commerce (EC) is familiar in today's articles, businesses, trades, public Medias, and many other sectors. It is related to marketing, sale, finance, law, and economy. It is necessary to analyze the factors that determine the sectors inclination towards deploying e-commerce technologies because this would help firms design appropriate interventions in order to control it. E-commerce is the process of doing business electronically among different entities for satisfying an organizational or individual objective purpose. E-commerce and World Wide Web play an important role in contemporary societies today. Requirement for better communication is one of the major factors for development of e-commerce in many countries. Rapidly developing communications technology and increasing internet penetration have contributed to the growth of e-commerce worldwide. The term "e-commerce" emerged only in recent years as businesses became aware of the potential role of the Internet as a powerful medium for conducting business. In the past decade, e-commerce has substantially affected the business world and is expected to increase in importance. E-commerce has prompted the rise of virtual business relationships including business-supplier, business-client, business-to-end consumer and strategic alliance [1]. Based on the parties involved in the business transaction, e-commerce can be classified as business-to-customer (B2C) or business-to-business (B2B) [2].

Zwass [3] defines e-commerce as the sharing of business information, maintaining business relationships, and conducting business transactions by means of telecommunications networks. Treese and Stewart [4] define e-commerce as the use of the global Internet for purchase and sale of goods and services, including services and support after the sale.

Kalakota and Whinston [5] define e-commerce as the delivery of information, products/services, or payments via telephone lines, computer networks or any other means. They do not limt their coverage to just Internet based means. Kauffman and Walden [6] emphasize the Internet as a medium for enabling end-to-end business transactions. Their definition applies equally well in dotcom and Internet-only business settings, as well as more traditional business settings where the new channel of the Internet is being used alongside existing channels [7]. Internet has not been used in traditional business in many developing countries. There are many reasons for lack of internet use, but the most important factors are trust and knowledge.

Yazd is one of the most ancient cities in the world which is located in heart of Iranian desert with the population of almost 400000. Muslims live and trade together along with Zoroastrians and Jews peacefully for many centuries.

E-commerce in this study is defined as using the internet to sell products or services. It incorporates both business to consumer and business to business activities [8]. For purpose of this survey, B2C is more relevant in order to identify the main problem for regular users of e-commerce. The e-commerce revolution is transforming business processes, supplier and procurement systems, the structure of industries, and the nature of firms [9]. Meeting customer needs of geographical accessibility is a critical factor in establishing EC operation strategies for customer contact and service delivery

[10], customer support and logistics [11], and distribution channel strategies and network design [12]. E-commerce arguably has a potential to add a higher value to businesses and consumers in developing countries than in developed countries [13–18]. Yet most developing country-based enterprises have failed to reap the benefits offered by modern information and communications technologies [13,19]. This paper attempts to gain an understanding of e-commerce barriers in city of Yazd for the first time.

The emergence of Internet-based business has radically transformed the global economic and social landscape over the past decade [20, 21]. E-commerce experienced a boom-and-bust in business cycle in its transition from the dotcom bubble in 2000 and 2001 back to an economy with more modest expectations for technology-led value. More recently, it has achieved steady growth in the global setting. The development of e-commerce and related technologies so far has mostly been limited to developed countries and has been relatively slower in the rest of the world [22 – 28].

The concept of e-commerce is crucial for the people in city of Yazd, because it affects some parameters including privacy, security, quality, cost, and physical separation between buyers and sellers. With the global business method moving towards productivity by using information technology, people have to reposition their traditional 'retail' role and change their methods of doing business. In the remainder of the paper, traditional business in Yazd is mentioned. Next, the methodology is discussed. Then, analysis is provided. The final part provides conclusion.

2 Trust

As a matter of fact, most of the people in Yazd are Muslims, Jews, and Zoroastrians. Clearly, there is a common gesture for fare and honest trade among all of these people. It is worth to mention that these people are famous for being honest and smart in business regardless of their religion.

Islam not only permitted and encouraged man to involve in all sorts of productive work (such as business), but also ordained it as a duty upon Muslims. Hence, the Quran regarded business as lawful, good and beneficial for both the individual and the society. Fair trade and honest business are praised, recommended and strongly extolled to by the Quran [29]. Zoroastrians are also famous for being very honest and trusted not only in Iran but also in other countries like India in which there are many successful businessmen. Jews are also very smart in business, but most of them migrated to other countries after the Islamic revolution.

3 Research methodology

A survey targeted at regular users, was utilized to collect data. To improve data reliability and validity, the questionnaires were evaluated rigorously by pilot testing prior to administration. Rigorous statistical tests for reliability and validity as described below were performed on the data eventually collected. The preliminary instrument was reviewed by nine professional researchers with more than 12 years of teaching experience, eleven professional businessmen familiar with e-commerce, and seven regular users. Of the 37 questionnaires, 7 were discarded due to missing values. The questionnaire was pre-tested with 30 users and there were no major problems with understanding, wording, etc. The Cronbach's alpha (α) coefficients of all constructs were above 0.85 in acceptable range. Therefore, total amounts of 150 questionnaires were provided for distribution in which only 96 were completed well by respondents and were chosen for analysis in this survey.

3.1 Collecting data and information

It is usually common not to apply only one method of collecting data to do a research. The researchers apply different means for data collection to make their output more reliable. Therefore, this study is not an exception applying three different methods to collect data:

- The library research which includes books, magazines, the project, websites and the articles
- The interview with the e-commerce experts.
- Survey (the provision and distribution of the questionnaires).

The application of several methods brings about different advantages such as:

- Improvement of the quality of data analysis, and the high quality of the data.
- Increase of the accuracy of the basic data.
- The coverage of the vast majority of the society.

3.2 Preparation of questionnaire

The questionnaire is common way to collect data, and it must be prepared in accordance with particular principles. The questionnaire is to analyze the purpose and hypotheses of the research, and meet the researcher's needs. The questionnaire is certainly aimed at assisting the researchers to achieve the goal of the research; otherwise it will reduce, in vain, to a bunch of questions merely bringing no results. The purpose of the questionnaire preparation is to recognize the advantages, disadvantages, problems and solutions of the research.

After obtaining the information concerning e-commerce and its techniques, a group of nine researchers was set to arrange the questionnaire which took for weeks. The first copy was given to the IT and e-commerce experts to put their comments on. After taking their comments into consideration, the questionnaire was given to nine members of research team for distribution to the population. The questionnaire was prepared for the people living in Yazd keeping in view that the number of people residing wherein is 368,412 according to the census. Therefore, 96 samples were required for the interview.

3.3 Sample determination

Due to the limitation of time, human resource and financial parameters, it is necessary to use sampling method, but in order to generalize the conclusion to the whole society it is a must to obtain numbers of samples through a scientific and reasonable method. In this study, the following method was applied through a scientific and reasonable method to obtain the necessary samples:

For two words function the probability of its acceptance is p=0.5 and is expected to represent the whole population with the confidence level of 95%. The accuracy included in the research indicates as to how much the expected value is different from the value estimated and whether the difference meets our purpose or not.

The level of the accuracy shows a distance which is expected to indicate the value obtained in the population is higher or lower than the value estimated.

In order to do the sampling, we want to sample in a way such that the real proportion of the population is not different from the percentage of the sample by 10%. The level of the accuracy- need is estimated to be equal to 0.1%. In the light of above pointes, the numbers of samples are obtained by the following equations:

$$n=(N.Z^2\alpha/2.\ pq)\ /\ (Nd\ .\ Z^2\ \alpha/2.\ pq) \quad (1)$$

$$Z^2\ \alpha/2=1.96 \quad (2)$$

$$P=q=0.5 \quad (3)$$

$$D=0.1 \quad (4)$$

The questionnaire was prepared for the people living in Yazd keeping in view that the number of people residing wherein is 368,412 according to the census. If we put the above-said number in the sampling formula, 96 samples would be required for this purpose.

4 Demographic characteristic and general issues

The survey questionnaire consisted of two sections wherein this first section, respondent's demographic information was asked and in the second main questions along with required information were asked for further analysis of the survey. The questionnaires were handed out to people and after a few minutes they were collected. Some other questionnaires were filled in an interview which turned out to be better than the previous one. Since in the previous method few people didn't answer some questions or they weren't aware of the importance of the issue, the second method proved to be more effective where all the questions were answered. After collecting the questionnaires the data were inserted to the SPSS software and the analysis was done by the said software. Based upon the information gathered for this survey, 65 percent of persons participated and answered the questions were men and 35 percents were women. It is observed that respondents with the age between 20 and 30 had participated more (29.1%) than other age groups. But older people with the age of 40 and above had the lowest participation in this survey (11.6%). However, 23.2% of interviewees were from 15 to 20 years old. Only 15.1% had the ages of between 30 and 40. Therefore, majority of the respondents for this survey were up to 30 years old.

Most of the participants had diploma and bachelor college degrees with 43% and 41.9% respectively. But persons with higher degrees like master and PhD were only 3.5 percent of the total. Only 10.5% of the groups were under diploma category.

According to the survey, 15.1 % of respondents use internet up to 1 hour a week, 37.2 % mentioned using internet 1 to 3 hours a week and 14 % said they use the internet 3 to 7 hours a week. Only 5.8 % use internet more than 7 hour a week. It is interesting that 25.6% never work with internet. While in the developed countries, higher percentages of people use internet. The internet and phone charges, the lack of internet usage, the lack of Persian websites and the people's inability to use English may be the reasons why Iranians don't use it as much as others do.

The web-sites and credit cards are usually applied for purpose of electronic commerce and e- mail is of limited use in the trade worldwide. However, due to lack of knowledge of the electronic trading, and inattention to this question by the participants, 35.9 % of the participants made the e-mail as their choice for trade in this survey.

12.5 % of those using e-commerce said that they used the web sites to do their job while 35.9 % of mentioned that they used email in order to do commerce, and 48 % used credit cards for trade. It goes without saying that these figures are for people who are familiar with internet and also implement methods of electronic commerce. It is interesting to know that major international credit cards are prohibited in Iran, because of economic sanctions and political matters. Therefore, many people are using domestic credit cards for purchasing goods or products.

Electronic banking is the only use of electronic commerce in Iran, but other uses of the electronic commerce are not common. The important point is that withdrawing money from the automatic teller machines is usually common. People have to stand in long lines, and most of the time the machines are out of order. The banking authorities had to improve the system, because there are many people who are willing to use e-banking.

8.5% of respondents taking part in the survey stated that they used electronic commerce in their every day life to pay the bills. 32.2% preferred to pay by credit cards, and 11.9 % mentioned they used credit cards to do shopping. Surprisingly, 41.5% of respondents used the electronic services of banks to withdraw money. Results show that majority of persons use e-banking in order to get cash for purchasing. It is an indirect use of electronic commerce for B2C trade.

The most important aspect is to inform and advertise to make people familiar with the new technology and if one fails to advertise the technology, he should expect failure. The electronic commerce is not an exception, it needs advertising

too. In order to make the electronic commerce well known, we need to apply a capable information service. Unfortunately people are found to have been poorly informed about the electronic commerce in Iran. The conclusion obtained from the survey shows that most people are not familiar with it.There are different types of advertising (Table 1) available in survey; the people were asked which one they preferred. 10.8% people participating in the survey said that reading a book was a suitable way for them to learn about the e-commerce. 63.1% mentioned that they acquired the necessary information concerning the services of e-commerce from the radio and the television. May be the higher percentage of the use of mass media persuades the authorities of the e-commerce to take it more seriously to advertise e-commerce and make its use common in Iran. The 13.8% of participants considered the newspaper as means of advertising while 7.1% stated that they used the catalogues and the information kiosk to learn about e-commerce.

Table 1 : Method of learning e-commerce

Method	Books	Media	Newspapers	Catalogues	others
Percentage	10.8	63.1	13.8	7.7	3.1

24.3% participants in (Table 2) the survey said that they used e-commerce due to its accuracy. 50% stated that they enjoyed the services of e-commerce due to its high-speed.18.6% mentioned they used e-commerce due to low charges. 7.2% of participants stated that they preferred to use e-commerce due to its quality and security measures respectively. It should be mentioned that some people have easy access to high speed internet services like ADSL which off coarse is costly.

Table 2: Reason for using e-commerce

Factor	Accuracy	Speed	Cost	Quality	Security
Percentage	24.3	50	18.6	2.9	4.3

People participating in the survey mentioned that lack of sufficiency of training impeded them from using the e-commerce. 27.1% believed that accuracy in e-Commerce is a major threat to this service in Yazd (Table 3). 40% percent of the people taking part in the survey mentioned that the lack of facilities made the people unable to use the e-commerce in Iran. 21.4% of participants stated that weakness in qualities had been a bar to the improvement of the e-commerce in Iran. 2.9% mentioned that the services of the provided in Iran didn't meet their requirements; this might have been the reason why the e-commerce hadn't improved yet. 8.6% mentioned that the charges of services had made e-commerce unviable to develop In Iran. Therefore, there are still many problems which must be solved in order to make EC popular in Yazd and Iran as well.

Table 3: Disadvantages of e-commerce

Factor	Accuracy	Availability	Quality	Field	Cost
Percentage	27.1	40	21.4	2.9	8.6

5 Analysis

For this part, the analysis was done on 10 following questions in table 10. These items were scored on a five point Likert-type scale ranging from (1) Very high to (5) Very low (Table 4).

The survey questionnaire consisted of two sections. In the first section, respondent's demographic information was asked. In second section, main questions and required information were asked for analysis of the survey.

Table 4: Percentage of answers to each question

Subject	**A**	**B**	**C**	**D**	**E**
Familiarity of persons with computer and internet	07.0	33.7	32.6	15.1	11.7
Familiarity of persons with EC	14.0	27.9	25.6	11.6	20.9
Trust to e-commerce	04.3	33.3	43.5	10.1	08.7
Level of using e-commerce for own activities	07.0	24.2	20.9	23.3	23.3
E-commerce service satisfaction	03.9	42.2	37.5	10.5	06.3
Using e-commerce and amount of time saving	09.7	56.6	25.8	04.8	03.2
Using e-commerce and level of cost reduction	08.1	35.5	41.9	09.7	04.8
Using e-commerce and lowering errors	06.1	34.8	36.4	07.6	15.2
Familiarity with World e-commerce services	05.4	17.4	15.1	25.6	26.7
Access to computer and internet	10.5	37.2	27.9	14.0	10.5

A = Very high B = High C = Moderate E = Low F = Very low

5.1 Familiarity with internet and computer

Over 40.7 % of participants know how to use internet and computer to a great to very great extent. Since more than half of the people participating in the survey possess degrees higher than diplomas; the statistical value of 40.7% seems to be reasonably low. The majority of those taking part in the survey are educated. They are expected to know how to use computer and internet very well. Unfortunately the result is not so interesting. Therefore, the authorities have to take a step forward for enhancement of this field in city of Yazd in Iran. School and university students must learn how to use computer and internet desirably.19.8% know how to use computer and internet to a little or quite a little extent. 32.6% know how to use computer to some extent .7% do not know how to use computer and internet at all.

5.2 Familiarity with e-commerce

Familiarity with electronic commerce is the first step toward its use, which requires being familiar with the internet and providing information in this field. Unfortunately, regarding the statistics of the survey, most people are not familiar with EC, while over half of the participants in the survey have higher education. This is because the educational centers like

schools and universities have not provided the students with necessary information concerning e-commerce which has developed drastically world wide. 14% of the participants said they were familiar with e-commerce well. 27.9% of the people got familiar with the e-commerce to some extent and 37.2% had a little knowledge and finally 20.9% didn't get familiar with it at all.

5.3 E-commerce for personal activities

Only 7% of the participants mentioned using the facilities of e-commerce to a great extent, which shows e-commerce in city has been obscure. The reasons must be recognized and examined. 24.4% of participants said they used facilities of e-commerce in their business to some extent, and 44.2% stated that they used the services of e-commerce a little and finally 23.3% of participants in the survey stated that they didn't use the facilities of the e-commerce at all. It shows there are still many people who are familiar with the method and use it in some extent.

5.4 E-commerce service satisfaction

45.3% of participants who were familiar with EC believed they were pleased about the services of e-commerce. 17.2% mentioned they were not pleased with it. 37.5% said they were somehow pleased with e-commerce facilities. Since majority of participants use the facilities of the electronic banking, their tendency to use e-commerce is likely to be rooted in their satisfaction from using e-banking. If such a generalization is accepted, the electronic banking servers have not greatly made their customers satisfied.

5.5 Time saving

Time consumption follows the electronic commerce, which makes this technology common and favorable. 66.2% of the participants said that the e-commerce had been a time saving technology, that is, in comparison with traditional commerce; it gave them time saving efficiency (9.7% a very high degree, 56.5% a high degree). 8% of the participants mentioned that they managed to save their time to a little extent. 25.8% said that they managed to save their time to some extent.
It can be concluded that people got satisfaction from the eCommerce due to its time-saving technique.

5.6 Cost reduction

One of the advantages of the use of e-commerce was to make reduction in charges which involves transportation, paperwork, and even the waste of time.43.6% of participants said that use of e-commerce caused their charges to reduce noticeably (8.1% to a very high degree and 35.5% to a high degree). 41.9% of participants mentioned that e-commerce made a relative reduction in their expenses.14.5% of participants said that e-commerce made a slight reduction in their costs (9.7% a low degree, 4.8% a very low degree).

5.7 Error reduction

31.4% of participants said the use of e-commerce led to the error reduction dramatically. (6.1% to a very high degree and 34.8% to a high degree).36.4% of participants said that the e-commerce contributed to the error reduction to a certain extent. 22.8% of people mentioned that there was a slight reduction of errors due to the e-commerce (15.2% to a very low degree and 7.6% to a low degree). As a matter of fact, based upon the data most of the participants are not sure whether EC would lower the errors.

5.8 Familiarity with global services

23.2 % of familiar people with EC mentioned that they were well-informed about the e-commerce services around the world (5.8% to a very high degree and 17.4% to a high degree).15.2% stated that they were relatively informed about the e-commerce services worldwide and 52.3 % mentioned they were a little informed about the e-commerce service around the world (25.6% to a very low degree, 26.7% to a low degree). It shows that majority of people are not familiar with World EC, so government should pay more attention in order to make people to be familiar with this service.

5.9 Access to computer and internet

The access to internet and computer is mainly based on the technical, economical, and cultural issues. The fact that people can afford to buy a computer and gain the advantage of using internet is of importance. Development of computer technology as well as technical improvement of devices has made internet and computer accessible recently, so there has been growing number of users.
Only half of people mentioned have easy access to computer and internet, so there is a long way to reach a favorable goal. Better facilities must be provided for people, such as increase of internet and computer subsidy for students. Development of computer and internet services like coffee nets should be in priority. 47.7% of the participants said they had an easy access to computer and internet (10.5% of the people very easy access and 37.2% of the people easy access). 27.9% mentioned access to computer and internet to some extent. Only 24.5% mentioned that they did not have acceptable access. There should be more attention in order to provide easy access to internet and computer in the city.

5.10 Trust

Trust is one variable which is receiving considerable attention since it seems likely that consumers will prefer to buy from sites which they trust; indeed lack of trust is often cited as a significant barrier to e-commerce adoption [30, 31, 32]. Trust plays an important role in many social and economic interactions involving uncertainty and dependency. Since uncertainties exist in transactions over the internet, many researchers have stated that trust is a critical factor influencing the successful proliferation of e-commerce [33].

The cultural limitations have been a bar to progress of e-commerce and lack of trust is deeply rooted in such limitations. Especially, B2C model has some disadvantages like lack of security and trust. It is very difficult to trust e-commerce in Iran, because of financial corruptions which are so common. People want to see the product and also businessmen who are in charge of commerce. Most of the people believe that there is a big deal of trust to e-commerce.
B2C versions are believed to show signs of great weaknesses in the protection of privacy and the provision of security while the weaknesses in keeping privacy is not as low as it is thought to be. So, one of the most important problems that the e-commerce has to change is those false attitudes.
The impalpable sorts of e-commerce technologies are difficult for the people to accept and rely on. People don't easily put their trust in visual shopping centers in which they don't pay paper documents or even the electronic cash. The feeling of mistrust is likely to enhance further in Iran, because people are not familiar with credit cards. This is because the economic instability advocates with a touch of mistrust.
In most cases, people like to touch their favorite products and also to be aware of some of their features. The reason why majority of participants in survey are pleased with the e-commerce is that people still are not aware of its services. They remember the services of the electronic banking like ATM and take it on trust.
37.6% who use e-commerce trust it completely (4.3% a very high degree, 33.3% a high degree). 43.5% roughly trust it. 18.8% said that they didn't put much trust in the e-commerce. (10.1% a little, 8.7% quite a little).
The survey showed the hope that a low percentage of people had a mistrust of the services of the e-commerce. It should be noted that many people think that e-banking is the only model of e-Commerce in which we see high percentage for this method all over Iran. As a matter of fact, E-Banking is very popular which many people have been using without any problem in Iran.

6 Relationship between parameters

Degree, to which two sets of variables vary together, can be estimated by calculating a correlation coefficient (a value between -1 and 1).
Such a coefficient can have a positive value as high as +1.0 if the relationship is perfectly direct (Table 5). It can have a negative value as low as -1.0 only if the relationship is in exactly the opposite order.

Table 5: Correlation coefficient

Relationship	Correlation coefficient
Very High	1 to 0. 9
High	0.89 to 0.7
Medium	0.69 to 0.4
Low	0.39 to 0.2
Very Low	0.19 to 0.0

Now, we study the linear relationship between the descriptive and quantitative data which have been defined in the questionnaire.

6.1 Weekly internet uses and Familiarity with internet and computer

There has been a direct relationship between familiarity with computer and the internet and weekly internet use. The more the people are familiar with computer and internet, the more they use it. So it is quite obvious that people must be provided with some training courses to learn how to use the computer. (Pearson correlation value is 0.464).Therefore, professionals who know internet and computer are majority users of this technology.

6.2 Familiarity between computer, internet and e-commerce

The data indicate that there has been a strong linear relationship between familiarity with computer (internet) and the electronic commerce. That is, the more a person is familiar with the computer, the more he/she is aware of the e-commerce. May be that when a person knows how to use the computer, he/she is aware of its uses. It can be concluded that the first step to develop e-commerce is to enhance the people's knowledge about the computer and the internet. (Pearson correlation value is 0.748). It does not mean that these familiar people use e-commerce, but it shows that they have the knowledge of using it.

6.3 Trust to e-commerce services and familiarity with e-commerce

The ongoing rapid growth in the popularity of the Internet is having a revolutionary impact on the way companies do business. Doing business online has become a necessity, not an option. However, some consumers are not completely comfortable using the Internet for transacting business because of concerns regarding security of their transactions [34].
The value of 0.632 (the correlation coefficient) indicates that there has been a direct and average relationship between e-commerce and trust in its services. That is, more a person is aware of e-commerce, a deeper trust he/she has toward this method. May be the mistrust is rooted in the lack of knowledge in this field, which has been proved earlier. It shows that it is not easy to implement and introduce e-commerce in Yazd.

6.4 Trust and satisfaction

First, it should be noted that there are limited people who are using technique of e-commerce for trade. There has been an average linear relationship between trust to e-commerce and satisfaction. That is the deeper a person's trust is, the greater his/her satisfaction will be. It is quite obvious that gaining the trust of the clients is the first step towards making them feel

satisfied with the e-commerce. To gain the trust, there is no alternative except train the people and enhance their skills. Acceptable business background is also very important to attract people in this field too (Pearson correlation value is 0.489).

6.5 Time saving and error reduction

There should be a direct and average linear relationship between time-saving and error reduction by the use of e-commerce, that is, the more time is saved, the more the errors are reduced (Pearson correlation value is 0.417). It also must be mentioned that this relationship is for those who are familiar and implemented this technique.

7 Conclusion

There is much to be learned about B2C method of e-commerce in the developing countries. There are thus a number of avenues for future studies and research works. This study has identified the barrier factors that people may face regarding the use of e-commerce in ancient city of Yazd in Iran. E-commerce has not been well defined in city and most of the time it has been confused and considered identical with electronic banking which is a branch of the e-commerce. Few people must be provided with some training courses to learn how to use computer and internet. The findings indicate that many people did not have enough access to internet and also the main problem was low speed of internet for those who were familiar with this technique. A major decision must be implemented in order to educate people and also lower cost for this service. Media could be helpful in order to increase trust of people about e-commerce and also to encourage them to use this new method of business. Faster internet access is also a major problem which must be solved. Method of payment is also one of the major barriers to use B2C, mainly if consumers intend to purchase products from abroad, because international credit cards are prohibited in Iran.

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Research on the Customer Involvement in E-Commerce 2.0

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Abstract - *As the existing related researches show and the analyze of cases indicates, the customer involvement is the key point in the E-commerce 2.0.With the application of the exploratory factory analyze, we develop a scale of the customer involvement in the E-commerce. Based on the scale, we extend the customer involvement theory to seven dimensions in the E-commerce area. After quantitative analysis, we give a multi-demission description of the current customer involvement in the E-commerce and some suggestions about the development of the E-commerce.*

Keywords: The E-commerce 2.0, The Customer Involvement Theory, The Scale

1 Introduction

With the development of the E-commerce and the revolution of the Internet, E-commerce 2.0 era is unveiled. The existing representative viewpoints about it are:

In 2005, Safa Rashtchy of Piper Jaffray Companies[1] gave a prospect of the future development of the E-commerce 2.0, saying that the E-commerce 2.0 era is the time of the fusion of platform with advanced searching technology to make the buying easier.

In 2006, the CEO of idaigou.com, Peng Zhiqiang pointed out the essence of the E-commerce 2.0 is "Customer Era". Customers control their buying decision and saying[2].

In 2007, the consultant of eBay, Ralf VonSosen described a whole generation of E-commerce[3]:(1)Sell Everywhere--Be Seen and Be Shopped (2)The Long Tail --Target Niche Markets(3)Customers Rule--Build a Community of Raving Fans(4)Personalized Shopping --Make It Fun to Shop and Easy to Buy(5)Mash-ups --Integrate and Collaborate(6)Data is King--Collect a Wealth of Opportunities.

The E-commerce 2.0 is similar to the conception "customers oriented "of Web 2.0, which is featured both in the development of technology and the business operation. Almost all these great transforms in business can own to the changes of the customer involvement:(1)It's easier to exchange information which makes customers contribute more to the sellers. The Niche Markets and the Long Tail are obvious (2)Customers make consumption propaganda via SNS, the Word-of-Mouth effect highlights (3)The personalized consumption concept increase. Customers want to take more involvement in custom production and reverse resource allocation highlights

All of these totally change the E-commerce. The customer involvement is the core of the business attributes of the E-commerce 2.0, which differs from the traditional business attributes. Therefore, the traditional customer involvement theory can't be totally applied. And most of the existing researches focus on the customer loyalty and satisfaction, the CRM theory but less focus on the customer involvement theory.

In conclusion, this research attempts to be an exploratory empirical research on the customer involvement in the E-commerce 2.0 and extend the customer involvement theory to more dimensions

2 Case Study

There are already some on-line shops using the multi-aspects of the customer involvement to make their products and brands much valued.

Reverse resource allocation---Qi Gege

Qi Gege is an on-line shop in Taobao selling original clothes which are all designed by a team with 15 young designers and 1 professional fashion coordinator. The team design the products samples off-line and let the customers vote on-line to decide the most popular design. And the team will revise the chosen design before it goes to produce.

Customers make the price——The UFO Shoes

UFO is a lady's shoes brand of Shanghai Mai Zhong Company. All the new shoes put online have a 30-days presale and the price will increase by time during these days . The final price is made by the presale numbers. It won't put into production until the presale is over.

Emotion Marketing via SNS——Lie Bo

Lie Bo is an on-line clothing shop in Taobao and do well in the niche market. With its bold outstanding designs, the combination of fashion and ethnic, it has a loyal customer base. Lie Bo uses some advertorial in every clothes ' webpage to communicate with customers and convey their brand culture. At the end of 2009, Lie Bo developed its BBS to interact with customers.

Control the custom production——Shi Zhibao

Shi Zhibao is an on-line shop selling customized pillows in Taobo. It designed a system which can calculate the curve between the head and neck shoulders through your height, head circumference, neck arc and shoulder width. With these data, it can make the fittest pillow for the customers.

3 The Customer Involvement Theory

3.1 Literature Review of the Customer Involvement Theory

The Customer Involvement Theory originated in the late 1970's. Lovelock & Young[4] researched the service production with the customers involved in, and found out that customers can make contribution to the production efficiency.

3.1.1 The Definition of the Customer Involvement

Silpakit&Fisk[5] suggested that the customer involvement included the devotion in spirit, intelligence, actions and the emotion.

Cermak[6] indicated that the customer involvement was the customer's specific action which related to the service production and transformation, and in the process the customer's effort and involvement degree.

Karthik&Namasivayam[7] defined the customer involvement as the role of the customer played, for the service or the tangible production.

3.1.2 The Dimension of the Customer Involvement

Silpakit&Fisk[8] suggested that the customer involvement included the devotion in the spirit, intelligence, actions and the emotion.

Kellogg[9] used the "Key events analysis" and found there were 4 dimensions of the customer involvement: preparation, relationship building, information exchange behaviour, intervention behaviour.

Ennew&Binks[10] alleged 3 dimensions: Information Sharing, Responsible behaviour, Personal Interaction.

Peng Shijin pointed out that in the light industrial products retailing, the customer involvement can expand to 4 aspects: the establishing the promise, the creation of the products, the production process, the pricing and the marketing process.[11]

3.2 The Features of the Customer Involvement in the E-commerce 2.0

After case studies and literature review, we conclude the new features:

1. The dimensions of the customer involvement have been expanded widely. Customers can easily participate into almost every part of the commerce: appeal the demand, take part in the creation and production, communicate via SNS, feedback and keep constant attention.
2. Customer involvement are greatly increased in the spiritual and material ways. Customers begin to involve in the production, and the time and emotion which involved by customers have increased greatly compared with the traditional trade.
3. The roles of customers become diversified. In E-commerce 2.0 the roles include:the buyer, the disseminator, the follower, the advisor, and the co-developer.
4. The customer involvement behavior can build a circle. Begin with the creation, through design, production, pricing, purchasing, feedback, communication and constant attention, customer s involve in all and this involvement circle will continue. Customers involve in any of them can bring monetary value or the knowledge value to the sellers. The more integrate customers involve in the circulation, the higher of the customer loyalty and satisfaction. And repeating this involvement circle, the customer loyalty and satisfaction will show spiraling upward trend.

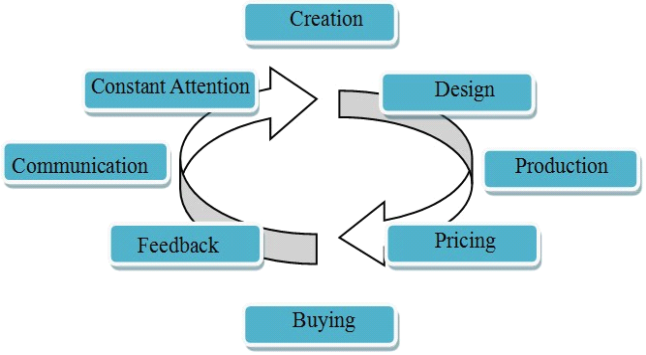

Fig. 1. The customer involvement circle

4 Construction And Inspection Of The Customer Involvement Scale Of E-Commerce 2.0

4.1 The define of the research

Because of the complexity of measuring the customer involvement, this research mainly focus on the customer involvement of clothes retailing in Taobao.

The reasons for choosing the E-commerce clothes retailing are:(1)The E-commerce clothes retailing is developing quickly(2)There appears a trend of the E-commerce 2.0 in clothes retailing. The reason of choosing Taobao is that it's the largest C2C platform in Asia.

4.2 Construction and inspection of the customer involvement scale

Cermak（1994）was the earliest one doing quantitative research on the customer involvement. They measured the customer involvement by asking" What's the actual pay of time and the devotion?" Claycomb（2001）used three dimensions to measure the customer involvement which are attendance, offering information and cooperation. Then he developed a scale including 3 dimensions and 9 items.

However, there isn't a mature and recognized scale of the customer involvement. This research will apply exploratory

research technology to develop a customer involvement scale based on the referencing predecessors' experience.

4.2.1 The Determination of Measuring Conception

This research defines the customer involvement as the pay in the spiritual and material ways before and after the commodity put on line. Refer to Kellogg" Key events analysis", we measure the customer involvement with constant attention, buying decisions, feedback & communication and co-development.

4.2.2 The Scale Formation

First, with the literature review and small-scale interview, we developed our initial scale with 45 items. Second, let 22 experienced on-line shopping customers do the initial scale. Then we discussed the items and the final scale came out with 32 items.

4.2.3 The Questionnaire and Data Collection

In December, 2010, we started to do questionnaires through on-line and off-line. We gave out 1000 to the people who have on-line shopping experience through sojump.com and the valid return is 334; and the off-line towards the colleges in Beijing for 800 and the valid return is 146. The final valid return is 480.

After the collection, we did some rejection by checking (1).Whether the questionnaire filled out by some rules (2).Whether complete the questionnaire

4.2.4 Specimen Descriptions

To ensure the reliability of the research, we did statistic analysis on gender, age, education and income/month and compared with CNNIC<2009's Chinese network research on on-line shopping>. Due to only gender with CNNIC has greater difference between the data, so with weighted adjustment on gender, the adjusted samples basically matched with CNNIC.

According to iReseach<2009-2010China's E-commerce industry development report>,we did classified statistic by 4 regions, which are Beijing and Southeast coastal area, central area, west area(Sinkiang, Tibet, Qinghai, Gansu, Ningxia) and overseas, and the results were 316,154,8,7. And the region of specimen matched the iResearch basically.

We didn't do random sampling but with weighted adjustment, the sample matched the entity in the crowd structure and regional structure.

4.2.5 Exploratory Factor Analysis and Results（using SPSS17.0）

TABLE I

KMO & Bartlett's TEST

	Sampling enough degrees Kaiser-Meyer-Olkin	.888
The sphericity Bartlett testing	Approximate chi-square	5877.809
	Df	496
	Sig.	.000

KMO was 0.888, the sphericity Bartlett test's Sig=.000, proved that the data was suitable for factor analysis. Accoding to Kaiser's rule, characteristic root should be greater than 1. And applied the maximum variation method doing orthogonal rotating, kept the items with factor loading quantity absolute value over 0.45. According to the characteristic value and the variance explained contribution, the characteristic value of the first 7 factors are above 1,and he cumulated variance explained contribution is 57.970%. So we extracted the first 7 factors.

TABLE II

EXPLAIN THE TOTOAL VARIENCE

Component	*Extraction squares loaded*	*Rotating squares loaded*		
	Cumulative %	Total	Variance%	Cumulative %
1	24.637	4.587	14.333	14.333
2	36.048	2.776	8.676	23.010
3	42.578	2.500	7.812	30.822
4	47.087	2.423	7.573	38.395
5	51.151	2.382	7.444	45.839
6	54.724	2.289	7.153	52.992
7	57.970	1.593	4.978	57.970
Extraction method: the principal component analysis				

4.2.6 The Scale Formation

According to the items after attribution, we named the factors as:

TABLE III.

FACTOR ANALYSIS RESULT

Factor	*Scale items*	*Factor loading*	*Contribution rate*
Co-development	D4 I often participate in design activities hold by the stores	0.811	24.637 %
	D3 I often vote or price for the stores	0.803	
	D6 I'll active to offer the stores ideas about web design, activities and services	0.764	
	D2 I know there are shops online let customers participate in pricing	0.714	
	D5 I often go presale	0.694	
	D1 I know there are drawings on the Internet so that customers can vote	0.643	
	D7 I have emotional exchange experience with the shopkeepers via BBS or IM	0.593	
social interaction	A5 I know and pay attention to some on-line shops' BBS, twitter or other SNS	0.789	11.411 %
	A8 I often participate in some online activities held by stores	0.763	
	A6 I often participate in the stores' twitter or BBS	0.724	
	A7 I'll active to vote for the in year-end ranking shops.	0.714	
spread&feedback	C4 I'll warn others about the unhappy on-line shopping experience	0.611	6.530 %
	C3 I often active to others recommend online or commodities	0.602	
	C5 I'll share my buying experience on facebook, twitter, douban ect.	0.588	
	C6 After buying, I'll share the commodity to Tao Jianghu	0.574	
	C1 After buying, I always give	0.513	

	serious comments on commodity		
	C7 I'll sometime active to offer some suggestions on commodity.	0.474	
appeal	B9 I'll initiatively inform the shopkeepers about my needs	0.742	4.509 %
	B8 I'll ask for rights if I found false information	0.661	
	B7 I have active contact experience with other buyers to communicate about commodity	0.595	
	B2. I'll active to contact the shopkeeper for the commodity which is sold out.	0.475	
communication	B6 If I have questions about the commodity, I'll take the initiative to contact the shopkeeper consulting	0.742	4.063 %
	B5 I concern about other buyers comments when buying	0.722	
	B10 I pay attention to logistics information, and will remind delivery on time in stores	0.634	
	C1 After buying, I always give serious comments on commodity	0.503	
constant attention	A1 I have fixed on-line shops	0.738	3.573 %
	A2 I'll often check some on-line shops even if I don't have demands.	0.716	
	A4 I subscribe to some shops on the new notice	0.634	
	A3 I often spend a lot of time browsing some stores of commodities	0.568	
preparation	B1 Before buying, I'll have considerable price searching, and go try-on	0.718	3.246 %
	B3 Before buying, I'll view others' share or comments on BBS	0.668	

4.2.7 The Reliability and Validity of the Scale

Cronbach'α is mainly using for evaluating the consistency of the measure of all reaction degree. Nunnally （1978）、Nunnally & Berntein（1994）thought that，Cronbach'α should be higher than 0.7. The overall reliability of this research is 0.887 meaning that the measuring tools of internal consistency is high.

TABLE IV

RELIABILITITY STATISTICS

Cronbach's Alpha	*Based on the study Cronbachs gamerelease standardization*	*Terms*
.887	.891	32

Validity can be showed by content and structural validity. All items of this scale are based on the related reference of scholars home and abroad, and the small-scale interview. With the pretest, we revised the scale and the final scale came out with high content validity. The structural validity can be showed by all variables on the common degrees factors to reflect the discretion. The principal component analysis operation results show all tests in the same factor of loads are larger than 0.45 value and the cross factor is small load. So it has excellent composite reliability, convergent validity, and discriminate validity.

4.3 The extending of the customer involvement theory

We got 7 dimensions after factor analysis, which also meant we extended the traditional customer involvement theory to 7 dimensions. The details are below:

Researcher	Kellogg	Ennew &Binks	Peng Yanjun	We
Customer Involvement dimension (Arranged by factors importance)	Preparation	Information Sharing	Preparation	Co-development
	Relationship building	Responsible behavior	Communication	Social interaction
	Information exchange behaviors	Personal Interaction	Cooperate	Spread&feedback
	Intervention behaviors		Interpersonal Interaction	Appeal
				Communication
				constant attention
				Preparation

- Customer participation dimension has been greatly expanded. The traditional business can't involve co-development, social interaction and constant attention.
- Factors explain rate shows, co-development is the most important factor and the importance of other factors decrease one by one, so is the value offered to the sellers.
- Because of the development of the Internet, preparation is not that important as before.
- With the development of the social media, the social interaction an communication & feedback become much more important.
- The customer involvement will effect more on the sellers' strategy and the development of the market.

5 Scale Analysis

5.1 The analysis of each factors

Based on the Like Te Scale, we add all items scores of each factor and calculate the specimen's average scores in each factor. The result is Communication--4.028, Preparation--3.181, Spread&feedback--2.895, Constant attention--2.748, Appeal—2.664, Co-development--1.702, Social interaction--1.543. From these average scores, we find the features of the customers involvement behaviour:

1. Before putting on line, the degree of the customer involvement is low, especially in co-development and the social interaction.
2. After putting on line, the degree of the customer involvement is high, especially in the part of communication
3. The customer involvement behavior after putting on line is much more active than that before putting on line.
4. The customer intellectual involvement is relatively less, while the emotional input is relatively more.

Though most of the respondents play the role of buyer, it is a trend that the roles of the customer involvement become diversified. And the behaviors of the customers have some features of the disseminator, the provider of information, the followers, and the co-developer.

5.2 Population Difference of the Customer Involvement

After doing ANOVA, if the sig. is less than.05, there must be some difference among the items. We discover:

1. Gender Differences

F2(Social interaction), F4(Appeal), F5(Communication) and F6(Constant attention) show the gender difference. The data indicates that the time and the emotion paid by women is more than that paid by men. And the male tend to appeal straightly. So for the male customers, the shopkeeper would better build more channels to guarantee their appeals. While for the female, they should pay more attention on the emotion marketing.

2. The differences of the online shopping times in half year

F2(Social Interaction), F5(Communication), and F6(Constant Attention) reflect the differences of the on-line shopping times in half year. The data indicates that the more frequently the customer do shopping on-line, the higher the average scores of all factors are. So we can conclude that the more customers doing shopping on-line, the deeper their involvement will be.

5.3 The Analysis of High-marked Group

We sift out the people whose total score is higher than 96 from the whole specimen.(their average score of each items is 4 or 5.) Because all items are positive questions, the sifted people's involvement in shopping is deeper than others. We call this group as high-mark group.

There are 83 people in the high-mark group, about the 17.29% of the total sample. Based on the diffusion of innovation theory, this group of people is the Innovators or the Early Adopters. Analyzing this group of people contributes to impact these people, and then impact the Late Majority and the Laggards.

From the data of gender, age, education background, monthly income, district, and the times of the online shopping in half year. We discover that most of the high-mark group live in the eastern and coastal area(64%), are from 20 to 30-year-old(72%)undergraduates(63%), and their monthly income is less than 1000 RMB. Most of these people are female(82%) and they have done shopping online at least 5 times in the last half year.

5.4 The Analysis of the Customers' Attitude

In our questionnaire, there are questions about the customer's attitude, whether they agree with improving the involvement, whether they hope to diversify the forms of involvement in shopping, and which forms and aspects of involvement is their preference.

The data indicates that people hold a positive attitude to the improving the involvement of online shopping.And they're more likely to communicating with the shopkeepers in order to help them make right decisions. However, people are less interested in involving in the creation and design.

6 Conclusion

6.1 The research findings

- Enrich the customer Involvement Theory, give the 7 dimensions of the customer involvement in E-commerce 2.0--co-development, social interaction, spread & feedback, appeal, communication and constant attention.
- Develop a scale for the customer involvement, which gives reference for the future researchers.
- With multi-dimension data analysis of scale, we summarized the situation of the customer involvement of the E-commerce in China at present and gave suggestions to E-commerce industry for improving service and customer involvement.

6.2 Suggestions

- Hold more activities which can help customers improve their shopping decisions and less on intellectual contributions
- Build more channels to guarantee customers appeals. Try to remain the existing customers and attract more potential customers
- Start to build your own SNS for the E-commerce
- Do data mining based on customers behavior to get better know about the market
- Improve the customer involvement based on the high-mark group's features.
- Pay attention to the gender difference

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SESSION

NOVEL APPLICATIONS AND STRATEGIES

Chair(s)

TBA

Tracking User's Programming Skills Using Multi Agents on E-Cloud

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Abstract

Most of the current E-Learning technologies assess the learners either by tracking the learning activity or estimating their programming knowledge. In this paper, a cloud based E-learning scaffold that utilizes performance tracking using Multi-Agents for assessing the learning and coding behavior of the users is proposed. Bayesian Networks are employed to analyze and compute the overall performance. In-order to improve the performance of the learners, a feedback based PQR (Performance-Tracking-Recommendation) rating algorithm for measuring the quality of the Learning Objects (LO) is suggested.

***Index Terms* — E-Learning, Performance Tracking, Agent, Learning Objects (LO), Cloud Computing.**

1. Introduction

E-Learning is a catchphrase in this internet dependant world. It has gained impact and reached every corner of educational industry because of its flexibility and interactive features. E-Learning is referred as any web based content delivered using computer based technologies. The Just-in-time access and personalised learning methodologies make it more convenient to access the contents from anywhere in the world. It also helps to enhance collaborative learning and adaptive learning. Providing quality learning resources based on cognitive levels of the users is a challenging task. To achieve this, we propose a performance tracking system that monitor and analyse the learner's reading and programming behaviour. The feedback information is collected from the users for every Learning Objects (LO)[8] that are accessed by them.

This new paradigm assist the learners to perform better in all aspects of learning methods from reading styles to programming practise[23]. In this paper, we trail users learning behaviour and their cognitive level in programming concepts. This idea has been extended to prove how quality LO increases the performance in learning and coding behaviour of the users.The various E-Learning methodologies that are currently available lacks the efficiency when the number of users swell. This leads to poor scalability in E-Learning applications.

To address this issue, deploying E-Learning applications on cloud computing platform offers a good solution. Cloud[1] endows the users with facets like On-Demand service, scalability, economic in cost (Pay-As-You-Go),low infrastructure maintenance, instant software updates, security etc. We make use of these characteristics in our E-Learning agenda. This platform [30] can provide scalable learning contents with no necessity for installation and upgradation of E-Learning tools like LMS and authoring tools.

On E-Cloud we can incorporate features such as multi-tenancy, efficient organization of resources, pay only for utilised resources. In this paper, we have presented the proposed architecture in Section 2. Section 3 illustrates the detailed description about the layers of the architecture. The E-Cloud framework is depicted in Section 4 with implementation discussed in Section 5. Finally we conclude with related and future works in Sections 6 and 7.

2. Related Works

Chih-Ming Chen[4] worked on data mining based learning performance assessment by using computational intelligence theories of Gray relational analysis (GRA), k-means clustering scheme, fuzzy association rule mining and fuzzy inference. They have also developed a web-based learning system which maintains students' portfolios. This information is examined by the instructors to weigh up the learning performance of the individual learners. Using this, the instructor can design web based content for achieving personalised learning. Here, the learning activities are monitored and performances are captured. But we have considered tracking and improving the performance of the learners using PQR rating.

Christos E.Alexakos and et.al [5] have implemented architecture that integrates intelligent assessment agents on E-Learning environments. Web services are used for intercommunication between agents. Bayesian networks and genetic algorithms are used to calculate intelligent assessment of the learners. Extending this idea we have created multi-agents for tracking users performance in programming and learning.

Zhang Guoli, et al [30] created a cloud computing framework for the e-learning applications. This technique was done to utilise the advantages of E-Learning and cloud infrastructures. This enables the e-learning applications to improve resource stability, balance the utilisation under the given conditions in order to meet the current increasing demand. But we have focussed on broadening this inspiration to render better services to the learner community.

3. Proposed Architecture

We propose an architecture called as user's Performance Tracking System (UPTS) for Tracking user's programming skills using multi-agents and management of dynamic Learning Objects.

The entire scope of this system includes the following activities:

i. **Search:** The user searches for learning contents
ii. **Learn:** The retrieved LOs are well-read by the users, followed by a set of Multiple Choice Questions (MCQ) for taxing their knowledge on the particular topic.
iii. **Code:** After reading, the user attempts to code a set of questions while performance is tracked simultaneously.
iv. **Rate:** The user gives feedback for the set of LO's they have refered.The UPTS architecture is given in Figure 1

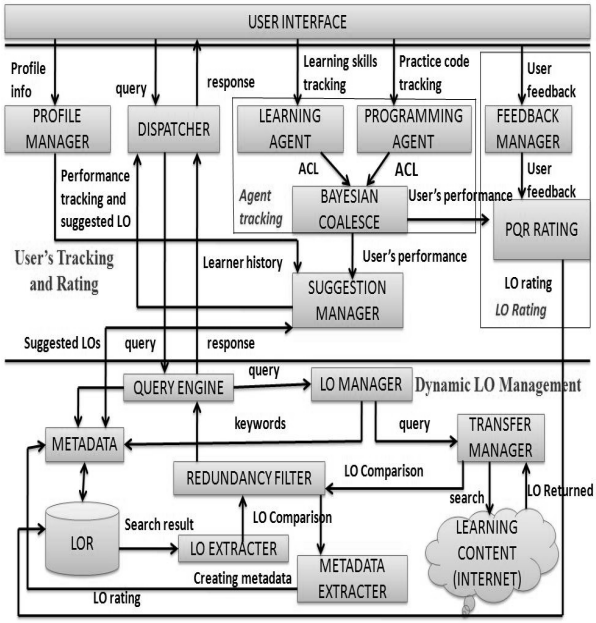

Figure 1. Users Performance Tracking System Architecture

This UPTS is incorporated on a cloud using the functionalities of the following layers:

User Interface

The user interacts with the learning and coding environment through the user interface. It is a user-friendly portal through which every user interacts with this skeleton.

Dynamic Learning Object (LO) Management System

This layers realizes the functions of the storage, retrieval and management of LOs. The LOs are retrieved from the internet and their metadata is extracted. The URL and the metadata are updated in the LO Repository (LOR) and metadata respectively.

The web contents are dynamically fetched for every search and compared with the current contents of the LOR and updates are made if necessary.

User's Performance Tracking

We have created agents to track the user's performance. The agents measure the parameters related to the user's learning activities and their programming skills. This result aids in understanding the learning behavior of the users.

LO Rating

The users rate the Learning resources that they have referred. Based on user's performance and their rating scores, PQR Rating is applied and other quality LOs are suggested to the them for further learning.

4. Layers Of The Architecture

A. User interface Layer

The user interface enables the learners to interact with UPTS through the web portal. The learners involved in the learning process take up the following activities.

1. Login/Registration:

The user creates an account with their basic profile information along with the educational details and interested courses. The registered users are provided with a secure login and password.

2. Search and Learn:

The users seek for web resources related to programming languages. The UPTS retrieves all the relevant LOs and presents it to the users. The users can choose any web links for learning from the search results.

3. Program Practice:

The learners, after reading the web resources on a particular programming language, attempt the practice session in the Integrated Development Environment (IDE). The learners should mandatorily try all the questions provided to them. The IDE is featured to display the output of the code, status, the number of errors, compilation time, memory utilized etc.

4. Quiz:

The user attends the basic Multiple Choice Questions (MCQ) quiz after completing the learning phase. The quiz helps to evaluate the level of understanding of the user on the basic concepts.

Feedback:

The user rates a set of resources they have referred during the learning phase. This feedback evaluates the quality of the Learning content.

B. Dynamic LO Management Layer

The Dynamic LO management layer (DLOM) is responsible for discovery, creation and storage of LOs.The metadata is created for every learning resource and updated in the LO Repository.

This layer deals with the Dynamic Management of LO based on the users requests. The structure of the DLOM is depicted in Figure 2

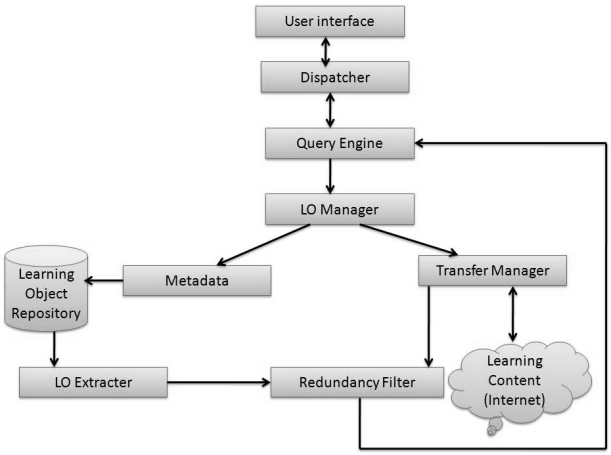

Figure 2. Dynamic LO Management Layer

The functionalities of this layer from user's perspective are illustrated in the following steps:

1. The learners search for programming resource contents through the user interface and a list of web links are displayed to them.
2. The dynamically retrieved learning resources are used by learners to read the contents.
3. The user's behavior and learning styles are tracked and MCQ is displayed to test their knowledge on a particular programming concept.
4. Once they are convinced with the knowledge they have perceived, the practice code session is initiated.
5. The codes are practiced until the expected output is produced by the learners or when the learners wishes to quit and see the output.
6. The feedback is collected to evaluate the learning resources.

Query Engine:

The learners search for programming language contents through web portal. These queries are forwarded to Query Engine which is then decomposed into keywords.

LO Manager:

The LO Manager retrieves decomposed search keywords from the Query Engine. These keywords are branched to metadata and transfer manager for finding the corresponding web resources.

Metadata:

The metadata is created for every learning resource that are retrieved for user queries. The metadata is the index for the LOs residing in the Learning Object Repository (LOR). The users query from the LO manager are given to the metadata to retrieve LOs from the LOR which match the search request. It is created with the following set of attributes: URL, Base, Domain, Title, Description, Keyword, Last Modified and Content Length.

LO Repository (LOR):

The LOR stores the physical locations of every LO that are searched on the internet by the user. The Metadata created for every LO has its corresponding links on the LOR. These links are updated for every dynamic search results. The LOs that are rated by the users are periodically stored in the LOR.

LO Extractor:

The LOs that are stored in the LOR are forwarded to the redundancy filter by LO Extractor. It acts like a buffer for storing the web links temporarily.

Transfer Manager:

The transfer manager receives the keywords from the LO Manager for user search queries. It simultaneously sends request and retrieves for the given search LOs on the internet. These returned LOs are sent to redundancy filter for comparison with existing LOs.

Redundancy Filter:

The redundancy filter gets a set of LOs from the transfer manager and the LO extractor. The existing LOs from LO extractor are compared with the new search results from the Transfer Manager. The redundant web links are discarded and new links are stored in the metadata. The redundancy filter helps in identifying and removing the duplicate LOs. The resultant list of LOs is sent to the user interface through the dispatcher.

Metadata Extractor:

The metadata extractor holds bundles of LOs newly found for every dynamic search. It extracts metadata from every LO and updates this information in the metadata.

C. User's Tracking and Rating Layer

The user's tracking and Rating (UTR) layer helps in tracking the user's performance using intelligent agents. The agents monitor the learning and coding activity of the users. Every user are made to attend the MCQ and give feedback on the used web resources.

Based on their feedback, the LOs are rated and updated in the repository. The agent can assess the user's performance and suggest LOs for further reading or learning.

The scope of this layer is explained in the following steps:

1. The profile manager administers the profile of the users.
2. The agents are created for tracking users learning behavior and programming skills.
3. The feedback will be given based on their experience with the LOs.
4. The high rated LOs are suggested to the learners based on their performance levels. We depict the features of the UTR in Figure 3.

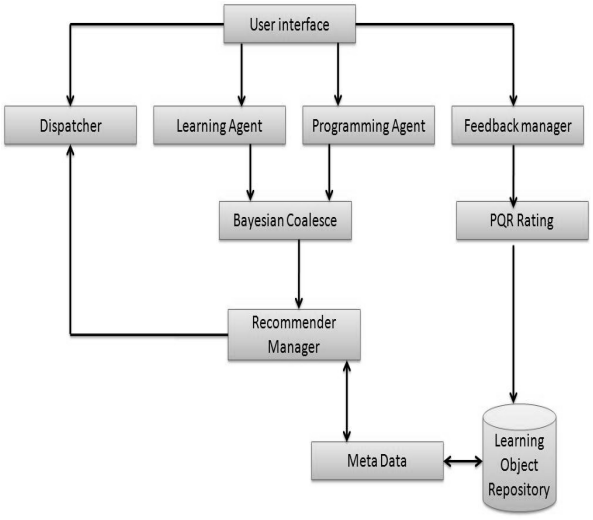

Figure 3. User's Tracking and Rating (UTR) Layer

Profile Manager:

The profile manager maintains the details about the learners such as personal details, educational qualification, courses interested etc. The management of learner's profile helps in storage and retrieval of user's search history and their performance.

Agents:

The intelligent agents are autonomous entity that monitor users activity in the UPTS. There are two agents involved in the tracking. They are listed below:

1. Learning Agent
2. Programming Agent

Learning Agent:

The learner sends a query and related LOs are given to them. They select a set of web resources from the choices returned to learn. The learner reads the content and perceives knowledge on programming language concepts. The learning style differs from one user to another and it is necessary to consider the different learning behavior.

The Learning Agent measures the following activities such as:

1. Time taken to read
2. Total number of Pages read
3. Navigation between pages used
4. Number of links referred

Programming Agent:

The Programming agent helps in identifying the programming skills of the users. The IDE provides a set of exercise to practice on particular programming concepts. The programming agent monitors and tracks the leaner's activities. The tracking mechanism judges the level of understanding and implementation knowledge of programming concepts. The assigned practice questions are based on the various LOs that the user has referred. The practice code session is assessed by considering the following parameters:

1. Number of lines of code
2. Types of errors
3. Number of compilations
4. Size of the program code
5. Number of compilations vs. Number of errors

Bayesian Coalesce:

The Bayesian agent consolidates the values measured by the other two agents and uses them to interpret these values into concrete performance types.This uses the concepts of Bayesian Belief Network and the resulting probabilistic value gives the overall performance. Based on the learner's scores, they are categorized into three levels:

1. Novice Learners
2. Intermediate Learners
3. Advanced Learners

Feedback Manager:

The users are suggested to rate the visited learning resource contents. The scale of rating consists of three levels namely high, medium and low. These levels help to judge the quality of a particular LO. The various factors considered to assess the LOs are:

1. Quality of Content
2. Use of multimedia contents like audio, video, animation etc
3. Levels of understanding
4. Coverage of topics
5. Suggestion of LOs to other users
6. Illustrated examples.

PQR Rating:

We propose the PQR (Performance-Quality-Recommendation Factor) rating algorithm to assess the quality of the LO by consolidating the factors of feedback and the performance of the learners. The concepts of the PQR Algorithm are illustrated as follows:

For every LO, Let

N=Number of users accessed
P=Average performance of the users
Q=Average Quality Rating (Feedback)
R=Recommendation Factor
O=Overall Rating

Now,

1. Calculate

$$\textbf{Average Performance of the users (P)} = \sum \frac{\textbf{Score}}{\textbf{N}}$$

Where, ∑score refers to the summation of performance grades of the users using that particular LO.

2. Calculate

$$\textbf{Quality Rating (Q)} = \sum \frac{\textbf{Feedback}}{\textbf{N}}$$

Where, ∑Feedback is the summation of cumulative LO Ratings given by the users.

3. Calculate

$$\textbf{Overall Rating of the LO (O)} = \frac{\textbf{P + Q}}{\textbf{2}}$$

If two or more LOs have the same Overall Rating value (O) then the **Recommendation Factor 'R'** value is considered. 'R' value is measured in three levels, positive, negative and neutral.

Positive - User Recommended LO.
Neutral - May or May not suggest LO.
Negative - Not Recommended LO.

This collective rating of **'O'** value is updated in the Metadata.

Suggestion Manager:

The Suggestion Manager extracts the highly rated LOs from the Metadata. The Performance of the users and the LOs extracted are suggested to the user for further reading. The suggestions of the Learning resource aids in improving the overall performance of the users by further suggestion of LOs.

5. E-CLOUD Architecture

We propose a E-Cloud Framework for deploying User's Performance Tracking System (UPTS) on Infrastructure as a Service (IaaS) cloud platform. IaaS provides physical platforms such as Hardware, network, Servers, Storage as a service. This reduces the cost for establishing hardware, installation and upgradation of software and management of data centres.

The E-cloud architecture for UPTS is discussed in Figure 4.

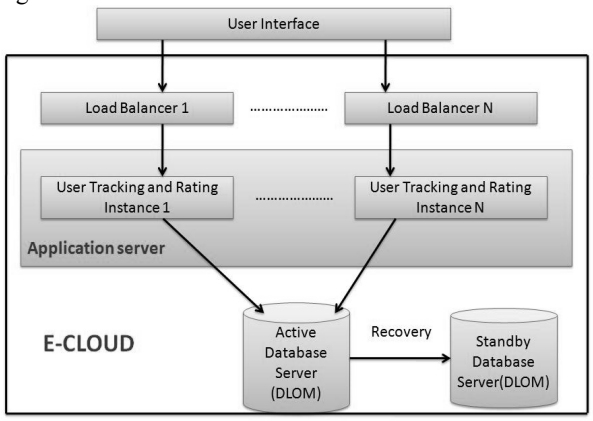

Figure 4. E-Cloud Architecture

The updation and monitoring of Dynamic LO Management (DLOM) layer and its components are stored in the active Database (DB) server. The standby DB server contains a recovery for backup of DLOM storage..The user's queries are handled by the User Interface layer and forwarded to the Load Balancer for allocating the request to appropriate Application Server. The Application Server contains instances of User's Tracking and Rating (UTR). Further instances can be extended for meeting the requirements of increased users thereby achieving scalability. The LO transactions are carried out between UTR instances in the Application Server and the Active DB Server.

6. Implementation

An interactive and user-friendly user interface is created using php and user's credential information are authenticated using javascript. The user interface includes creating a user's profile and monitoring the learner's history. It also provides provision for searching learning resources and to choose contents for further reading.

The XAMPP web server stack bundle acts as a common path to retrieve learning resources from the database servers. MYSQL stores metadata of every LO and updates the resource location in LOR.

The metadata extractor tool URLMetaTag extractor is used to extract metadata for every user queried search results. The multi-agents [3][19] are created using aglets which is a Java based mobile agent platform and library for building mobile agents based applications. An aglet is a Java agent which can autonomously and spontaneously move from one host to another carrying a piece of code with it. It can be programmed to execute at a remote host and show different behaviours at different hosts. Java based security implementations take care of authorised access to local resources at the remote hosts.The feedback manager generates a set of Multiple Choice Questions (MCQs) based on the LOs that are learnt by the users. These questions are framed to evaluate the quality of the resource's contents.

The UPTS is deployed on E-cloud for managing the scalability of users. The IaaS is suitable to host this e-learning application. Many IaaS providers like Amazon EC2,Eucalyptus, Sun-Cloud, Go-grid etc are widely used for different types of applications.

7. Future Work

Our future work is formed on semantic based content retrieval to the users. This fetches more relevant learning contents in lesser time. Bringing adaptive learning to Users Performance Tracking System (UPTS) is a challenging task. The Learning styles of students can be determined and practice codes can be given based on their cognitive levels identified. The suggestions for learning resources can be enhanced by incorporating semantic based rules.

8. Conclusion

In this paper, architecture for User's Performance Tracking System (UPTS) for tracking the performance of the learners is designed. This framework provides an automated agent based tracking system for determining the learning behaviour during reading. This system also monitors the programming skills of the users by assigning

few practise code. The overall performance is estimated and suggestions are given for utilising other learning contents based on their performance levels. The feedback given are collected and updated in metadata, which in turn helps to deliver better quality LOs to the users. The limitations of this platform is that it confines the Learning Resources related only to programming languages and only those LOs are considered for Performance Tracking and Rating.

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Personal Assets Evolution: A new free of charge web server application for a real-time tracking of personal investments and net worth

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Abstract

We created Personal Assets Evolution (PAE), a free web application allowing users to follow in real-time the evolution of their holdings. The server includes a flexible e-mail alert system which can notify the user of events of her/his interest. The novel part of our application is that the alerts can be sent not only for individual stocks or currencies, this option is currently available in several stock managing web servers, but for the total of user's assets as well. For instance, using our alert system, one can ask PAE to send an e-mail to her/his cellphone when the full wealth increases by more than 5% compared to the last week average. The users receive an alarm e-mail including a detailed PDF report presenting the evolution of their holdings. The developed web server includes three versions of charts and a handy search engine allowing one to find stock symbols and the associated companies, commodities or futures, which can be easily added to the user stock list afterwards. In total, the evolution of more than 18,000 stocks and commodities sold in major stock exchanges worlwide can be freely tracked by means of the new application.

1 Introduction

Several asset management tools have been developed to support individuals, small businesses and large organizations. They include commercial desktop software and free of charge Internet-based systems. An individual might be interested in an asset management tool that allows her or him to track fixed and movable items, as well as his or her net worth in real time.

Such tools permit the individual to maintain a home record of all valuable items and make strategic decisions related to the further investments. Typically, personal asset management software should be purchased as a standalone application or as a part of a whole personal accounting package, but some free of charge Internet-based systems are also available. The existing applications allow users to track, in real time or with a certain delay, the evolution of their stock portfolios and make other investments. The best known home asset management programs are Quicken [6], Microsoft Money [3], Household Register [1], Stuff Safe [8] and Personal Stock Monitor [4].

In the same way, many small and large businesses rely on asset management software such as Quick Books [5] or Quicken Home & Business [7]. These programs help businesses control their information and resources, maintain databases of their inventory and keep track of purchases and sales. Nobody can know what her/his company is worth, without adequate asset management.

On the other hand, personal asset preventive maintenance software help individuals manage and optimize the worth of their assets. Usually, personal asset preventive maintenance applications deal with taxes and investments. In fact, the money management programs like Quicken and Microsoft Money, including features like automatic bill pay, budgeting features and savings and investment advices, can be also used as personal asset preventive maintenance tools.

For instance, a very popular, but rather expensive Quicken Home & Business 2011 application – the cost of this program, intended for personal and home-business finance management and investments, is 109.99$ – allows users to track, analyze and optimize their investment portfolios, including real-time tracking of net worth changes; see changes in assets, liabilities, and net worth; show how user's investments are performing across all existing accounts; and identify top-performing investments so that the user can make smarter decisions.

Unfortunately, the existing free of charge Internet-based systems such as Yahoo Finance [12] or TMXmoney [10] do not support the alarm and report generation features allowing one to track net worth changes in real time. For instance, the main features proposed by the Yahoo Finance web system are limited to creating a new portfolio, editing or deleting a portfolio, downloading portfolio data to a spreadsheet, adding a new tickers to a portfolio, deleting a ticker from

a portfolio, creating and editing different portfolio views, adding holdings information to the existing portfolio and adding transaction history to the existing portfolio.

On the other hand, My TMXmoney Portfolio and Alerts web site, designed to provide users with one password-protected area in order to access personal Portfolio and Alerts accounts, is limited in a number of stocks allowed by portfolio. Each portfolio can contain up to 52 stock and/or mutual fund symbols. This system allows users to view the portfolio holdings, see graphical representations of the holdings by symbol, asset class and sector, and get the latest news for symbols included in the portfolio, but is unable to create and dispatch personalized real-time alarm reports concerning user's net worth.

In this paper we introduce an original and free of charge web server application, called Personal Assets Evolution, focusing on tracking the real-time changes in the user net worth.

2 Application

The Personal Assets Evolution web server allows the users to follow the evolution of their stock and currency assets portfolio in real time. Unlike other existing business programs and web services providing the information and alerts for individual stock shares, our application is focused on the real-time evolution of the user net worth. Our application is freely available at the following address: `http://www.trex.uqam.ca/~projet_finance`.

After the registration, the list of stocks and currencies held by the user can be established and then accessed via the page "Stocks & Currencies". We will fist present the available options and the design of the Stocks and Currencies page. Then, we will describe the remaining options of our new application.

2.1 Stocks & Currencies page

This central page of the application combines several key pieces, including: Search engine (the stocks search can be performed either by stock symbol or by company name), date selector (price and rate comparisons are done with respect to the specified date), user's stock list (table and summary), user's currency list (table and summary), summary for the full total (sum of stocks and currencies) and graphs representing the evolution of user's net worth during the specified period of time (three graph types are available: for stocks, currencies, and net worth).

2.1.1 Stock list

The stock list contains the stock holdings of the user (see Figure 1). This list consists of a table with the following columns:

1. Order, which is a simple counter of the stocks.
2. Stock name: this is the internationally recognized ID of a given stock (ex.: MSFT).
3. Name of the company (ex.: Microsoft Corporation).
4. Number of shares, i.e. how many shares of the given stock the user owns.
5. Current price. Here we indicate the current price of the given stock (in the local currency, which depends on the stock exchange where the stock shares are sold) and the change of its value compared to the specified date or period. If the price increased, the change percentage is displayed in green; otherwise, it is printed in red. The change percentage is indicated near a green or red arrow showing, respectively, the increasing or decreasing trend for the given stock.
6. Total current price of user's shares, displayed for each stock and obtained by multiplying the current price and the number of shares.

At the end of the table, we can find the total price of stocks. Here, the sum of stock prices is presented in USD, which is taken as a basic currency of the application, i.e. all currencies are converted into USD in the summary. In the summary, the price change compared to the specified date or period is presented as a change percentage and as an absolute value, altogether with the specified date that was used for the price comparisons.

The following operations are available for stock shares:

- Adding a new stock. Here, the stock ID and the number of shares must be specified.
- Editing the existing user stock. The user can change the number of shares of the selected stock.
- Stock removing option. This option will remove the selected stock from the list.

Getting the current price and the price of the previous close of a stock The current price and the previous close of a stock is obtained using an API provided by Yahoo. For instance, querying the stock MSFT, the following URL must be called: `http://finance.yahoo.com/d/quotes.csv?s=MSFT&f=nl1px`, which returns the string "Microsoft Corpora",25.68,25.81,"NasdaqNM". In this example, 25.68 is the current price while 25.81 is the previous close value.

Once the price of a stock is obtained, we store it in an SQL table together with a timestamp that indicates the date and time of data retrieval. In the application, we can set a time limit, which is 10 minutes by default. If the application needs to look up the price of a stock, first it will try to get

#	Stock Name	Company Name	Number of Shares	Current Price	Total Current Price	Operations
1	MSFT	Microsoft Corpora	6	25.45 USD (↑ 0.16%)	152.70 USD	Edit... Remove
2	BBD-B.TO	BOMBARDIER INC.,	10	6.27 CAD (↓ 0.95%)	62.70 CAD	Edit... Remove
3	PRAN	Prana Biotechnolo	20	2.57 USD (↓ 0.39%)	51.40 USD	Edit... Remove
4	AAPL	Apple Inc.	3	350.24 USD (↓ 0.06%)	1050.72 USD	Edit... Remove
5	GOOG	Google Inc.	2	579.92 USD (↑ 0.79%)	1159.84 USD	Edit... Remove
6	^YHOH714	Gold	1	1010.55 USD (↑ 0.11%)	1010.55 USD	Edit... Remove
7						Add Clear

Total price of stocks: 3489.46 USD (↑ 0.26% [9.06 USD] compared to Mar 28, 2011).
(3425.21 USD, 62.70 CAD)

Figure 1. An example of a stock list

#	Currency	Quantity	USD Rate	Total in USD	Operations
1	USD (US Dollar)	10.00	1.0000	10.00 (0.00%)	Edit... Remove
2	HUF (Hungarian Forint)	3000.00	0.0053	15.77 (↑ 0.13%)	Edit... Remove
3	SEK (Swedish Krona)	30000.00	0.1574	4722.33 (↑ 0.66%)	Edit... Remove
4	CAD (Canadian Dollar)	130.92	1.0248	134.17 (↑ 0.30%)	Edit... Remove
5	ILS (New Israeli Shekel)	10.00	0.2834	2.83 (↑ 0.42%)	Edit... Remove
6	BGN (Bulgarian Lev)	10.00	0.7202	7.20 (↑ 0.38%)	Edit... Remove
7	EUR (euro)	15.00	1.4085	21.13 (↑ 0.37%)	Edit... Remove
8	USD US Dollar				Add Clear

Total money in currencies: 4913.43 USD (↑ 0.64% [31.40 USD] compared to Mar 28, 2011).

Figure 2. An example of a currency list

this data from the database. If the time limit has not expired, the stored value will be used; otherwise the application will call the Yahoo API again.

Getting the price of a stock for a given date For obtaining historical stock data, we need to use another type of Yahoo's API. For instance, the price query for the MSFT stock for January 18, 2011 can be formulated as follows: `http://ichart.finance.yahoo.com/table.csv?s=MSFT&a=00&b=18&c=2011&d=00&e=18&f=2011&ignore=.csv`. This query will return the following two lines: (1) Date, Open, High, Low, Close, Volume, Adj Close, and (2) 2011-01-18, 28.16, 28.74, 28.14, 28.66, 53322700, 28.49. The value that we need in this example is 28.66 (column "Close"; in fact, we are looking for the close value of the day). Note that the latter API does not return the stock price for days when the stock exchange was closed.

2.1.2 Currency list

The currency list contains the currency holdings owned by the user (see Figure 2). The list is represented as a table comprising the following columns:

1. Order, which is a simple counter for the currencies.
2. Three-letter code and the currency name (ex. USD ⇒ US Dollar).
3. Quantity: the money total in the specified currency.
4. USD Rate: rate of the currency with respect to the US dollar, which is chosen as a basic currency of our application.
5. Total in USD: the total amount of the given currency converted into US dollars. The change percentage and currency trend, compared to the selected date or period, are indicated for each presented currency except USD.

Below the table, the total of all currencies – converted in USD – is displayed. Changes with respect to the specified date or period are also shown. The supported operations are similar to those available in the stock list.

Getting the current rate of a currency The current rate of a given currency can be retrieved with another type of Yahoo's API. For instance, the Euro conversion rate can be obtained using the following query: `http://finance.yahoo.com/d/quotes.csv?e=.csv&f=nl1&s=EURUSD=X`, which will return the string: "EUR to USD",1.4085. Similarly to the current prices of stocks, all obtained currency rates are stored in our database cache.

Getting the historical currency rates Unfortunately, Yahoo's API that we used to get the current rate

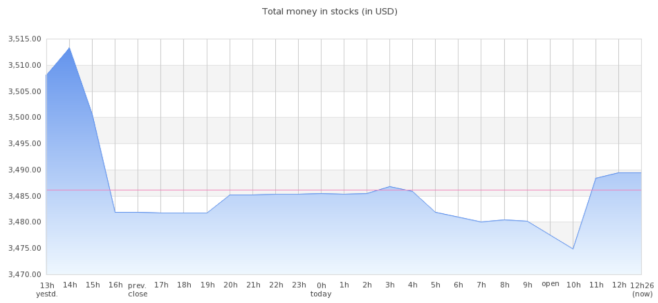

Figure 3. 24-hour representation for stocks

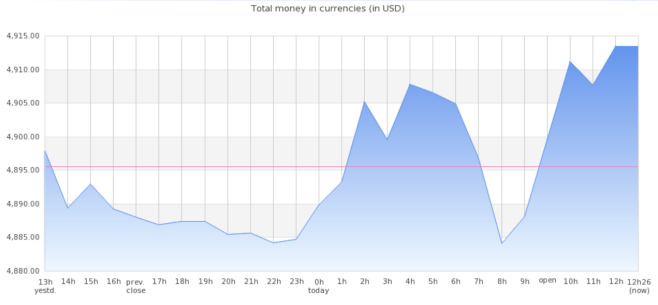

Figure 4. 24-hour representation for currencies

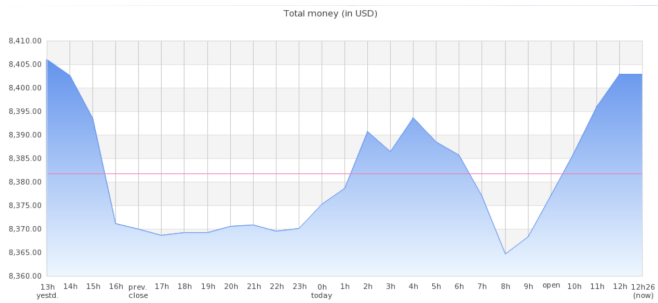

Figure 5. 24-hour representation for net worth

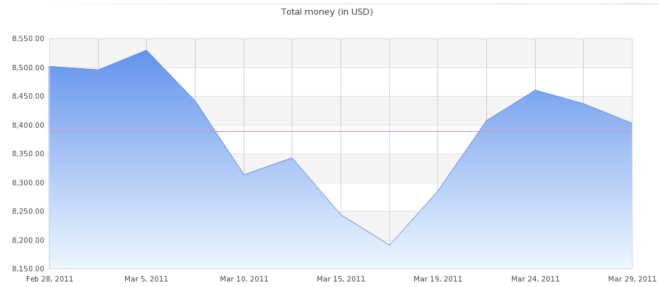

Figure 6. Multiple-day representation

of a currency does not return historical data. Thus, in order to obtain currency rates for past dates (including yesterday), we had to look for another data source. The European Central Bank (ECB, `http://www.ecb.int/`) freely provides such historical data for 33 main world's currencies. ECB distributes historical currency data in XML format. Currency rates since 1999 have been made available by ECB at the following URL address: `http://www.ecb.europa.eu/stats/eurofxref/eurofxref-hist.xml`. The rates are updated once a day. They are based on a regular daily concertation procedure between central banks across Europe and worldwide, which normally takes place at 2.15 p.m. CET. The ECB historical datasheet is distributed in the following format:

```
<?xml version="1.0"?>
<Cube time="2011-03-25">
  <Cube currency="USD" rate="1.4115"/>
  <Cube currency="JPY" rate="114.57"/>
  ...
  <Cube currency="ZAR" rate="9.7056"/>
</Cube>
...
```

Since the ECB rates are Euro-based, our system converts them into USD-based rates. The ECB dataset contains no entries for weekends. Thus for Saturday and Sunday, we use the rates of the previous Friday.

2.1.3 Net worth evolution

The evolution of the full total of the user assets is also presented. The net worth summary includes the sum of the totals of the user stock and currency lists and displays the user full total changes with respect to the specified date or period. By default, the comparison of the real-time user's assets with those available at the previous close of the stock exchange is made.

2.1.4 Graphical presentation

Figures 3 to 5, provided by our application, represent the summaries of the stocks, currencies, and net worth evolution during the pre-defined period (e.g. past 24 hours). A presented graph can be in one of the following modes: 24-hour representation or multiple-day representation. The red straight line on the graphs represents the average value of the period. The graphs are produced using the JpGraph library [2].

24-hour representation If the date used for comparison is yesterday, then a 24-hour representation is used in the figures. A Python script that we developed, collects once an hour the necessary stock prices and currency rate data and stores this information in our database. The obtained data are represented with a 15 minutes delay because Yahoo's APIs do not provide up-to-the-minute data.

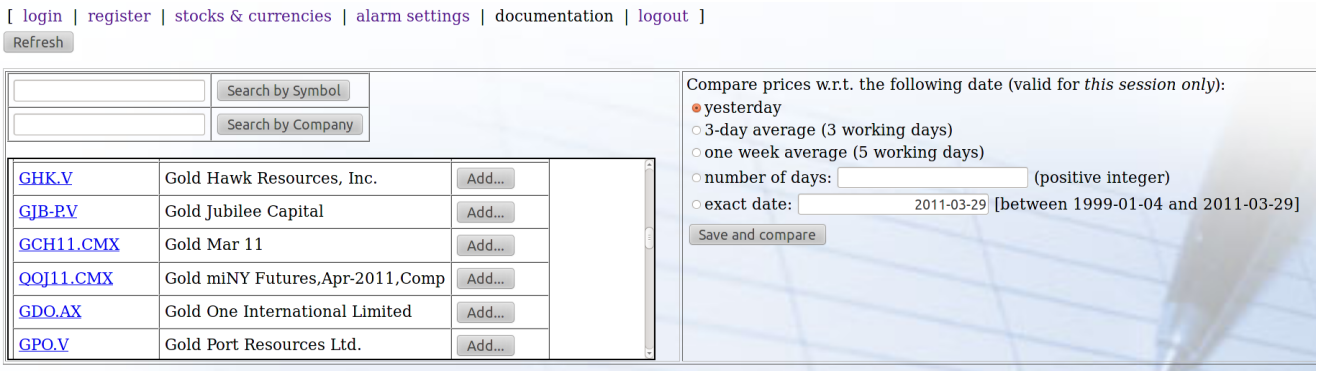

Figure 7. Top of the main page of the application

Multiple-day representation If the number of days between today and the date used for comparison is greater than one, then a multiple-date representation is used to illustrate the holdings evolution. The interval between the specified date and today is divided into equal segments, as illustrated in Figure 6.

2.1.5 Top of the main page

The top of the main page of our application is presented in Figure 7. The header contains a navigation bar present on each page of the application. It allows the user to quickly access different parts of the application that are the following:

1. Login page.
2. Registration page: new users can create a new account here.
3. Stocks & currencies page: this is the main page of our application.
4. Alarm settings: here users can specify a date or period of time (see below for more details) to which their current stock and currency values will be compared as well as indicate the alarm thresholds (for the net worth and for each individual stock or currency owned by the user). For example, if the change in the net worth exceeds the threshold value (either in a positive or a negative way), the user will be notified about it by e-mail. A detailed report containing the exact copy of the Stocks & Currencies page will be generated and sent to the user in the PDF format. If necessary, the alarm message can be sent once an hour.
5. Documentation: online documentation for our application is provided online.
6. Logout page.

Users can access a variety of existing stocks when performing search by symbol or by company name. The main commodity stocks such as Crude Oil or Gold have been also made available. On the left side of the screenshot presented in Figure 7, a search result returned by our system (i.e. for the companies having 'Gold' in their names) is illustrated. Our database contains more than 18,000 stock entries covering all the most important stock exchanges world-wide.

On the right side of the screenshot (Figure 7), the date selection panel is displayed. The following options are supported here:

1. Yesterday: this is the default option.
2. 3-day average: here, the last three working days are taken into account.
3. One week average: here, the last week (i.e. the last 5 working days) is considered.
4. Number of days: one can specify the exact number of days (for example 10 days).
5. Exact date: it is possible to specify an exact date too. The selected date must be after January 4, 1999 because the ECB historical data have been made available starting from this date.

In the 2^{nd} and 3^{rd} options, stock values and currency rates are compared to the average values of the given time interval.

2.2 Remaining features of the application

2.2.1 Login page

The login page allows a registered user to log in. The login process requires an e-mail address and a password.

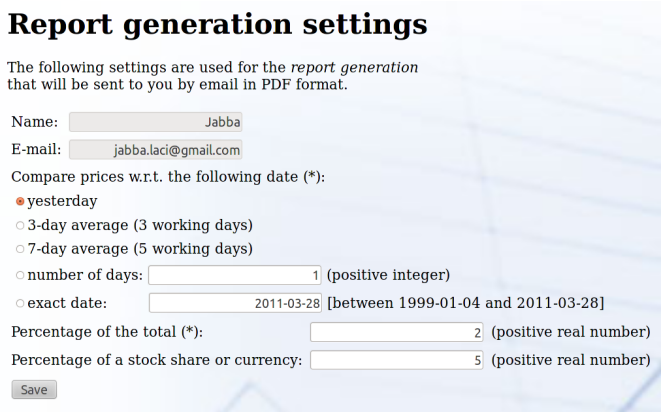

Figure 8. Report generation settings

2.2.2 Registration page

The registration form allows new users to sign up for the proposed services. They need to provide a name, a password and an e-mail address to complete the registration process. A registration confirmation e-mail is then sent to a new user.

2.2.3 Alarm settings page

The alarm settings are used for the report generation (see Figure 8). The generated report is then sent to the user by e-mail in PDF format. On the alarm settings page, the user can specify a percentage threshold and a period of comparison. The comparison with an exact date is also possible. The date selector is similar to the one on the main page of the application. The net worth of the user assets is verified, and if the changes exceed the specified threshold compared to the selected date or time interval, the user receives a notification e-mail (this option of our application is novel). The same verification is carried out for each individual stock or currency (this option is available in many existing Internet-based applications). The HTML to PDF report conversion is accomplished using the open-source wkhtmltopdf project [11].

3 Conclusion

In this paper, we presented Personal Assets Evolution, a freely available web application for monitoring personal holdings. Our application is intended for users interested in a real-time tracking of their net worth. The main features of our application include: World-wide coverage with support for most major stock exchanges, built-in currency conversion allowing users to track their foreign investments as easily as their local (North American) investments, real-time tracking of all user's quotes and net worth, comprehensive search engine for searching by stock ID and company name, handy portfolio management of user's stock and currency lists, customized e-mail alerts system with report generation and graphical representations of the user stocks, currencies and net worth.

When developing the Personal Assets Evolution web application, we used tools provided only by open-source projects. The application interface is implemented in PHP 5.3. The database behind the application is a MySQL server. The web server is a Linux box running Apache, i.e. we used a classical LAMP stack. The application relies on real-time stock prices and currency rates (up to 15 minutes delays may sometimes be observed while using the Yahoo APIs). The data are obtained by calling some freely available Yahoo APIs and by downloading an XML dataset, which is also freely offered by European Central Bank. Third-party libraries were also used, including Swift Mailer [9] (for sending e-mail notifications), JpGraph [2] (for generating graphs) and wkhtmltopdf [11] (for converting HTML to PDF). The report generation script was written in Python.

In the future, we plan to develop a module allowing for sharing user's data with Quicken and other popular software. Thus, our web server will be able to support the industry-standard QIF file format necessary to exchange information with Quicken, Microsoft Money and compatible applications.

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Motivation Strategy by using Word of Mouth

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Abstract *- In Japan, the mobile phone e-learning is still at the early stage. A reason for this might be the lack of good quality electronic learning materials. In this paper, I develop the mobile phone e-learning using manga based learning system. Word of mouth is a determining factor for success in this system. This case study was to examine motivational factors affecting the mobile phone e-learning system using manga media for students based on observations, interviews, and questionnaire survey. This system is try to do mobile phone learner under the influence of word of mouth. In addition, word of mouth have influence on her friend's motivation. Word of mouth can attract learner and enhance learner's confidence, thus gain more learner.*

Keywords: m-learning, manga, word of mouth, motivation.

1 Introduction

Research on mobile phone e-learning has been conducted in countries all over the world. But, the mobile phone e-learning is still at the early stage in Japan. A reason for this might be the lack of good quality electronic learning materials and good support system. I develop the mobile phone e-learning using manga based learning system.

Mobile learning is defined by the E-Learning Center [1]: "Mobile learning is the use of learning solutions on mobile or wireless devices and this covers a number of aspect laptops using wireless connections; PDA and mobile phones".

Mobile learning, therefore, has the potential of reaching a wider audience than the classroom, especially where cellular infrastructure and network have been highly developed. Consequently, mobile learning can learn everywhere, every time and in any occasion compared with e-learning. However, teachers were not prepared to deal with or assist with learner by mobile phone e-learning. In this paper, I propose a method motivation of students by using word of mouth.

The rest of the paper is organized as follows. In section 2, I explain motivation theory and word of mouth. Section 3 presents our development approach to manga based contents. Section 4 presents our experiment approach to investigate student's motivation learning online and gives the experimental results and discussions for the results. Section 5 presents our experiment approach to investigate word of mouth. In Section 6, our give the experimental results and discussions for the results.

2 Motivation

2.1 Motivation theory

According to Frannokola [2], online learners have a high drop-out rate. There are many theories about how and why students are motivated online. The field of psychology has many theories of motivation.There are two types of motivation: intrinsic and extrinsic. Intrinsic motivation can be defined as motivation that comes from inside an individual rather than from any external or outside rewards, such as money or grades.

People tend to become much more motivated to study when their friends tell them that studying is fun, than when their teachers and/or bosses tell them to study.

2.2 Word of mouth

Harrison-Walker [3] defined Traditional word-of-mouth is defined as a type of informal, person-to-person communication between a perceived noncommercial communicator and a receiver regarding a brand, a product, an organization or a service.

On the other hand, online word-of-mouth has become a common topic of research in the area of computer-mediated communication. Especially, innovation of the internet allows us to publish and share various. We contents using CGM (contents generating media) such as blog, wiki (Wikipedia) and SNS (Social Networking Service).

Ever since, word of mouth on the web is becoming popular. There are both good-will word-of-mouth and bad-will word-of-mouth. However, the epistemic curiosity is significant element in intrinsic motivation. Word of mouth using marketing the capturing theory and have been systematized.

There is TSUZUMI MODEL of word of mouth marketing [4]. TSUZUMI means traditional Japanese hand drum.

I tried to apply "TSUZUMI MODEL" to education (Depicted in Figure1). From following figure1, word-of-mouth can attract learner and enhance learner's satisfaction, thus gain more learner.

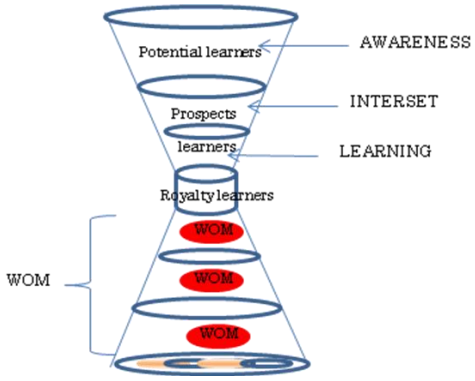

Figure 1 TSUZUMI MODEL applied to the education

3 Educational Story Manga

3.1 Teaching method with manga

The manga is popular and important resource in our modern culture in Japan. Manga is comic strips in Japanese. Recently, it is widely recognized that manga based learning has been widely adopted for children's. In addition, manga based learning has also been proposed for adult learners. Manga based contents can rouse a student's interest and encourage learning through fun and easy understanding and interactions.

A number of studies were carried out that focused on retention of learning using manga teaching materials. (e.g., T.Kogo, et al, 1998 [5], K.Hasegawa, et al ,2006 [6], R.Kukihara , et al, 2005 [7]) .

There are many interactive learning techniques that have already been used in manga based learning. But, there is still a lot of room for further development.

3.2 Instructional Design (ID)

I design theoretical framework for a manga contents. Motivation in instruction means factoring incentives, and is important for designing effective instruction. The theory of Instructional Design (ID) is a systemic approach to designing effective learning, teaching and training. ID has captured attention in Japan through e-Learning. The goal of ID is to make instruction more effective, efficient, and appealing [8]. The proposed procees model is based on the theoretical assumption [9].

I have used the ADDIE model to create manga based contents. The ADDIE instructional design model forms a roadmap for the entire training project. The ADDIE model is a method to describe a systematic approach to instructional development. The name itself seems to have been disseminated by word-of-mouth, beginning perhaps in the 1980s.

This is an acronym referring to the major processes that comprise the generic instructional systems development process. It is constituted by the following five phases: Analysis, Design, Development, Implementation and Evaluation. Each step has an outcome that feeds into the next step in the sequence.

3.3 Narrative approach

Narrative approach holds that people's beliefs, skills, principles, and knowledge, in the end, help them regain their lives from their problems. Operationally, narrative approach involves a process of deconstruction and "meaning making" which are achieved through interviewers' questioning and collaboration with the people. By focusing on problems' effects on their lives rather than on problems as inside or part of them, distance can be created. This externalization or objectification of a problem facilitates investigation and evaluation of the problem's influences.

In this study, I incorporated narrative approach into educational story manga.

3.4 Needs analysis of the manga

I survey needs of manga from college woman. The following two data were used to survey.

The first data was the library's loan records of the International Exchange Center Nara Women's. Loan records were up to date. The total loan records are 29655. (As shown in Table 1)

Next data was "License character consumer investigation 2009" VOICE INTELLIGENCE Co., Ltd [10].

The data was characters-favorability ranking of college woman (As shown in Table 2).

Based on these finding, I develops character within manga contents. (Depicted in Figure 2).

Tab. 1: total loan ranking (29655 rent)

	Title	rent
1	One Piece	3865
2	Slam Dunk	1882
3	Nodame	1792
4	Dragon bal	1439
5	Inu-Yasha	1419
6	NANA	1379
7	Hana Yori Dango	1317
8	Alchemist of steel	1223
9	Hikaru No Go	1081
10	Garasu no Kamen	1030

Tab. 2: College woman favorability ranking (50 people)

	character	Favorability(%)
1	My Neighbor Totoro	93.0
2	Winnie the Pooh	88.0
3	mickey mouse e	86.0
4	snoopy	85.0
5	Peter Rabbit	83.0
6	Kiki's Delivery Service	83.0
7	DORAEMON	79.0
8	miffy	79.0
9	Moomin	79.0
10	Rilakkuma	1030

Source "License character consumer investigation 2009" [10].

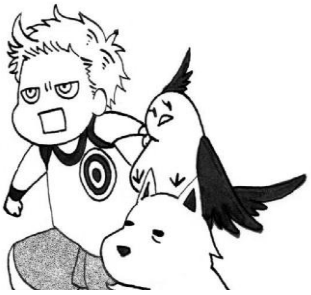

Figure 2 within Manga character

4 Experiments

4.1 Preparation

This study analyzed a case of Introduction to information processing of students at Nara Women's University an online "Web class": "Web class" is production of teaching-materials using e-learning software. I have two hundred sixteen students, and I perform tests by using the manga contents online “Web Class”.

4.2 Materials

The questionnaire survey in this study was developed by the ADDIE mode.

1. The six manga contents. "Let's learn the copyright of computer "(Depicted in Figure 3).

2. The thirty-five cartoon on mobile phone. "Let's learn the copyright of mobile-based "(Depicted in Figure 4).

3. The twelve PDF. "Let's learn the copyright o PDF "(Depicted in Figure 5).

As experimental subjects, I have two hundred sixteen first-year students. The students were divided over three departments. These three departments were selected for their different disciplines – Letter, Science and Human life and Environment. As shown in Table 3 and 4.

The first experiments, hundred sixteen students responded to the questionnaire.

The second experiments, I have forty students to the questionnaire. As shown in Table 5 and 6.

Figure 3 Let's learn the copyright(computer).

Figure 4 Let's learn the copyright(mobile).

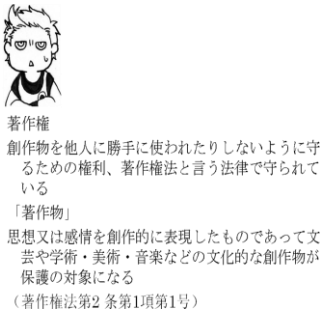

Figure 5 Let's learn the copyright(PDF).

Tab. 3: Experimental subjects (216 students)

Letters	Science	Human life and Environment
58	114	44

Tab. 4: Experimental year (216 students)

year	Total
Freshman	204
Sophomore	4
Junior	6
Senior	2

Tab. 5: Experimental subjects (40 students)

Letters	Science	Human life and Environment
19	8	13

Tab. 6: Experimental year (40 students)

year	Total
Freshman	33
Sophomore	5
Junior	2
Senior	0

4.3 The first survey

In this survey, I showed these students six pages of an educational manga story and asked them to eleven questions. The students do not have to answer each question, only those that applies to your own experience. The objective of the experiments is to find that difference in selection of media between learning environment using mobile phone device. In addition, I survey the interest of e-learning by using manga based.

The following eleven questions were 1) Do you have experience use of manga? 2) Do you have repeated study this manga contents is? 3) Which do you can see easily better, Manga or PDK? 4) Which do you can read fast better, Manga or PDK? 5) Which do you can understanding better, Manga or PDK? 6) How would you rate satisfaction the this manga content on computer.? 7) How would you rate funny this manga content on computer? 8) How would you rate confidence this manga content on computer? 9) What kinds of device do you use? 10) How would you rate read this manga content on mobile phone e-learning? 11) How would you rate seen this manga content on mobile phone e-learning?

4.4 Experimental Results

This survey showed that students select of media by environment on learning. Question 1 is" Do you have experience use of manga study?" The experiment results show the correct answer rate of the experience 52.7%.

Table 7shows the mean and the standard deviations in As shown in Table 9." satisfaction "- 94% say This manga content has done Excellent or good. " funny "- 86% say This manga content has done Excellent or good. " confidence "- 89% say This manga content has done Excellent or good.

Among two hundred sixteen students were able to access to e-learning their computer, 90% answered, "I want to use personal computer" On the other hand, 75% answered, "I do not want to use mobile phone e-learning".

Twenty students were completed to opinion of mobile phone e-learning. These opinions were selected two departments. The first, they point out the function side of the cellular phone. The second, they point out the communication fees of the cellular phone are expensive.

Tab. 7: Your own evaluation (216 students)

Question	Yes	No
Do you have experience use of manga?	114	102
Do you have repeated study this manga contents is?	24	192

Tab. 8: Comparison of contens (216 students)

Question	Manga	PDF
(1)	215	101
(2)	186	30
(3)	150	66

(1) Which do you can see easily better, Manga or PDK? (2) Which do you can read fast better, Manga or PDK? (3) Which do you can understanding better, Manga or PDK?

Tab. 9: Evaluation (216 students)

Question	Excellent	good	Only fair	Poor
(1)	54	149	11	2
(2)	59	128	24	5
(3)	98	96	14	8

(1) How would you rate satisfaction the this manga content on computer? (2) How would you rate funny this manga content on computer? (3) How would you rate confidence this manga content on computer?

Tab. 10: Difference of device(40 students)

Question	computer	mobile	both
What kinds of device do you use?	30	6	4

Tab. 11: Comparison of contents (mobile) (40 students)

Question	Excellent	good	Only fair	Poor
(1)	4	19	10	7
(2)	3	10	20	7

(1) How would you rate read the this manga content on mobile phone e-learning?(2) How would you rate seen this manga content on mobile phone e-learning?

5 Interview

5.1 The Second survey

In Japan, the spread of a smart phone has been extending, October in 2010. Smart phone is hybrid devices which combine the abilities of mobile phones and PDA. They have smaller sizes than PDA and smaller than mobile phones.

I was interviewed for students. It executed between January and the end of February of 2011. I interviewed one hundred twenty-five students as experimental subjects, as shown in Table 12 and 13.

The objective of the interviews is to find the spread of smart phone on student In addition; I survey the interest of smart phone e-learning by using manga based. 1) Do you have an ownership of smart phone? 2) How much/strongly are you interested in smart phone m-learning? 3) How much/strongly are you interested in smart phone m-learning incorporating an educational manga story? As shown in Table 14 and 15.

Tab. 12: Experimental subjects (125 students)

Letters	Science	Human life and Environment	Graduate School
39	24	27	35

Tab. 13: Experimental year (125 students)

year	Total
Freshman	37
Sophomore	11
Junior	17
Senior	25
Master	35

Tab. 14: Ownership(125 students)

Question	Yes	No
Ownership of smartphone	5	120

Tab. 15: Evaluation (125 students)

Question	Excellent	good	Only fair	Poor
How much/strongly are you interested in smart phone m-learning?	40	44	16	25
How much/strongly are you interested in smart phone m-learning incorporating an educational manga story?	30	46	15	21

Tab. 18: Word of mouth (23 students)

Question	YES	NO
Do you feel like talking to their friends how interesting the story is?	15	8
Do you feel like trying smart phone m-learning incorporating an educational manga story, if you hear about your friends talking about how interesting it is?	21	2

5 2 The Third survey

I was interviewed for students, on February 23, 2011 and March 1, 2011. As experimental subjects, I have twenty-three students as shown in Table 16 and 17.

The purpose of this survey is to educational manga story give the learner the word of mouth.

In this survey, I showed these students six pages of an educational manga story on a smart phone and asked them 1) if they feel like talking to their friends how interesting the story is, and 2) if they feel like trying smart phone m-learning incorporating an educational manga story, if you hear about your friends talking about how interesting it is? As shown in Table 18.

Tab. 16: Experimental subjects (23 students)

Letters	Science	Human life and Environment	Graduate School
6	7	0	10

Tab. 17: Experimental year (23 students)

year	Total
Freshman	0
Sophomore	0
Junior	0
Senior	13
Master	10

5.3 Interviews Results

The First survey, it was find that the spread of a smart phone is not too advanced at students, Because, that smart phone is too expensive for her to buy. In addition, smart phone can not connect directly with the e-mail system But, 80% answered, "I want to use smart phone". And, 60% answered, "I want to use smart phone e-learning". It is our expectation that smart phones are on the march at college women.

The Second survey, They try to do mobile phone learner under the influence of word of mouth. In addition, word of mouth have influence on her friend's motivation.

6 Conclusions

It is clear that manga media make the contents more creativity and keep student's motivation of learning high. I have developed manga contents by needs of the manga from college woman. Manga based contents try to do mobile phone learner. And word of mouth has influence on her friend's motivation. However, they select of manga media by environment online learning. In the example, mobile phone e-learning by using manga based is unpopular for her. Because, cellular phone are the lack of function to mobile phone e-learning by using manga based contents at present. In contrast, smart phone are no lack of function. However, smart phone are not on the march at college women. In the near future, using word of mouth, I hope to develop an effective instructional strategy for the field of education.

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Building a Multimodal, Trust-Based E-Voting System

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Abstract: *This paper addresses the issue of voter identification and authentication, voter participation and trust in the electoral system. A multimodal/hybrid identification and authentication scheme is proposed which captures what a voter knows – PIN, what he has – smartcard and what he is – biometrics. Massive participation of voters in and out of the country of origin was enhanced through an integrated channel (kiosk and internet voting). A multi-trust voting system is built based on service oriented architecture. Microsoft Visual C#.Net, ASP.Net and Microsoft SQL Server 2005 Express Edition components of Microsoft Visual Studio 2008 was used to realize the Windows and Web-based solutions for the electronic voting system.*

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Keywords: Multimodal, Multi-trust, Internet voting, Service-Oriented Architecture, Electronic voting, Remote voting

1. Introduction

In a democratic system of governance, election is very crucial and the integrity of the electoral process is sacrosanct. The electoral process includes registration of voters, voting, tallying and collation.

The Council of Europe recommendations defined electronic voting (e-Voting) as "the use of electronic means in at least the casting of the vote" [1]. e-Voting is a major issue of concern in governance especially in developing nations. Electronic elections are still an emerging field [1].

The punch card was the earliest e-Voting system used in the 1960s [2]. The optical scan machine is another e-Voting system that can read a voter's mark on a ballot. The Direct Recording Electronic (DRE) machine is the most recent. The voter enters his choices into electronic storage via a touch-screen, push buttons, or similar device. The voter's choices are stored in these machines via a removable memory

cartridge, diskette or smart-card and added to the choices of all other voters. Bellis affirmed that the DRE machine has been extensively used in Brazil, India, Venezuela and United States of America [2]. In

2004, more than 27% of US counties used DRE technology, an increase of 13% over 2000 election [3].

In kiosk/polling place e-Voting, dedicated machines are used in polling stations to enable the voters cast their votes. This form has the advantage that it can be thoroughly supervised. In remote e-Voting, voters are able to mark and cast their votes on the Internet or telephone but supervision

is limited. Though, remote e-Voting has an advantage of convenience [4] for the voter which can enhance turnout, it is fraught with problems which include: privacy and anonymity infringement, vote buying, vote coercion, vulnerability to attack, audit trail may not be possible, etc [5, 6, 7, 8, 9].

Internet voting (i-Voting) had been employed in countries like United Kingdom, Estonia, Canada and Switzerland. Table 1 shows the list of countries with e-Voting projects by type and year of first usage and figure 1 shows the world map of e-Voting

Table 1:List of Countries with e-Voting Projects by Type and Year [20]

Country	Type	Date
Belgium	Polling place e-Voting	First trial in 1991
Brazil	Polling place e-Voting	First in 1996
Germany	Remote e-Voting	First tested in 1999
UK	Polling place e-Voting, Remote e-Voting	First in 2000
Ireland	Polling place e-Voting	First tested in 2000
Australia	Polling place e-Voting	First in 2001
Switzerland	Remote e-Voting	First in 2003
Norway	Polling place e-Voting	First in 2003
Austria	Remote e-Voting	First in 2003
Canada	Remote e-Voting (Internet and Telephone)	First in 2003
France	Polling place e-Voting, Remote e-Voting	First in 2003
India	Polling place e-Voting	First in 2003
Spain	Remote e-Voting	First in 2003
Estonia	Remote e-Voting	First in 2004
Portugal	Polling place e-Voting	First in 2004
The Netherlands	Polling place e-Voting, Remote e-Voting	First in 2004

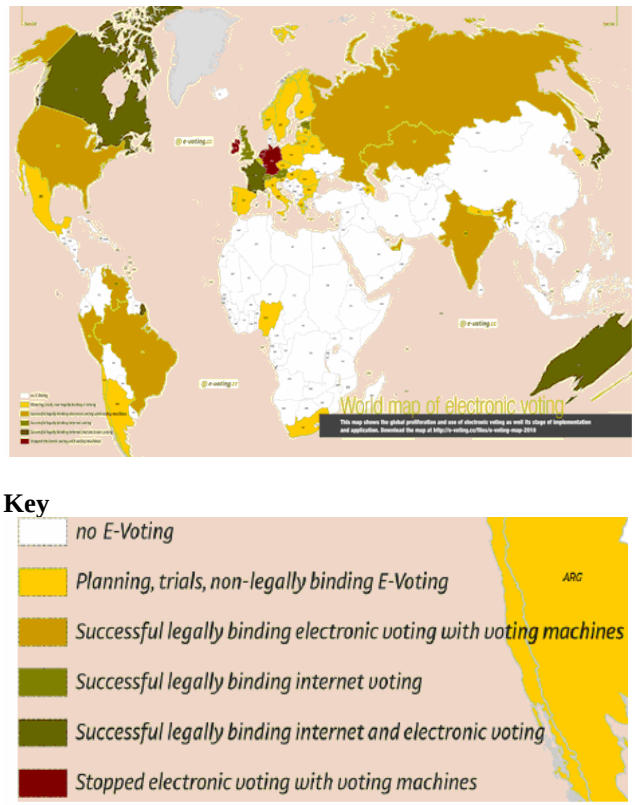

Figure 1: World Map of E-Voting [29]

In order to design and develop an e-Voting system that is suitable for large-scale elections, it is expedient that some acceptable public standards be observed. Burmester and Magkos in [14] identified some of these standard requirements as follows:

(1) *Security* [8, 15]. This standard includes the following properties (a) Democracy [18, 19] - Only eligible voters can cast votes, and no voter can cast more than one vote. (b) Accuracy [18, 19] - No vote can be altered, duplicated or eliminated without being detected. (c) Privacy [8, 16, 19] - All votes remain secret while the voting process is taking place, and each individual vote cannot be linked to the voter who cast it. For uncoercibility, no voter should be able to prove the value of his/her vote to another party. (d) Verifiability [8, 17, 18, 19] - Any observer can be convinced that the election is accurate and that the published tally is correctly computed from votes that were correctly cast and (e) Robust [16, 17] - All security requirements are fully satisfied, despite the failure and/or malicious behaviour by any coalition of parties (voters, authorities, outsiders).

(2) *Practical*. This standard includes the following properties (a) Convenience [15, 16, 17, 19] (b) Conformance with standard platforms and technologies. (c) Accessibility by the disabled [15, 17]. (d) Performance irrespective of the size of the election, and (e) Extensive testing - so as to enhance trust and confidence from officials and the public.

The electoral process includes registration of voters, voting, tallying and collation. Kofler et al., (2003) identified two fundamental elements in any e-Voting system (i) The registration process during which the voters is identified and authenticated and (ii) The voting process where the voter cast his vote.

Before a voter can cast a vote, he has to register. In order to identify a voter, three fundamental criteria can be used to differentiate the technologies. These according to Krimmer et al., (2007) are: (a) what he knows, (b) what he has and (c) what he is. Biometrics is what you are. These following techniques of identification are used in e-Voting system: (i) Username and Password (Personal Identification – PIN) - the voter is identified because he knows the PIN. (ii) Transaction Number (TAN) - the voter possesses something that identifies him. (iii) Smart-Cards - this also identifies him when his properties are read as stored on the card and (iv) Biometrics - the voter himself identifies himself with his biometric properties. A hybrid of these identification technologies can be explored in e-Voting system.

In PIN-based e-Voting systems, the voter logs in to the system with his PIN and he is identified. He is then allowed to access and fill the ballot. An example is the Active Transport Society Elections [21]. The voter logins with a one-time security code, fill the ballot and cast his vote, where cryptography is used to secure the communication between the browser and the election server. In this system, security is based on the integrity of the election commission and server administration.

In TAN-based e-Voting systems, the voter is issued with a transaction number with which he can cast his vote. The number is usually generated by a trust center. The connection between a voter and the election server is also cryptographically secured [26]. The European Union (EU) student vote system is a TAN-based Internet application system used to vote for EU student council [22]. The communication between the voter and the election system is encrypted with a key issued by a trust center [26]. Another example of a TAN-based election system is the one for the election of the Jugendgemeinderat (young city council), an advisory board at Fellbach, German, 2001 [23]. Figure 2 expresses the various levels of elections.

Levels	Leg. Binding	Org. Binding	Non-Binding
1st Level: national	☑		
2nd Level: regional, local	☑		
3rd Level: org., assoc., companies	(☑)	☑	
4th Level: shadow, parallel			☑
5th Level: technical test			☑

Figure 2: Levels of Election [1]

First and second level elections are legally binding and of higher political importance. They are regulated by law (example - the Nigerian Electoral Act 2010) and the results of the elections have consequences. The most rigid legal framework being the first level elections. Though PIN-based and TAN-based election systems are relatively cheap to implement, they do not have a legal foundation as a basis of identification and authentication. Distribution of TAN for each election can be expensive and susceptible to error. Hence, PIN-based and TAN-based systems cannot be used for first and second level elections.

The use of smartcard is another means of identification in e-Voting systems. Some smartcard-based e-Voting system uses smartcard for digital signature and enables cryptographic protocols. The Sensus system [24] and the German i-Vote [25] system utilize the blind signature based

algorithm. The algorithm follows a one-stage approach where the voter fills a ballot sheet which is then blinded and signed. It is encrypted and sent to the registration server which authenticates the digital signature of the voter. The authenticated ballot sheet is then sent to the ballot server. In this type of system, registration and voting is done in a single phase. The limitation [26] is that if the registration server and the ballot box server are able to collude, voter anonymity can be compromised and his privacy infringed upon.

Kalu-Mba and Ofodile, (2010) developed a secure e-Voting system where voters identification and authentication is multimodal based on biometrics, smartcard and Voter Identification Number (VIN) [12]. In their work, they incorporated multilingual audio facilities in English and three major Nigerian languages: Yoruba, Hausa and Igbo to allow the active participation of the disabled/impaired ones. Voters' participation is limited to citizens living in the country alone. Nigerians living outside the country cannot participate. Election system architecture is one-phased.

Ayo and Babajide in [27] developed a secure i-Voting system where identification and authentication was based on multimodal features also, such as biometrics and PIN. Audio was also incorporated. The limitation was that the architecture was one-phased.

In this work, the objective is to emphasis on e-Voting model implementation in developing nations and one of which is Nigeria. We also address the issue of security by employing a multimodal means of identification and authentication that captures what the voter knows, what he has and what he is [12, 13]. Also, massive voter participation issue is considered where voters in and out of the country are given chances to participate in the democratic government of their country. The system has two channels through which vote can be cast and these channels are integrated. These are: through the kiosk (e-Voting Machine (EVM)) and the Internet. Trust issue is very paramount in e-Voting system. The voters need to have confidence in the voting system so that they can believe in it. Hence, we leverage on service oriented computing theory to develop a multi-trust e-Voting system.

The remaining part of the paper is succinctly arranged as follows: section 2 enunciates on the service-oriented computing theory, section 3 discusses the architectural framework and section 4 the conclusion.

2. Service-Oriented Computing

According to Papazoglou [10], Service Oriented Computing (SOC) is the computing paradigm that utilizes services as fundamental elements for developing applications using Service Oriented Architecture (SOA). Service Orientation is a paradigm for developing and deploying application quickly and cost effectively [30]. SOA applications are developed using component-based software development approach, with reuse in mind. In SOA, software components are encapsulated as services. SOA builds applications by seeing components therein as a set of interacting services. Services encapsulate business functionality. It is a function performer. Services are autonomous and platform-independent. Services enable access to one or more capabilities with prescribed interface. Services can be described, published, discovered, and dynamically assembled for developing massively distributed, interoperable, evolvable systems [11]. Other service characteristics are: loose coupling, reusability, autonomy, statelessness. Services can also be composed to provide higher functionality for distributed applications [31].

3. Architectural Framework

Based on Purba in [28], we proposed a 3-tier Enterprise Application Architecture as represented in figure 3, with the introduction of the SOA services layer to the business tier.

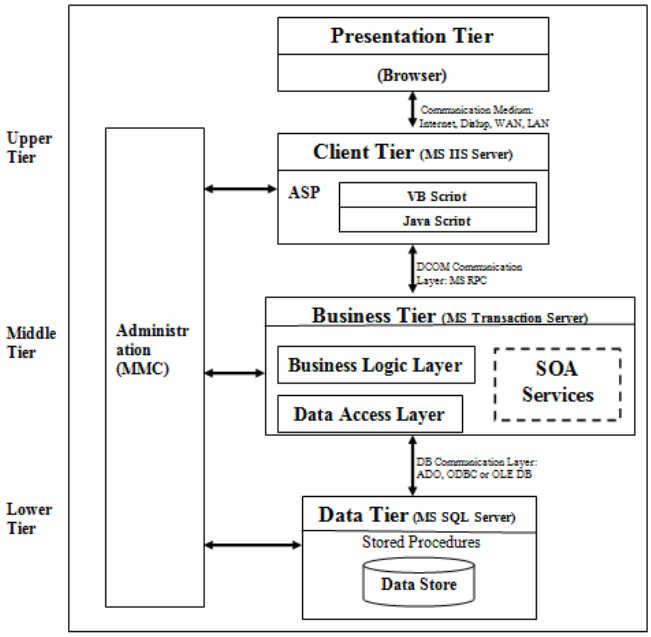

Figure 3: Enterprise Application Architecture

A trust-based multi-phase voting protocol was used while the election process was done in phases and they were rendered as web services.

The SOA-based e-Voting services are illustrated in figure 4.

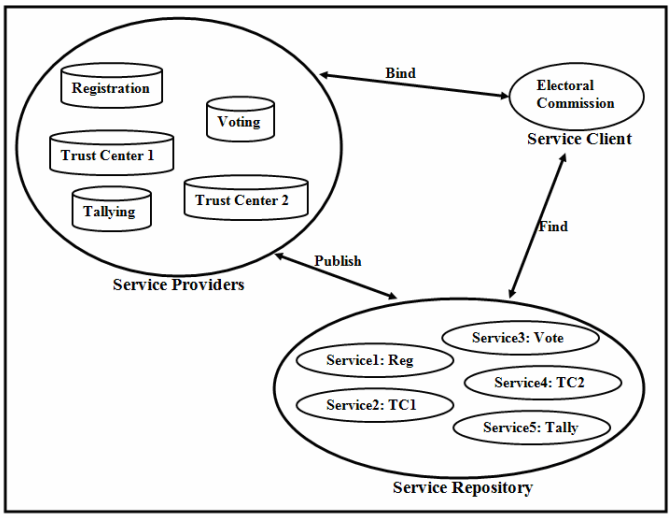

Figure 4: SOA-Based e-Voting Services

In figure 4, the service providers advertise their services by publishing to the service repository. The electoral commission is the service client/consumer. The service client finds related services from the service repository and composes services using service orchestration paradigm. After which the service client binds to the appropriate service providers at the instance of each voter. A sample voter interaction with such system is shown in figure 5.

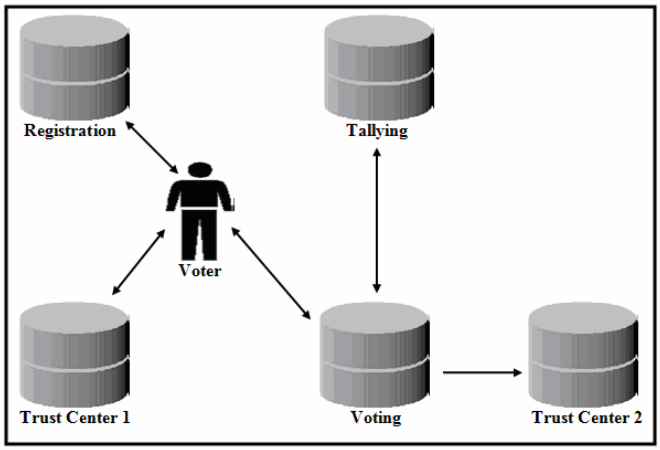

Figure 5: Voter Interaction with the e-Voting System

Trust, in this model, is distributed among the following participants in the system: Registration authority, trust center 1, voting authority, tallying authority and trust center 2.

Voter interaction with the system is as follows:

Step 1: Eligible voters register before the start of elections. Registration is done continuously except at a legislated time. For example, according to the amended Nigeria Electoral Act 2010, it is 30 days before the commencement of the elections.

Step 2: On the Election Day, a voter is authenticated as eligible by the registration authority and given a token.

Step 3: A voter also obtain another token from the Trust Center 1. This is to reduce the possibility of collusion in order to break the voter's privacy property [26].

Step 4: These two tokens are presented to the voting authority to request for a ballot.

Step 5: He fills the ballot, cast it and obtain a receipt. The cast ballot is transmitted to trust center 2 as a backup for security reason.

At close of election, the votes are collated by the tallying authority and result is announced.

4. Conclusion

The advent of electronic voting is indeed a revolution of the traditional paper based voting system. e-Voting system has helped in the automation of the traditional voting system and hence its efficiency. Electronic model of voting has been largely embraced in the developed world from Estonia to Switzerland and the United States of America to mention a few. There is a need for developing nations to embrace the technology in their democratic system. It is also necessary to fully explore the benefits entrenched in the e-Voting model.

The multimodal, multi-trust, integrated e-Voting model ensures voters' identification and authentication, massive voter participation in and out of country of origin and enhances voters' trust. Its underlying voting scheme is such that the trust assumptions are distributed on many trusted authorities. The e-Voting system also takes cognizance of the universal e-Voting system standards and requirements in its implementation.

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A CCR-Relational Converter for Enhancing eHealth Interoperability

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Abstract. For any e-Business/e-Government practice in the healthcare area, health data exchange is a challenging and essential issue to deal with. This paper presents a feasible solution to health information exchange, which utilizes a data converter to translate ASTM CCR document into relational database model. A proof of concept Web portal is also shown as an application of the solution. The data converter as described in this paper is supported by Medicaid Transformation Grant (MTG) as part of West Virginia eHealth initiative project.

Keywords: eHealth, Personal Health Record, CCR, CCD, HL7, EMR

1 Introduction

In order to guide the development of a statewide eHealth system, a grant was awarded to our group to develop an eHealth Architecture & Standards document, with its first purpose to guide Medicaid Transformation Grant (MTG) activities in the state of West Virginia. Included in the grant is a Personal Health Record site for citizens in the state. As the research activities progresses, pretty soon the group realizes that health information exchange is an essential component, considering that heterogeneous data formats used in hospitals, community care centers, and other involving parties. After extensive investigation and research, ASTM Continuity of Care Record (CCR) format has been chosen as one of the standard data formats in the West Virginia eHealth Architecture & Standards recommendation, and the designated data format to implement the experimental Personal Health Record Web portal.

To facilitate the development of the experimental Personal Health Record Web portal, we have developed a data converter between CCR XML files and relational database model. The data converter is developed as part of the statewide PHR Web portal efforts. However, it has been carefully designed and developed as a universal data converter that can be used in eHealth application that requires data exchange among its various components.

The module is put into test by developing a proof of concept Personal Health Records Web application. An open source Electronic Medical Records (EMR) system, VISTA, is chosen and enhanced to provide CCR data that is to be converted.

Our converter module may be integrated into any healthcare related e-business practice. We plan to demonstrate our converter module and pilot PHR site in EEE 2011.

1.1 Continuity of Care Record (CCR)

The American Society for Testing and Materials (ASTM) has developed an XML standard (International E2369-05) format that is used to store and transmit health care data. This standard is now well supported by many eHealth applications, including Google Health and Microsoft Health Vault.

One can view the CCR as a data set of the most relevant administrative, demographic, and clinical information facts about a patient's healthcare, covering one or many healthcare encounters. Since CCR is a standard format, it provides a means for healthcare practitioners, systems, insurance companies or government agencies to encode all of the pertinent data about a patient and share the data with each other to support the continuity of care, or to support e-Business/e-Government practices.

The CCR data set contains the basic information about a patient, which is wrapped in XML format. It can also be viewed as an XML application in the healthcare area. Some of the CCR standard's main data elements are:

- Personal and demographic information
- Insurance information
- Problem lists
- Medications/allergies
- Immunizations
- Labs and tests
- Hospitalizations/surgeries
- Advanced directive form
- Spiritual affiliation/considerations
- Care plan

1.2 VistA

The VistA system is an Electronic Medical Records (EMR) system that was first developed and deployed by the Department of Veterans Affairs (VA) in the early 1980's. Many variants of VISTA are now available. RMPS was the version tailored by HHS Indian Health Service. The US Department of Defense (DoD) had their variant of the VistA system referred to as CHCS. In the 1990's a number of other healthcare organizations across the country and around the world also adopted VistA, e.g. German Heart Institute, University of Kuopio in Finland, etc..

The demand for VistA has exploded since 2000 when an open source version of the VistA system was developed and released by WorldVistA and other organizations. Numerous healthcare IT vendors began to market and support VistA deployments around the world, in both public and private sector. The VistA Software Alliance (VSA) trade organization was established. VistA was deployed in Samoa, Mexico, Nigeria, and Jordan with many other countries examining the potential use of the system. In the U.S., VistA was implemented in medical centers and clinics in Oklahoma, Hawaii, Texas, California, West Virginia, and other states.

Vista is adopted as a state recommended EMR system in state supported medical and health care center in the state of West Virginia. Consequently, the statewide PHR Web portal would have most of its health care information from VistA systems.

The remaining sections of this paper are organized as follows. Section 2 presents our architectural and platform decisions. Section 3 discusses the data flow in the generic CCR to relational database converter, which reflects the major components included in the data converter. In Section 4 we introduce our pilot PHR Web portal. Section 5 summarizes this paper.

2 Architectural and Platform Decisions

Our CCR to Relational conversion module is part of the Data/Information sharing services in the MITA (Medicaid Information Technology Architecture) framework, which is a comprehensive, six layered framework, as shown in Figure 1.

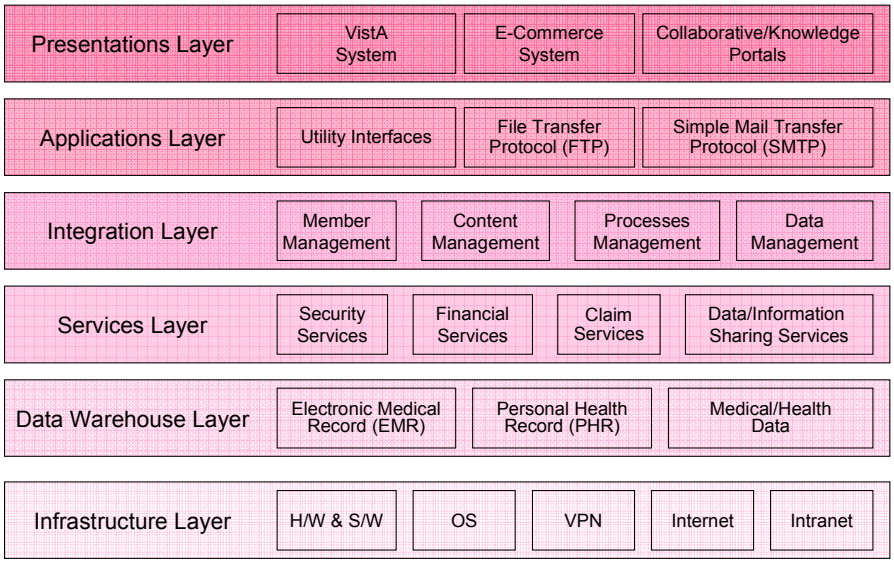

Figure 1: Six-layer Architecture of MITA

Note that Figure 1 is adopted from MTG eHealth Initiatives - West Virginia Health IT Architecture and Standards, published in September, 2008.The West Virginia MITA Recommendations document recommends Microsoft technology as the platform for the eHealth platform and statewide PHR Web site. The converter is developed using C# programming language and LINQ is adopted to facilitate the conversion between XML and relational database. Microsoft SQL Server is used to develop our application prototype, which is introduced in the following section, but the converter may support any major relational database systems, including Oracle and MySQL.

3 Data Flow through CCR-RDB Converter

Figure 2 shows how data flows through our CCR-RDB data converter, which also reflects the major components included in the data converter.

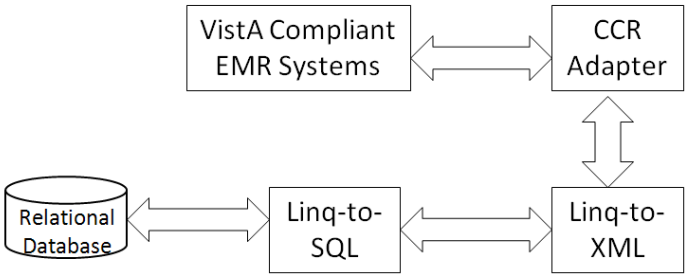

Figure 2: Data Flow in CCR-RDB Converter

At first, a CCR adapter was developed for VistA compliant EMR systems so that the output will be CCR XML data. LINQ-to-XML is then employed to extract the data from the CCR XML files and load them into user defined classes. These user defined classes mirror the sections found within the CCR and the database tables, which follow the ASTM CCR standard. A different approach (i.e. LINQ-to-SQL) is used to load the database tables. The DataContext function is also developed to Create, Read, Update and Delete (CRUD) data within the database.

4 Proof-of-Concept Application: A PHR Prototype

Although our converter is meant to be generic and can be used in any application that requires health information exchange, one of our planned applications of our CCR-RDB converter is our proposal West Virginia Personal Health Records Web portal. As a result, we have developed a proof of concept PHR prototype. The PHR prototype consists of several pages, which include a home page; an upload XML page; a display XML data page; a display database table page; a contact page; and several pages that allow a user to upload additional patient information. Figure 3 shows the layout for our prototype.

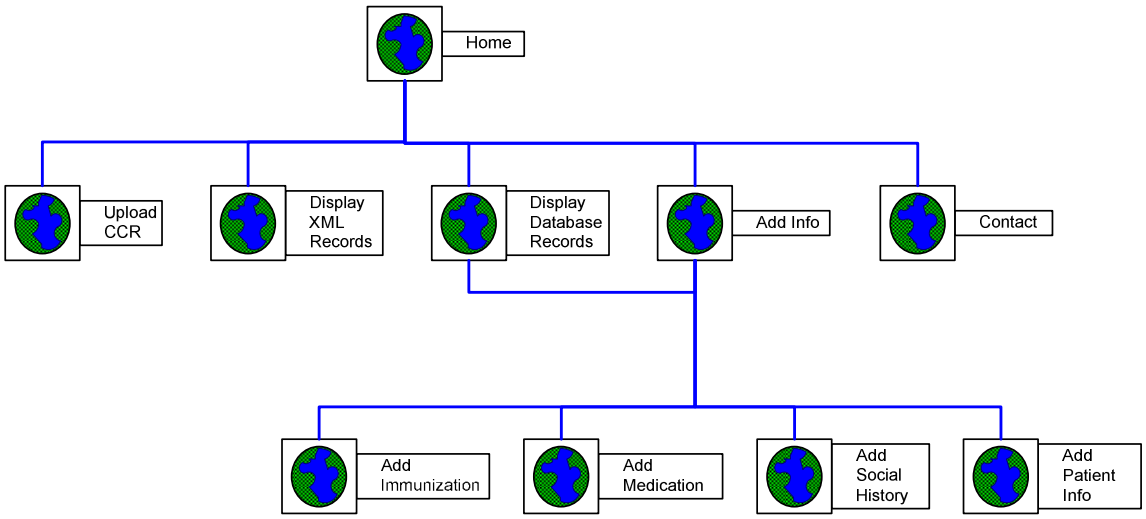

Figure 3 Page Layout for PHR Prototype

One of the most important components in our prototype PHR site is displaying the medical records from the database or from the CCR file. Users are provided with options to view medical records either from CCR files or from the converted relational database, or from both for comparison purpose.

Figure 4 shows Display Records page.

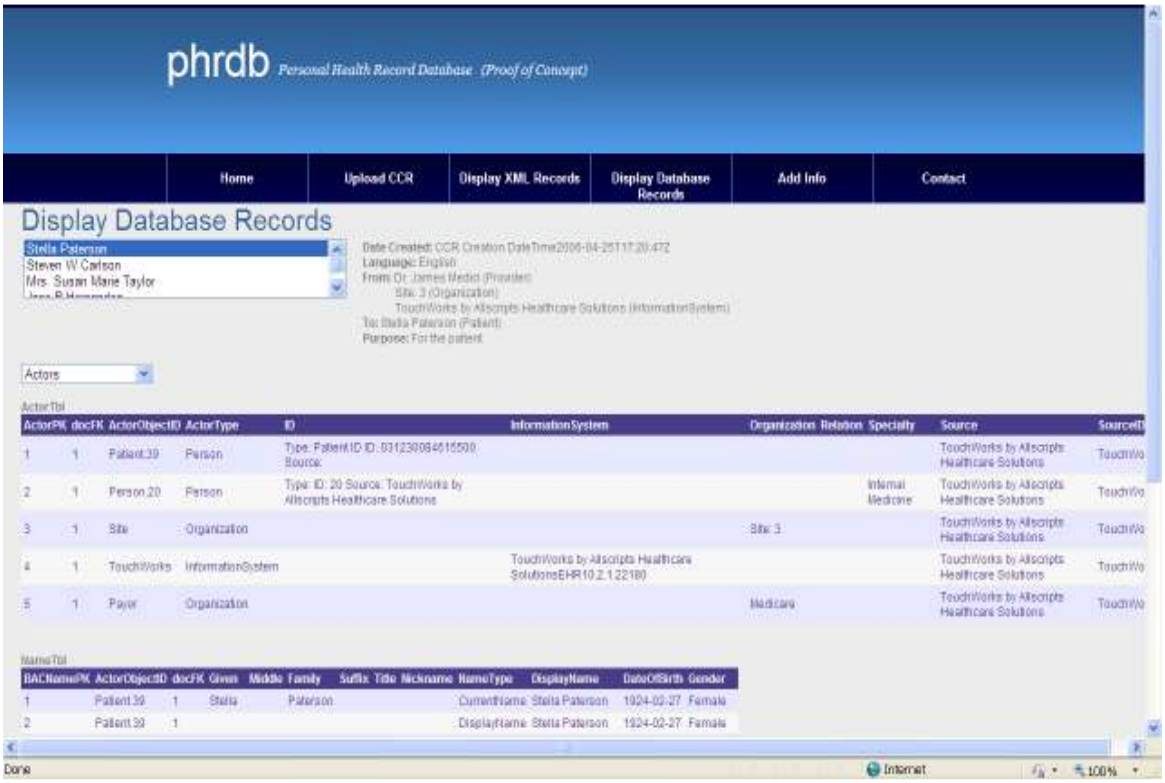

Figure 4: Display Database Records

5 Summary and Future Work

CCR to relational model transformation is one of the essential components for many EMR and Personal Health Record (PHR) systems. An open and universal converter between CCR data and relational database will certainly be helpful in facilitating health information exchange. In this paper we discussed our practice in developing such a converter and how our converter is used in developing our experimental PHR Web site.

Other data formats in parallel to CCR are also available. One of them is CCD (Continuity of Care Document) document, which is part of HL7 Clinical Document Architecture (CDA) standard.

Our next step will be developing an adapter between CCR and CCD format, and using the adapter in our PHR prototype so that it could integrate a variety of CCR/CCD based EMR systems.

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SESSION

ENTERPRISE APPLICATIONS

Chair(s)

TBA

A privacy architecture for context-aware enterprise social networks

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Abstract— *Context information is used to derive user profiles and social networks in an enterprise system called Instant Knowledge. This system requires privacy as well as conventional information security requirements. The privacy requirements include anonymity, unlinkability, unobservability and pseudonymity; these are designed to provide privacy by default to users of an Instant Knowledge service. A privacy architecture is proposed that focuses on identity management and Instant Knowledge communications. The architecture provides granular control of authorisation decisions, and is designed for quick deployment within an enterprise. Moreover, the architecture minimises user effort, which is one of the main design goals of Instant Knowledge.*

Keywords: enterprise, context, social-networking, privacy

1. Introduction

Social networking technologies are a relatively recent development that have caused a paradigm shift in the use of the Internet, communications and online business. Moreover, the pace of development is accelerating. One future direction for social networking technology is the integration of context from smart mobile devices. Context includes: applications that are being used; text entry; location; contacts; type of communication; i.e. tacit information that is a potential source of input for new services. An example is Mobile VCE's *Instant Knowledge* (IK) system for enterprise [1]. This consists of an IK service that recommends work-related contacts to an IK user, based on the IK user's context and work-based 'social network'. IK uses autonomous profile generation and collation, from which informed, privacy respecting, recommendations can be derived. IK provides a system for identifying human resource within the enterprise, which might otherwise be unknown or difficult to discover.

More details of the Instant Knowledge system are given in section 2. The main contribution of this paper is to show that such a system can and should be designed with privacy as a primary goal. The privacy needs may be defined by a set of requirements that are described and discussed in section 3. Section 4 provides an overview of the IK privacy architecture that has been developed, and specifies the recommendation protocol with which users interface with IK. This is followed by section 5, which contains an analysis of IK privacy and the design decisions that were made. Finally, conclusions are given in section 6.

2. Instant Knowledge

The Instant Knowledge system [1] consists of an IK service and IK clients. The smart mobile device, increasingly becoming integrated into enterprise workflow, is an ideal platform to host an IK client. *Context Generators* on the device monitor interaction between the device and IK user, feeding information to a *Profile Estimator*. This context data, together with data stored within the device, is used to generate and maintain a current *Profile* for the IK user. This is illustrated in figure 1.

Furthermore, as the IK user contacts other IK users, as a result of either natural workflow or recommendations from the IK service, a *Network Growth* monitoring component builds and maintains the user's *Roster*. The Roster records profile information for an IK contact as a *Person Object*, and relationship information as a *Tie Vector*. It is important to note that one of the goals of IK is to minimise user effort, hence the Profile Estimator and Network Growth components operate and interact with the IK service autonomously.

The IK service should be ubiquitous within the enterprise, to receive and collate IK user Profiles and Rosters. The central component of the IK service is the *Recommender* [2]. This is a machine learning component that processes Profiles and Rosters to produce informed contact recommendations, based on a user's current context and requirements. Again, in meeting the goal of minimising user effort, the IK client can proactively request recommendations as a background process, so they are immediately available should the user wish to use them.

3. Privacy requirements

Privacy is not a new concept and has been studied extensively within sociology research. Hence, the first part of requirements gathering focused on a literature review [3]. The most salient outcome was that the work environment was not considered as a variable within previous research. Thus, a study of several misuse case scenarios was conducted, focusing on attacks on IK user privacy [4]. Moreover, this study also revealed several implications for the IK adopting enterprise. This section encapsulates the findings as a set of privacy requirements for IK.

3.1 Requirements definition

The common criteria [5] defines four security functional requirements relating to privacy that can be adapted for an IK protection profile: anonymity, pseudonymity, unlinkability

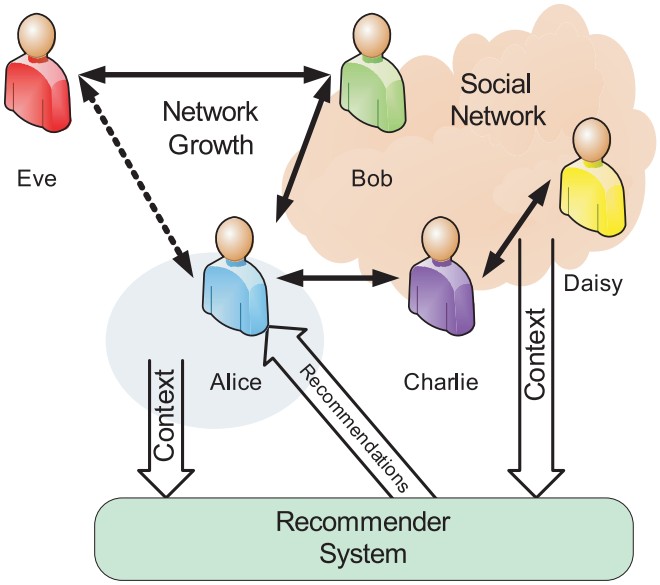

Fig. 1: IK concepts

and unobservability. The provision of anonymity is subsumed within the provision of pseudonymity (as discussed in section 3.2), so the following defines the remaining three requirements for IK:

1) The IK dataset consists of a set of $\{data, user\}$ value-pairs, where $data$ is a list of profile keywords. Let $\{d_1, u_1\}$ and $\{d_2, u_2\}$ be two arbitrary IK dataset elements, and $d_1 \neq d_2$. **Unlinkability** is the property that an IK user given only d_1 and d_2 cannot determine whether or not $u_1 = u_2$.
2) **Unobservability** means that a set of IK users A cannot use the IK system to determine the past, present or future actions of another IK user $u \notin A$ without u's authorisation. A corollary of this requirement is that the IK users A cannot use the IK system to obtain private information, about u, that they are not authorised to read.
3) **Pseudonymity** provides the ability for an IK user u to participate using a pseudonym p, chosen either for or by a user, instead of u's real identity. It must be possible to verify that p conforms to pseudonym construction rules. An important extension is **reversible pseudonymity**. An authorised user or authority has the capability to determine u from p, but only under specific conditions; these will be particular to the enterprise IK policies. This extension provides accountability and non-repudation for the enterprise.

3.2 Discussion

Unlinkability prevents profiling attacks. It is extremely difficult to determine the value of personal data a priori; but since the amount of information that can be derived increases along with the amount of data, we can suppose that the value of personal data increases as more is collected. Sociology studies reveal user concerns as personal information is collected and used. An example is receiving personalised but unsolicited e-mails from strangers [6].

Unobservability means that, although the IK users in A may already have private information relating to u, the IK system should not reveal additional private information about u, without u's permission. Unobservability is important because it enables an IK user to work freely in solitude, as and when they want to, to perform efficiently and effectively. Moreover, if the user's location or contact details can be retrieved using IK, then this could lead to unsolicited contact external to the IK system.

Anonymising context data before it is delivered to the IK service is not feasible, because the IK recommender component requires a rich dataset in order to make informed recommendations, including the relationship information between employees. In turn, informed recommendations will enhance the credibility of the IK system, encouraging more use and self-disclosure. Thus, the amount of information disclosed and the quality of the recommendations made is self-perpetuating. The same arguments mean that pseudonymising data before it is delivered to the IK service is also impractical.

Anonymity can be provided for IK users when either making requests to the IK service or when being recommended. This will help to prevent discrimination, for example, when users only respond to IK requests made by senior employees. Discrimination would severely impact the perceived usefulness, acceptance and adoption of IK. Anonymising recommendations helps to provide unobservability and unlinkability. Hence, this helps to protect IK users because they can choose not to respond to a request without fear of reprisal; one possible reason could be protection from being excessively recommended.

However, the IK system requires a method of referring to both requesting and recommended IK users. This can be achieved by pseudonymising all requests and by referring to recommended IK users by pseudonyms. The use of pseudonyms is easily understood, and IK users themselves can control the disclosure of information mapped to a particular pseudonym. This allows them to maintain a relational distance at which they feel comfortable.

In order to meet the needs of enterprise information governance and compliance auditing, reversible pseudonymity can be incorporated. This allows a verifiable information provenance trail to be recorded. Provided that access to the pseudonym–identity mappings is restricted, the same anonymity guarantees can still be met.

These privacy requirements are related; this is illustrated in figure 2, which shows how different types of pseudonym [7] affect each of the privacy requirements outlined above. At the two extremes are *person pseudonyms*, which represent

an individual and are used multiple times, and *transaction pseudonyms* that are used only once but provide greater anonymity, unlinkability and unobservability.

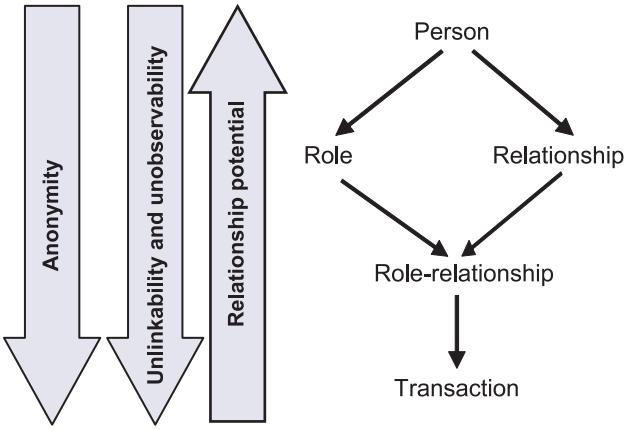

Fig. 2: Types of pseudonym [7]

4. IK architecture

The IK privacy architecture, shown in figure 3, must cater for two main functions: IK identity management and IK messaging. Large enterprises, which would benefit from IK the most, are likely to already have identity management systems in place. These can be leveraged by the *IK service*, which can communicate with existing enterprise *identity providers*. IK maintains its own messaging service for communication between IK users. We use the terms *IK relying user* and *IK knowledge provider* to indicate the employee using a recommendation and the employee being recommended, respectively. In figure 3, the IK relying user and IK knowledge provider are both affiliated with different identity providers, but in reality the identity providers could be the same principal.

4.1 IK privacy architecture

The IK service is at the centre of the architecture, and is a trusted principal. In addition to IK user profiles and rosters, the IK service must maintain a *Recommendation Database*, to store information related to each IK recommendation used, including the pseudonyms and credentials created for that recommendation.

An enterprise IK usage policy is used to make authorisation decisions on: accessing the IK service; making a request; and which employees can be recommended. The policy can exist at varying levels of granularity, with a central policy augmented by several lower level policies. The precise details of these policies is outside the scope of this paper.

The IK service incorporates a single policy enforcement point (PEP), which enforces the decisions made by various policy decision points (PDPs). In addition to a central PDP, which may or may not reside in the IK service, each identity provider can incorporate a PDP to act on local IK usage policies. Therefore, the IK service must have a trust relationship with each identity provider to maintain the authorisation service. The identity provider is trusted to follow local IK usage policies when considering the requests that its registered users are making. The IK service is trusted to enforce both local and global IK usage policies when selecting IK knowledge providers to recommend.

Each identity provider must have a security association with the IK service. Thus, each identity provider has a certified and valid copy of the IK service's public signature verification key. Conversely, the IK service has a certified and valid copy of each of the identity providers' public signature verification keys. These credentials are used by the respective principals to create confidential communication channels that also provide data integrity and origin authentication.

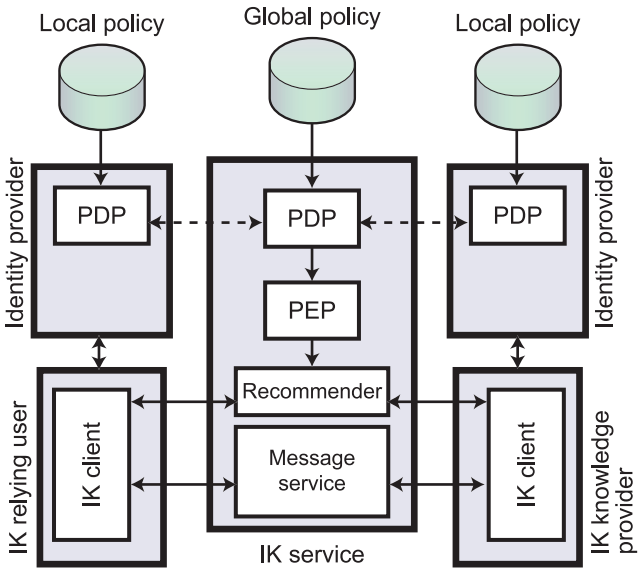

Fig. 3: IK privacy architecture

4.2 Privacy-enabled recommendations

This section specifies the protocol that is used to retrieve and respond to IK recommendations.

4.2.1 Prerequisites

Table 1 contains the notation used to specify the protocol described in the next section. While XML based messaging will be used, in the form of SAML assertions and XACML extensions [8], [9], the actual XML structure will not be presented in this paper; instead, the relevant content within those messages will be given.

A prerequisite for the IK protocol specified below is that an IK user's device can establish secure channels to communicate with both the corresponding identity provider and the IK service, e.g. using Transport Layer Security.

Table 1: Notation

I	IK service
$I(u)$	IK message inbox for IK user u
r	The identity of the IK relying user
r_i	A transaction pseudonym for r relating to recommendation i
i, j, l	Nonce (random number used once)
K_i	Set of recommended IK knowledge provider identities
S_i	Set of recommendation metrics
T_i	Set of transaction pseudonyms
$f_i : A_i \mapsto B_i$	Mapping between sets A and B relating to recommendation i
α	The identity provider for r
β	The identity provider for $k \in K_i$
w	A list of keywords, i.e. a recommendation request
σ_u	A digital signature created by the principal u
q^u	A SAML query for principal u
$\text{PDP}_\gamma(u)$	An XACML authorisation decision made by the Policy Decision Point located at principal γ
$\text{SA}_\gamma(u, i)$	A SAML authentication assertion about the security context that the principal u has with the principal γ, uniquely identified by nonce i
m	Message sent by an IK relying user
m'	Response sent by an IK knowledge provider
$\|$	Concatenation of elements

These channels are used for the secure collection of context data from IK users. In addition, it is assumed that all IK protocol messages in the next section are confidentiality and integrity protected, and origin authentication is assured.

4.2.2 IK protocol

The following is the protocol used by both an IK relying user and responding IK knowledge provider for initial contact using IK:

$$r \rightarrow I \;:\; w\|j\|\sigma_r \quad (1)$$
$$I \rightarrow r \;:\; q^r = \{w\|j\|\sigma_r\|i\|\sigma_I\} \quad (2)$$
$$r \leftrightarrow \alpha \;:\; \text{Establish secure channel} \quad (3)$$
$$r \rightarrow \alpha \;:\; q^r \quad (4)$$
$$\alpha \rightarrow r \;:\; \text{PDP}_\alpha(w)\|\text{SA}_\alpha(r,j)\|i\|\sigma_\alpha \quad (5)$$
$$r \rightarrow I \;:\; \text{PDP}_\alpha(w)\|\text{SA}_\alpha(r,j)\|i\|\sigma_\alpha \quad (6)$$
$$I \rightarrow r \;:\; i\|r_i\|S_i\|T_i\|h_i : T_i \mapsto S_i \quad (7)$$
$$r \rightarrow I \;:\; m\|i\|t \in T_i\|r_i \quad (8)$$
$$I \rightarrow I(k \in K_i) \;:\; m\|w\|i\|t \quad (9)$$
$$k \leftrightarrow \beta \;:\; \text{Establish secure channel} \quad (10)$$
$$\beta \rightarrow k \;:\; \text{PDP}_\beta(k)\|\text{SA}_\beta(k)\|l\|\sigma_\beta \quad (11)$$
$$k \rightarrow I \;:\; \text{PDP}_\beta(k)\|\text{SA}_\beta(k)\|l\|\sigma_\beta \quad (12)$$
$$I(k) \rightarrow k \;:\; m\|w\|i\|t \quad (13)$$
$$k \rightarrow I \;:\; m'\|i\|t \quad (14)$$
$$I \rightarrow I(r) \;:\; m' \quad (15)$$
$$I \rightarrow r \;:\; m'\|i\|t \quad (16)$$
$$r \leftrightarrow I(r) \leftrightarrow k \;:\; \text{Further communications} \quad (17)$$

For the above interaction, the following describes each stage of the protocol:

1) The IK client on r's IK device constructs a recommendation request w and a nonce j, appended with a digital signature σ_r on the message. This is sent to the IK service I.
2) The details from message 1 are used to create a SAML query q^r, which additionally contains a recommendation nonce i and an XML enveloped digital signature σ_I on q^r.
3) If r has not already done so, it must establish a security context with its identity provider α, creating a secure channel for communications between r and α.
4) r forwards q^r to α.
5) If both σ_r and σ_I from q^r are valid, then PDP_α retrieves local IK usage policies to process w. A SAML response is generated, which contains a PDP decision $\text{PDP}_\alpha(w)$ and an authentication statement $\text{SA}_\alpha(r, j)$. The SAML response is signed by α, creating σ_α, and sent to r.
6) r forwards the SAML response to I. The two nonces, i and j, are verified for freshness. If validated, then I verifies σ_α, and uses $\text{SA}_\alpha(r, j)$ to create a security context for r. PDP_I processes $\text{SA}_\alpha(r, j)$ and $\text{PDP}_\alpha(q)$. The result is a set of knowledge providers that r either is or is not authorised to contact, and their contexts are input into the recommender component, along with w and r's context.
   The recommender output is a set of knowledge providers K_i, a set of recommendation metrics S_i, and $g_i : K_i \mapsto S_i$. I generates a set of unique transaction pseudonyms T_i with $f_i : T_i \mapsto K_i$, and a transaction pseudonym r_i for r. I records i, r, r_i, f_i and g_i in the Recommendation Database (see section 4.2.1).
7) I sends the pseudonyms and metrics to r, along with the mapping $h_i : T_i \mapsto S_i$ and i.
8) S_i is shown to r. r chooses $s \in S_i$ and writes a message m. The IK client dereferences s to $t \in T_i$ using h_i. The message is sent together with t, i and r_i.
9) I dereferences t to the chosen IK knowledge provider $k \in K_i$, using i and f_i. Then m is forwarded to k's IK message inbox, along with i, t and w. Optionally, a new IK message notification can be sent directly to k.
10) If k has already not done so, it must establish a security context with β, creating a secure channel for further communication between k and β.
11) PDP_β retrieves local IK usage policies and generates a SAML response for k, which contains nonce l and a PDP decision $\text{PDP}_\beta(k)$ on whether or not k is authorised to access their IK account. An authentication statement $\text{SA}_\beta(k, l)$, is also generated with nonce l. The SAML response is signed by β, creating σ_β. The

SAML response is sent to k.

12) k forwards the SAML response to I. I verifies σ_β in the SAML response, and uses $\mathrm{SA}_\beta(k, l)$ to create a security context for k. PDP_I processes $\mathrm{SA}_\beta(k, l)$ and $\mathrm{PDP}_\beta(k)$.
13) k checks their IK message inbox and retrieves m, along with i and t.
14) Having received a knowledge request $m \| w$, k can choose to either not respond or, as in this case, send a response m', along with i and t, to I.
15) I dereferences t using i and f_i to determine which IK user inbox to forward m' to, namely r. m' is forwarded along with i and t.
16) Either a new message notification is actively sent to r, or r retrieves m' when checking for IK messages.
17) All further IK communications between r and k occur with I using i, t and f_i to dereference the source and destination, and forward the message to the appropriate IK message account. In addition, when r sends a message, it must also contain r_i.

5. Analysis

This section provides an analysis of the IK privacy architecture and protocol specified in section 4.1, and how they meet the privacy requirements defined in section 3.1.

5.1 IK architecture

The availability of context information is a concern for the recommender component. Thus, the focus was on providing privacy services for the IK communications, i.e. protecting the output of IK rather than the input. Ensuring the high quality of recommendations cannot be underestimated because it is the primary functional goal of IK; impeding this goal would lead to the IK service being used less, regardless of whether or not privacy protections are provided, thus disrupting the self-perpetuating cycle that is desired (see section 3.2).

The use of relationship, as well as context, information for IK required the development of IK specific recommender algorithms. This meant that existing privacy preserving recommendation systems [10] could not be used. While future work might look into integrating privacy preserving features into the IK recommender itself, the IK privacy architecture in this paper is independent of the recommender algorithms, allowing for future upgrades. Therefore, any work to integrate privacy into the IK recommender would only enhance the privacy properties provided.

There must be adequate IK usage policies that govern IK requests, preventing the request of directly identifying information. These policies must have a supporting architecture. The IK service contains a PEP that is instructed by a PDP acting on IK privacy policies. Determining the precise contents of such a policy is outside the scope of this paper. However, it is likely that a global enterprise policy cannot offer fine granularity of control. Thus, the IK privacy architecture allows for localised policies to be expressed to the IK service. For example, a global policy could restrict requests to keywords that only exist in declassified enterprise documents, and local policies could prevent data that exists in personnel records from being requested. In this environment, IK requests are subject to a two-stage policy vetting process: the identity provider will first make a local policy decision, and this is sent to the IK service PDP to interpret, together with the global PDP decision. Thus, the IK privacy architecture is flexible while still providing strong policy enforcement.

Restricting initial contact between an IK relying user and IK knowledge provider to the IK system means that privacy can be provided by default. IK users can subsequently choose to reveal their identities within the IK messages, and contact each other outside of the IK messaging system. However, recording details of the initial contact allows the IK service to meet requirements related to enterprise information governance. The recommendation database contains information that can be used for auditing processes.

The relationship with the identity providers is essential for audit information to be accurate and useful. It is reasonable to trust enterprise identity providers. Thus, the IK architecture uses the SAML assertion query-response protocol [8], [9] to provide a single-sign on service, which can be initiated in two ways. The first is the service provider pulling identity federation: this is used by the IK service when an IK relying user requests recommendations (messages 1–6). The second method is an identity provider pushing identity federation: this is demonstrated when a recommended IK knowledge provider signs on and authenticates to their identity provider, and subsequently to the IK service (messages 10–12).

A centralised IK server may not seem to be privacy-centric, because compromising the IK server could reveal private context data collected from IK users. However, it can be argued that a centralised solution is efficient and cost-effective to implement, manage and maintain; this includes physical security as well as information security services. It also meant that creating a demonstration system could be achieved within the project timeframe. Future work will investigate if it is possible to create either a distributed or decentralised IK service that also mitigates a successful compromise.

5.2 Privacy requirements

The IK privacy architecture follows the IK principle of minimising user effort to protect private information. Thus IK was designed to provide privacy by default; IK users can choose when to reveal private information, such as their identities, within the IK messages they write to each other.

This user choice will aid the acceptance of the IK system, especially for more involved recommendations. For example, while it might not be necessary for an IT technician to reveal

their identity in answering a technical question, it might be essential for the users to reveal their identities if they are discussing potential collaborative work.

The following is an analysis of the IK privacy architecture with respect to the privacy requirements of section 3.

5.2.1 Unlinkability

A transaction pseudonym provides the highest level of unlinkability because it is only used once (see figure 2). Each recommendation, whether it is used or not, generates different transaction pseudonyms for both the IK relying user and IK knowledge providers. From the definition of unlinkability in section 3.1, an IK relying user could choose d_1 and d_2 for consecutive requests. Suppose that the IK knowledge providers u_1, u_2 are chosen for the two requests respectively; their identities are not revealed to the IK relying user. Instead, the IK relying user receives transaction pseudonyms and corresponding metrics (t_1, s_1) and (t_2, s_2) (message 7). Since $t_1 \neq t_2$ by definition, then the IK relying user cannot determine a link between d_1 and d_2 based on the transaction pseudonyms.

The requirement of unlinkability focuses on providing privacy when $d_1 \neq d_2$. If the IK relying user submits the same request twice, i.e. $d_1 = d_2$, then the IK relying user could infer that t_1 and t_2 relate to the same user if $s_1 = s_2$[1]. However, this does not break the unlinkability requirement because the IK relying user has not linked two disparate data items to the same IK user. Moreover, this is still only a deduction — the changing contexts and networks of both the IK relying user and potential IK knowledge providers, including the fact that the IK relying user has made the same IK request twice, means that the same recommendation metric from two or more requests may not refer to the same IK knowledge provider. Thus, even unique recommendation metrics cannot be reliably used to link together requested data.

5.2.2 Unobservability

Instead of using a conventional messaging system that identifies the sender and recipient, the IK system uses a self-contained messaging system that directs each message according to the recommendation nonce and transaction pseudonyms of corresponding IK users (messages 8, 15 and 17). These details are used to dereference the record in the Recommendation Database created for the recommendation, that the IK service uses to identify the IK message inbox to forward messages to. Thus, the identities of the IK relying user and IK knowledge provider are not revealed by the IK service.

Suppose that a set of IK users A can make IK requests that lead to an IK user $u \notin A$ either always scoring the highest recommendation metric, or always scoring the same recommendation metric. The IK service will respond to each request by generating a different set of transaction pseudonyms. Therefore, IK users A cannot use the IK service to determine if the information in their requests relate to u. u does not have to respond to any IK requests and may remain unobservable.

From messages 9 and 13, u will be able to see the recommendation request keywords that led to u being recommended. u can use this information to determine what private information would be revealed when responding to requests. Note that the Profile and Roster data that is input into the recommender (the processing of message 6) is not revealed to any IK users.

An IK managed messaging system also masks the location of the communicating parties, and helps to mitigate traffic analysis. When an IK relying user and IK knowledge provider communicate using the IK messaging system, their location cannot be linked to their identities. This information can only be revealed by the users themselves.

5.2.3 Pseudonymity

The IK architecture provides pseudonymity to IK users through the use of transaction pseudonyms, which are allocated by the IK service for each recommendation made. Since the users themselves do not create the peudonyms, then it is trivial to verify their construction.

When an IK relying user requests a recommendation, they receive a list of recommendation metrics (message 7), from which the user can choose one. Each metric represents an IK knowledge provider $k \in K_i$ and is mapped to a transaction pseudonym $t \in T_i$; no information is gained by IK relying user learning the transaction pseudonyms so they need not be shown to the IK relying user. Even if the IK user device is compromised, each IK knowledge provider still has pseudonymity.

A transaction pseudonym r_i is also created and sent to the IK relying user (message 7). Note that r_i is never sent to the IK knowledge provider; instead it is used by the IK service as a record for auditing purposes, along with the mapping for k's transaction pseudonym. Therefore, the IK relying user also has pseudonymity, and the enterprise can reverse pseudonym mappings, meeting the requirement of reversible pseudonymity.

5.3 Related work

Various work can be considered relevant to one or more particular aspects of IK, including context aware services, autonomous social network discovery and recommenders. This section considers only work in which both context-awareness and social networks are used as input for making recommendations, as is case with IK.

The CAESAR architecture [11] is designed for low-end mobile devices. Call and messaging logs are uploaded to a

[1]Note that the identity of the recommended IK knowledge provider is pseudonymised and still not revealed to the IK relying user.

central server and used to determine a user's social network. A user makes a recommendation about a particular business or service by making a 'missed call' to the business. When a contact from the user's social network physically enters the vicinity of the business, the recommendation is related to the contact. Clear differences, when compared to IK, include the need for user effort to make recommendations, and recommendation retrieval is restricted to location. Furthermore, privacy issues are not mentioned in [11].

Friendlee [12] focuses on monitoring mobile call and messaging activity to achieve two aims: firstly to 'infer social closeness' of a user's social network contacts, and secondly to determine the services and businesses used most by a user. Friendlee makes recommendations based on a user's usage history, in which recommendations are ranked by social distance. In addition, close social contacts can browse each other's context and contacts. Privacy concerns surrounding the sharing of this information are addressed by allowing users to categorise their contacts, and then specifying policies accordingly. It is expected that socially close users are willing to share significant amounts of context information.

In comparison with Friendlee, IK privacy services are provided by default in IK by delivering pseudonymous recommendations; requiring users to categorise their contacts opposed the requirement of minimising user effort. This approach allows IK to be an opt-in system, whereby IK users can firstly choose to respond to a recommendation request, and secondly can choose whether or not to provide an identity. Moreover, the scope of IK usage within an enterprise means that there could exist additional enterprise policies that determine whether or not a user is recommended.

In contrast to Friendlee, an IK user cannot 'browse' the context information of a social contact that has not been directly shared; only the IK system can access and process such context information. This again minimises the effort required by the user to maintain their privacy.

6. Conclusions

A context-based enterprise networking system, like Instant Knowledge, and privacy are not two contradictory goals. Indeed, privacy is an enabler for Instant Knowledge. However, privacy is multi-faceted and the implications for Instant Knowledge had to be considered from both social and technical viewpoints.

The focus has been on the output of the IK service, balancing the functional goal of IK, of informed high quality recommendations, with the privacy issues that were identified. Privacy has to be protected from alternative viewpoints, and the three privacy services defined are essential for providing privacy. IK manages reversible and ephemeral transaction pseudonyms for IK user communication, providing privacy by design. Fine-grained authorisation can be achieved through the use of both global and local policies, in an architecture that leverages existing identity management infrastructure.

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Cloud and Open Source Enterprise Resource Planning Systems

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Abstract— *Enterprise resource planning systems can be extremely expensive for any business to implement and maintain. For small businesses, in-house enterprise systems are often too expensive to even consider, given the high cost of the systems, the installation and configuration process, and the infrastructure to support them. However, open source and cloud-based alternatives are starting to crop up that are bringing enterprise capabilities into the realm of possibility for small to mid-sized businesses. Options range from do-it-yourself in-house solutions to subscription-based services. This paper explores some of the pros and cons of these more affordable enterprise solutions.*

Keywords – Enterprise Resource Planning, Cloud Computing, Open Source

1. Introduction

This is an investigation into affordable opportunities in enterprise resource planning systems (ERP or "enterprise systems"), including an examination of the capabilities of enterprise systems and the potential benefits of using cloud-based resources and/or open source solutions. Whereas large businesses can generally afford enterprise systems, a small to mid-sized business might find them out of reach due to the high cost of purchasing and implementing such systems.

2. Definitions

It is important to set forth the definitions of the terms used in this investigation, including enterprise resource planning systems, open source, and cloud computing. An enterprise resource planning system is a broad-based system designed to integrate software applications from the different functional areas of a business. These systems often serve both internal and external functions. Internal functions in an ERP focus on core activities such as financial management, operations management, and human resource management. External functions involve integrating enterprise systems with those of business partners and suppliers [1]. This integration with external businesses allows information to flow from one company to another in a value system, where each company's value chain is connected to its suppliers' value chains (the "upstream" flows) and/or to its distributors' value chains (the "downstream" flows) [1]. This interconnection is referred to as a value system because value can be added at any point in the flow, and this value can help a company to achieve competitive advantage [1].

Traditional enterprise systems are developed or purchased in modules, where each module applies to a different functional area of the business. For example, one module might be developed to handle inventory management, another might be developed to track customer service activities, and another might be developed for marketing and sales activities. The benefit of this is that a company doesn't have to implement the entire system at one time. It can install and configure the inventory management system first, then add the marketing and sales module, then add the customer service module [2].

Whereas each module of an enterprise system is developed or purchased separately, the advantage of an enterprise system lies in its ability to draw and aggregate data from the modules that serve the separate functional areas. The modules for the different functional areas have various capabilities and features, and yet all data is stored in a centralized data warehouse using consistent data structures. Thus, data from different areas can be combined, queried, and aggregated to produce a clear picture of the entire organization's activities [3].

Even the experts have trouble agreeing on a definition of the term "cloud computing", but a recent

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article in Windows IT Pro summed it up as "an umbrella term for an Internet-based service that provides some type of essential service to the organization" [4]. Cloud services include file storage, application hosting, and even critical services such as database hosting [4].

The term "open source" can be more specifically pinned down, thanks to a non-profit organization called the Open Source Initiative (OSI). The OSI provides a list of ten criteria that software must meet in order to be deemed "open source". Most relevant to this investigation, the software must be freely redistributable, it must include editable source code, and it must allow for "modifications and derived works" [5]. In addition, it must not discriminate "against fields of endeavor", or in other words, it must be available to commercial and non-commercial entities alike [5].

Both open source and cloud-based enterprise systems have the potential to make such systems more affordable and thus, available to a wider array of businesses and organizations. According to ERPwire.com, open source enterprise systems have "done away with the hassles of paying license fees not only during installation, but also whenever a modification is made" [6]. Likewise, ERP.com claims that cloud-based enterprise systems are "easier to use and deploy, thus further reducing the time and cost of meeting specific business needs" [7].

3. Analysis and Discussion

Traditionally, implementing and maintaining an ERP has been a costly undertaking reserved mainly for businesses and corporations with large budgets. In a 1999 article that described issues surrounding ERP implementation, Bingi, Sharma and Godla said that the process often takes more than 3 years. Dow Chemical, for example, expected to spend seven years implementing their ERP system, and Corning was working on implementation of a system that they expected would take five to eight years [2]. Traditional implementation often runs into the millions or even hundreds of millions of dollars [8].

This trend appears to be changing. In a recent blog post describing trends for ERP in 2011, ERP consultant Eric Kimberling predicts a "heavy adoption of Software as a Service [SaaS] models at small and mid-size businesses" [9]. Computer Weekly's Michael Pincher agrees. In May 2010, Pincher said, "given the state of the economy and the fact that traditional big-bang ERP implementations cost more than some organisations can currently afford, SaaS ERP is gaining ground" [10].

Vendors are adapting to this need by providing SaaS ERP systems. For example, Lawson Software uses Amazon's EC2 cloud infrastructure to deliver an enterprise system that is geared toward "mid-sized companies and organisations looking for a more affordable, flexible, and agile deployment option for full-function enterprise software" [11]. Another company called Compiere delivers a cloud-based ERP via Amazon's Web Services [11]. In November 2010, Japan's NEC Corporation announced a partnership with Germany's SAP AG to "launch new ERP cloud service systems" [12]. This new system will merge features from NEC's "core enterprise system into a cloud service system based on SAP ERP", and will include modules for the major areas of business, such as "finance, sales, and procurement" [12].

Open source ERP options have also appeared in recent years. In June 2009, SourceForge.com's top ten open source project list included five ERP projects: PostBooks ERP, OpenBravo ERP, ADempiere ERP Business Suite, OrangeHRM, and webERP [13].

OpenERP is another open source option that includes more than 700 modules, such as "Sales, CRM, Project management, Warehouse management, Manufacturing, Financial management, [and] Human Resources" [14]. By definition, open source systems are distributed for free and are free from licensing fees, so a business could opt to download the system, install it, implement it, and maintain it, all without paying anything to the creators of the software. However, many open source applications are available either via online subscription or with on-site support. In these cases, fees are associated with the services.

OpenERP offers online subscriptions for $39 per user, per month. The cost of on-site support varies, ranging from an annual fee of $1,800 for up to ten users, to over $13,900 for more than 150 users. The on-site service includes help desk services, migration services, bug fixing, security upgrades, and other ongoing services [15].

Another open source project called Apache Open for Business (Apache OFBiz) is "an open source enterprise automation software project licensed under

the MIT Open Source License" [16]. In addition to ERP capabilities, it also includes Supply Chain Management (SCM), Customer Relationship Management (CRM), E-Commerce features, and more [16]. Apache OFBiz is touted as "a foundation and starting point for reliable, secure and scalable enterprise solutions" that can either be used out-of-the-box, or it can be customized to suit individual business needs [17]. Many well known companies are using OFBiz, including 1-800-FLOWERS, DKNY, Discovery Toys, and Isotoner [18].

Both open source and cloud-based ERP systems offer a number of advantages over traditional systems. Some of the advantages of cloud-based systems include the following:

- Increased scalability and performance – the system can grow as the company grows.
- Reduction of capital expenditures – no need to purchase costly servers and infrastructure.
- Distribution of cost through multitenancy – a smaller company might not even need its own server, and thus, can share the use of a server with other small companies.
- Lower barrier to entry – rather than spending millions, a company can start by using a few key modules and purchasing licenses for a few key users [19].

Open source systems are freely distributed, so the system itself can be acquired at no cost to the business or organization that adopts it. In addition, because the source code is available, the business or organization is free to edit the code, add on to it, and customize the system in any way that it sees fit.

The reality is that although open source licensing is free, implementation and maintenance of any ERP takes work and somebody has to do that work. Open ERP, for example, is an open source product, but the company that produces it (also called Open ERP) sells an on-site support package starting at $1,800 per year. A business could certainly opt to perform its own support, but they would need to hire qualified staff to do so. Given that Open ERP already has knowledgeable staff and has already been asked all of the difficult questions, they are likely to be able to provide support at a fraction of the cost it would take to hire somebody in-house due to economies of scale. Also, if a business adopts an open source system and opts to perform data migration on its own, it will have to learn the process from scratch. Open ERP, on the other hand, has likely performed hundreds or thousands of migrations, and as such, they know the best methods and potential pitfalls, and again, can likely perform the migration at a fraction of the cost. For those businesses that opt to go without the support options, they "shouldn't expect to get the same level of support and hand-holding they would receive from commercial software providers" [20]. That is, if they get any support at all.

There are downsides to cloud-based ERP systems as well. According to a recent article in Computer Weekly, it is possible that annual leasing costs can become more expensive than it would have been to install a system locally. Subscription-based cloud systems are also inherently less flexible when it comes to adapting the software to suit unique business needs. And last, systems may not be as easy to implement as the providers purport. Businesses must be prepared to train system users in "new process workflows and transactions" in order to make the most of the new system [10].

4. Conclusion

The barriers to entry for ERP systems have come down in recent years with the advent of cloud-based services and open source systems. In the past, ERP was affordable only to multi-million dollar corporations. Today even many small businesses can afford the annual fees of a cloud-based ERP provider. It could be argued, for example, that nearly any company should be able to afford Open ERP's entry level service at $39 per year per user [15].

Open source systems are also a possibility for smaller businesses, but the total cost of ownership must be considered before implementing such a system. While licensing is free, a locally installed open source ERP would require in-house experts for installation, data migration, maintenance, upgrades, and training. For this reason, small to mid-sized businesses that are considering ERP implementation are likely to be better off with a cloud-based resource, at least initially. Once the business has used the system for a designated period of time, it would be better equipped to determine whether it would be more cost effective to move to an in-house solution.

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Complex Event Processing in a High Transaction Enterprise POS System

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Abstract

Complex Event Processing (CEP) is a software methodology that uses the concept of an event for system development. CEP has several advantages that make it suitable for time- and resource-constrained problems. In this research we develop an abstract CEP architecture to support a high transaction enterprise Point Of Sale system. The enterprise CEP provides a highly available and reconfigurable environment for an industrial application. Results from the deployment of the system show that the CEP application provides a scalable solution to the problem of high transaction environments.

I. Introduction

Complex Event Processing (CEP) [Luc2002] is a methodology for processing multiple events that occurs in an organization by indentifying the relevant events, and acting on them, based on the notion of the event as the organizing paradigm. CEP has been used as a solution strategy for applications in transportation [GSS2008], trading, environmental monitoring [KYK2008], healthcare [WLG2005], RFID-based asset tracking, etc. [EN2010]. CEP has several advantages that make it suitable for time- and resource-constrained problems [ZCM2005] seen in enterprise applications. Large transaction processing applications place heavy demands on the software infrastructure. First, the volume of transactions can overwhelm the capacity of the system to respond, leading to software failures. Second, the notion of the event considers the temporal component of the data stream which are handled organically by CEP systems using windowing operations in SQL-like aggregation or joins to correlate events in time. Finally, while stream imperfection such as out of order packets and blocking I/O, can introduce expensive overhead to conventional systems, CEP provides the ability to incorporate feedback systems, and dynamically adjusted timeouts to address this problem. The characteristics of CEP systems include the ability to detect simple event patterns in streaming event data, compose complex events, and react to complex event patterns in a highly efficient and optimized manner [GO2003, Owe2007].

This paper develops details the application of CEP in the enterprise architecture of a high transaction Point of Sale (POS) environment. The CEP component provides the benefits of high availability and optimized system performance, in addition to the advantages described previously. The paper is structured as follows: Section II outlines previous efforts in Complex Event Processing and describes the abstract architecture used in this project. Section III details a real world example and shows how the CEP is used to enhance system performance. The conclusions and future work are presented in Section IV.

II. Background

The CEP approach used in this paper is based on the notion of events used to model data in the context of enterprise applications. An event is an occurrence or happening of significance that can be defined as a region or collection of regions in spatial-temporal-attribute space. The event data type based on the following mandatory attributes: eID, space, time, event-name, event-granularity, event-associations, and event-topic. The attribute space provides the geographic information, abstract symbolic information like the merchant ID, processor errors, failures and transaction volume to locate the event. The timestamp may include start and end times for an event or be a point in time.

In event processing, discrete events have orderly relationships that aid the generation of hypotheses, guides understanding, helps and control actions. The following relationships between events are considered.

Temporal relationship. In the event structure, the fundamental element is the event which is then related to other events by a temporal ordering such that events occur in a particular sequence, Allen's temporal interval algebra [All1983] for representing and reasoning about temporal relationships may be applied for presenting the temporal relationship between events. Thirteen relationships including seven basic relations and their symmetrical relations are represented in Allen's temporal algebra.

Spatial relationship. Spatial relations are classified into two types: topological relations that describe neighborhood and incidence (e.g. overlap, disjoin) and directional relations that describe order in space (e.g. south, northwest). A general spatial relationship considers 12 directional relationships and 6 topological relationships [LOS1996]. The directional relationships are classified into the following three categories: strict directional relations, mixed directional relations, and positional relations. The topological relationships include equal, inside, cover, overlap, touch, and disjoint.

CEP Architecture

Figure 1 shows the abstract complex event processing architecture used in this research effort. Streaming data is converted into contextualized event and handled in real time by the Business Rule Engine (BRE). The meta-rule interpreter is used to translate the high level rules defined in the system to the object rule engine. This open architecture permits any object rule engine to be deployed, the only requirement is that the mapping between the meta-rules and the native rule structure of the object rule engine to be defined. The main memory data repository and the contextbase support the mapping from low-level event to semantic domain event. Spatial and temporal reasoning are provided by the BRE.

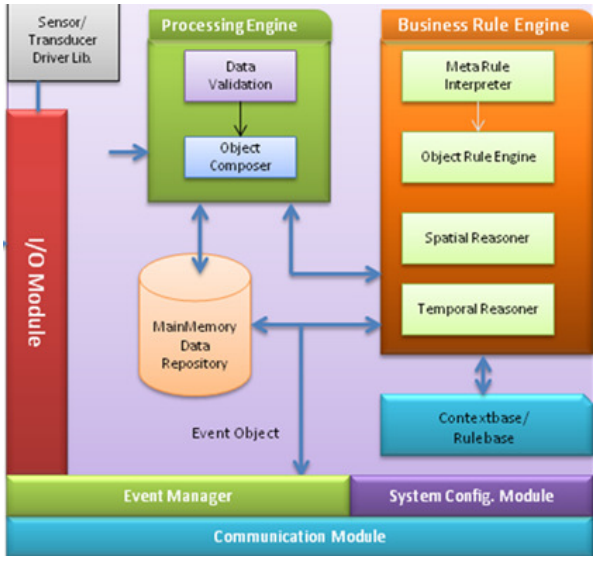

Fig. 1. Complex Event Processing Architecture

CEP implementations include general purpose stream management systems such as *Aurora* [ACC2003] and its second generation version *Borealis* [AAB2005]; the general purpose complex event processing system, *Cayuga* [DGP2007]; STREAM, with integrated stream and storage data capability [ABB2004]; and *TelegraphCQ,* a continuous query system [KCC2003]. Commercially available systems include StreamBase, Progress, Coral8, and TIBCO. The applications for Complex Event Systems are numerous and do not all fit the standardized approaches offered by current implementations [SC2005, EN2010]. The CEP approach presented here is designed to overcome problems seen in standard CEP systems. Current deployments are large and centralized, and are not compatible with the mobile and decentralized approach to decision making currently under way. The ability to embed CEP properties on existing hardware cannot be easily achieved with existing implementations. A second and more significant drawback is that most CEP systems are based on the database paradigm. Data streams in enterprise POS applications can change rapidly; however, the CEP approach forces the data stream to conform to schema creation and usage paradigms. Detection of events is primarily based on the ability to perform widow-based joins. Joins are

expensive database operations, and special indexing structures are needed to make them efficient (which further increases system footprint). Finally, events in data streams can be of different periodicity, with some having relatively long periods. Database approaches handle these using long transactions which have poor efficiencies. The system presented in this paper uses an integrated rule/data based approach to overcome these problems.

III Complex Event Processing for POS Transaction Processing

The CEP solution was implemented for the industry leading distributor of stored-value and prepaid cards which processes several hundred million transactions every year. In a stored-value card, the monetary value is physically stored on the card and not in an externally recorded account. The software infrastructure has to provide flexible transaction processing and activation options to process transactions. The enterprise architecture supports several modes of transaction processing, with each method supporting activation, refunds, and deactivation. In addition it supports web-based applications that enable the sale of services including cable and satellite television, wireless and more from providers. Figure 2 shows the CEP software architecture deployed.

The Enterprise POS Model

During normal processing, Real Time events are received from the Merchant, logged, and then sent to the Provider for processing. The Provider's response is then sent by the system to the Merchant to complete the transaction. In this normal situation, the transaction proceeds through the Merchant Interface Layer (MIL), the Application Processing Service (APS), and the Service Provider Interface Layer (SPIL) in the system. Transaction volumes are normally range from high to very high levels; the latter being associated with national and regional holidays (corresponding to high consumer gift giving) The transaction mode heterogeneity and the volume of transactions puts a very heavy load on the software infrastructure resulting in exceptions which cause the non-completed transactions. We define a Store and Forward model based on Complex Event Processing (*Front End SAFing*) which can alleviate the problems of software exceptions, which include the following: 1. Stored value cards in an incorrect state, 2. Discrepancies in billing references, and 3. FES limitations.

The solution inserts a CEP component between the MIL and the APS to respond to the Merchant in the event that the APS is not able to complete the transaction. This component is based on the Store and Forward (SAF) model which stores transactions that cannot be completed until a time that they can be completed. The SAFing model is applied to the beginning of the transaction process and is therefore referred to as Front End SAFing (FES). FES contains a Merchant Parsing Layer (MPL) to translate the transaction.

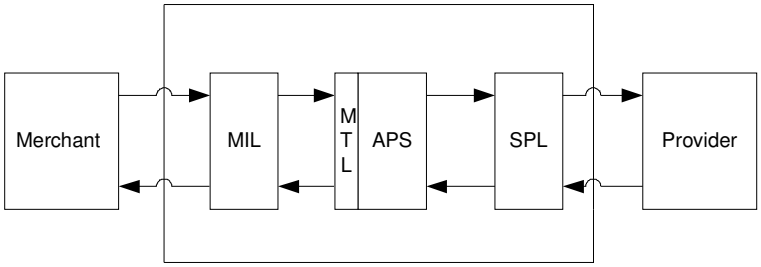

Fig. 2: Real Time Transaction Model

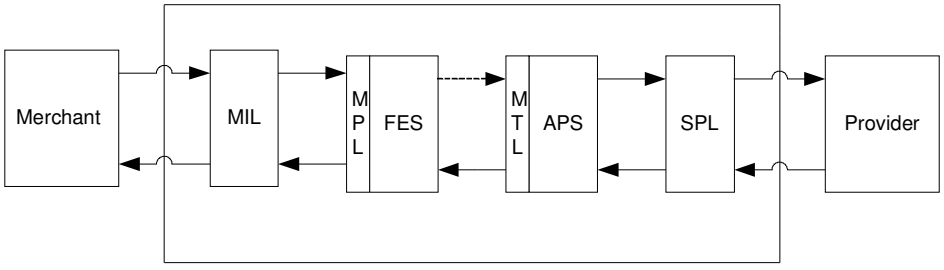

Fig. 3: FES Transaction Model

The SAF service enables the transaction processing engine to deliver messages reliably between distributed applications (such as external APIs for vendors/service providers). If the destination is not available at the moment

the messages are sent, either because of the network problems or system failures, the messages are saved to a database, and are forwarded to the remote endpoint once it becomes available. The transaction processing engine utilizes the SAF service to enable the APS component to reliably send messages through the SPIL component to a remote transaction endpoint.

FES has three modes of operation. In the first FES mode, FES operates transparently between the MIL and the APS. FES parses and logs the transaction, then passes the request to the APS to continue the normal operational process. The APS will pass the response to FES where it will be logged into the FES database before transitioning to the MIL. In the second phase of FES, in addition to parsing and logging the transaction, FES will send a preconfigured response for the transaction to the MIL as show below.

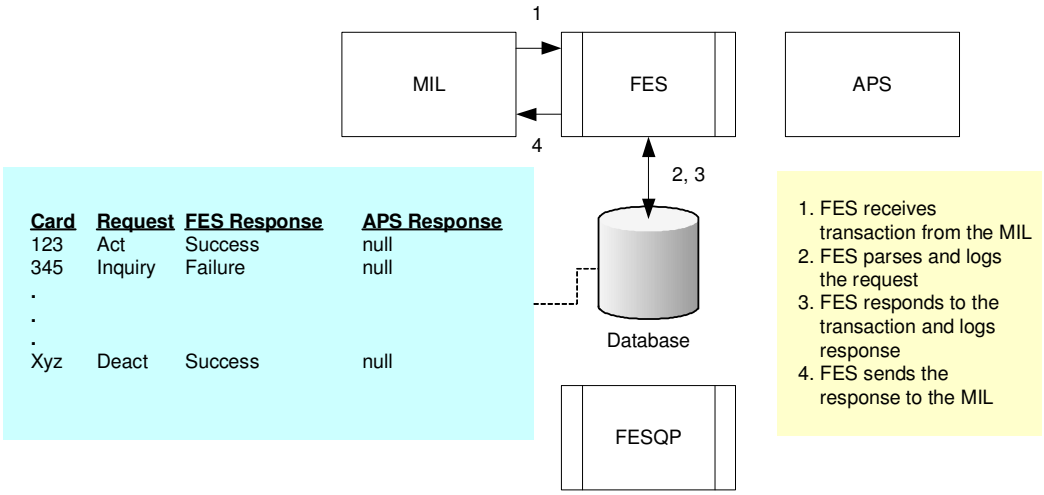

Fig. 4 – FES Queuing Operation

When FES is operational, there is no validation. Based on the Merchant configuration, the same response is sent for all transactions. The third phase of FES operation begins once the APS is back online. At this time, three separate processes operate concurrently. First, once the APS is back on line, the FES Queue Processor begins to clear the SAFed transactions by forwarding them to the APS for processing. The APS response is logged in the FES database. The APS response is not sent to the MIL, since FES previously sent a response to the Merchant for the transaction. If the APS response does not match the FES response, the discrepancy is noted in the FES database for exception reporting. Second, the FES parses and logs the transaction received from the MIL, and then verifies that there are no previous transactions for the card in the FES queue. Once it is determined that there are no SAFed transactions for the card, the transaction passes to the APS for processing. The response is then logged and passed to the MIL. Third, if a transaction was stored during FES operation, and while the FES Queue Processor (FESQP) clears the first transaction, if another transaction is received for the same card: the new transaction is then stored sequentially in the FES database and the configured response is returned to the MIL. The FESQP will process the transactions in the order in which they were received. Sample FES rules are shown in Figure 3- note that the operational mode is determined by the rule. It determines whether the transaction should proceed normally. The operational mode is an indicator of the number of exceptions generated by a particular merchant-vendor combination.

CONFIGURATION CHANGE INFORMATION

Configuration	FES.CONDITION.XYZ
Previous Value	YELLOW
New Value	GREEN
Operational Mode	ORANGE
Failure Count	1
Total Transactions	14
Percentage of Failures	7.14%
Failure Samples	Card Number Response Code Source

Rule Implemented	IF MERCHANT=XYZ AND SIZE=MEDIUM AND CURRENTMODE=YELLOW AND FAILURES <= 6 AND FAILURES PERCENT <=10.0 AND DEFAULT MODE IN (NONE,GREEN) AND ELAPSEDTIMESLICES >=2 AND TIMESLICE =188 THEN CHANGE MODE TO GREEN

Figure 3: Sample FES Rules: Changing the Operational Mode

The deployment of FES has been critical in ensuring the high availability in the enterprise architecture. As noted previously the volume of transactions and the heterogeneity of origin can stress the enterprise POS architecture. As an example, during a high transaction scenario, Front End SAFing (FES) was enabled for several Merchants. During the time that FES was enabled the FES application intelligently SAFed 278,725 transactions. Of the 278,725 transactions, 5,424 (1.95%) did not result in a successful response code (0 or 136) from the APS layer. 76% of the failed transactions resulted from improper usage modes.

IV Conclusions

Complex Event Processing provides a good solution to the problems of high transaction environments. In this paper we presented a unique application of CEP in a highly stressful industrial environment. In this environment, dealing with the activation and redemption of stored value cards, a highly available, high performance enterprise infrastructure is vital to the organization. This effort reported on the details of the architecture of the CEP system, and the deployment environment. Currently we are considering enhancing this system to also to detect fraudulent card activation and usage since all transactions are currently being handled by the FES component. The performance characteristics of the FES component would permit fraudulent transactions to be detected in near real time.

Acknowledgements

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Development and Testing Of the Webreep Online Feedback Instrument

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Abstract - *Satisfaction, loyalty, and likelihood of referral are regarded by marketers and the Big Three diagnostics leading to retail profitability. However, as yet no-one has developed a model to capture all three of these constructs in the context of the internet. Moreover, although several attempts have been made a developing models to measure quality of website experience, no-one has sought to develop an instrument short enough to be of practical use as a quick customer satisfaction feedback form. In this research we sought to fill this void by developing and psychometrically testing a parsimonious model to capture the Big Three diagnostics, brief enough to be used in a commercial environment as a modal popup feedback form.*

Keywords: A Maximum of 6 Keywords

1 Introduction

Despite the relative maturity of E-commerce, online sales continue to grow at a phenomenal rate [1]. Recent forecasts from Forrester predict online retail sales will grow to $250 Billion by 2014, accounting for 8 percent of all retail sales in the US. Already, 44 percent of computers, apparel, and consumer electronics are purchased online [2], highlighting the importance of the internet as a retail channel for many industries.

Since the late nineties, academics and practitioners alike have recognised the similarities between quality of experience using an e-commerce website, and quality of experience in a physical retail store. Ultimately the common function of both channels is to facilitate search, evaluation, and transaction [3, 4]. Accordingly, well established marketing constructs known to affect the profitability of traditional channels such as customer satisfaction [5], loyalty [6], and likelihood of referral [7] have been identified as important to evaluating the quality of website experience [e.g., 8, 9, 10]. The difference however is how these important variables are shaped. Issues of trust [11], ease of use [12], information content and design [13], and load speed [14] are all important factors affecting the quality of website experience, potentially impacting customer satisfaction.

Given the rapid growth of e-commerce and the importance of understanding customer behaviour online, several attempts have been made at developing models that measure and explain website experience quality [e.g., 15, 16, 17]. However, despite these attempts, there has yet been a parsimonious model developed to explain and predict the relationships between satisfaction, loyalty, and likelihood of referral. Moreover, most models that have been developed to measure website experience quality consist of too many questions to be of practical use for deployment as a customer satisfaction survey tool. Existing models to evaluate website quality, although accurate, are typically very long, designed to capture a wide range of website quality elements not necessarily related to satisfaction, loyalty, or likelihood of referral. The WebQual scale for example consists of 36 items tapping 12 constructs to measure intentions to re-use the website [15]. The SiteQual scale, although parsimonious with just nine items, measures intent to return but not the important antecedents shaping satisfaction, loyalty, and likelihood of referral [16].

As customer satisfaction, loyalty, and likelihood of referral are central to diagnosing service quality for Marketers, this research seeks to identify and test the key factors influencing these constructs in an online shopping environment. Moreover, the present research aims to produce a model to explain and measure these constructs that is parsimonious enough to have practical usage as a quick online satisfaction feedback form.

This study makes two main contributions. First, this study is the first to develop a single model to assess website satisfaction, loyalty, and likelihood of referral after a website experience. Second, this research is also the first to develop a short website customer satisfaction form that has practical usage in the field. Our model, while parsimonious, successfully captures the antecedents and variance of the three key variables central to diagnosing service quality for Marketers variables.

We validate our model using 168 participants engaged in an online shopping exercise, who are then instructed to complete our feedback form after a web browsing experience. In the following section review relevant literature pertaining to the measurement of website experience quality. We then develop a set of hypotheses that define the relationships in our model.

We then present the results of our model tests, followed by a discussion of the results.

2 Conceptual Framework and Hypotheses Development

In the present research we define satisfaction as the "positive emotions consumers derive from their consumption experiences with firms" [18]. The concept of satisfaction fits the principles of classical conditioning, whereby rewards lead to repeat behavior. Put in the context of Marketing, when customers are rewarded with a satisfying purchase experience, they are encouraged to return to the same vendor next time a need to purchase the same object is evoked [19]. Customer satisfaction programs are sometimes classified as a defensive marketing strategy where the focus is on customer retention. This is in contrast to offensive marketing strategies such as new product developments, advertising and line expansions where the focus is on direct recruitment [20]. Defensive marketing strategies are often preferable because attracting new customers through offensive marketing strategies is more expensive than retaining existing customers implementing customer satisfaction programs. Moreover, increasing customer retention rates by 5% increases profits by 25% to 95% [21].

2.1 Navigation

Website navigation is a critical component of website experience. Based on Davies [22] Technology Acceptance Model (TAM), consumer adoption of technology is based on perceived ease of use. In the context of online retailers, this use of technology would refer to the perceived ease at which consumers are able to explore the website and find what they are looking for [16]. Thus, websites with good navigation mechanisms such as functional links and a well-organized lay-out enhances overall website usage and information search [23].

Yoo and Donthu [16] and Todd and Benbasat [24] found a positive correlation exists between customer perceptions of website navigation and satisfaction with website performance. Further support is provided by Huizingh and Hoekstra [25] who found that navigation had a direct influence on consumer attitudinal changes towards websites.

Therefore, this study proposes that perceptions of navigation has a significant influence on satisfaction towards website experience, leading to the first hypothesis of this study

Hypothesis 1: *Ease of navigation is positively correlated with customer satisfaction.*

Hypothesis 2: *Ease of search is positively correlated with customer satisfaction*

2.2 Website Performance

Another key factor impacting consumer attitudes towards website experience is perceptions of website performance. Kim, Fiore and Lee [26] found that consumer perceptions of online stores were negatively influenced by broken links and slow down-loading speed. As technical functionality has a direct impact on other website experience attributes, such as ease of navigation, poor performance in this aspect has a detrimental impact on overall website experience amongst consumers [27].

In addition to technical functionality, website performance is also influenced by how attractive, i.e. aesthetically pleasing, websites are [28]. Without tangible cues such as a physical store front and product demonstrations, website aesthetics such as a well-organized layout and animated presentations demonstrating the product in action is critical in cognitive engagement and inducing positive associations with websites [29].

Therefore, it is theorized that technical performance and website aesthetics drive consumer evaluations of website performance, and consumer perceptions of website performance is an important driver of website experience satisfaction, leading to the next hypothesis of this study:

Hypothesis 3: *Website Load Speed is positively correlated with customer satisfaction*

Hypothesis 4: *Visual Appeal is positively correlated with customer satisfaction*

2.3 Content

Content is one of the most important influences on perceptions of website experience. With the absence of tangibility on the Internet, the key driver of consumer traffic online would be the subject matter available that is relevant to consumer needs or goals [30].

In the context of e-retailers, the subject matter, or content consumers are interested in would be information, for e,g, product and pricing information. Loiacano et al. [31] found strong evidence that a positive correlation exists between evaluations of information fit to task and tailored information with consumer intentions to re-visit and re-purchase.

In addition to relevancy, the novelty and quality of content helps to further enrich consumer experiences whilst on websites. As opposed to a website that contains plain text, a website with the right combination of animated graphics, videos and text would provide a far more enriching and valuable experience to consumers, and evidence have found higher satisfaction levels for the latter website [29]. Moreover, intuition would suggest that consumers would be dissatisfied with websites with incomplete or incorrect information. Indeed, Liu et al. [32] found evidence to proving

information quality has a positive correlation with overall customer website satisfaction. Further, this study further proposes that novel content which is relevant and valuable to customers provides a distinct competitive advantage for e-retailers.

Thus, it is theorized that the relevancy, quality and novelty of website content also drives consumer perceptions of website experience satisfaction for e-commerce websites, leading to the following hypothesis:

Hypothesis 5: *Information Quality is positively correlated with customer satisfaction*

Hypothesis 6: *Information Relevancy is positively correlated with customer satisfaction*

2.4 Trust

According to Reichheld and Schefter [21], the most important factor consumers use to assess e-commerce websites is the level of trust- worthiness conveyed. This is because with the absence of tangible attributes such as physical store locations, the ability to touch, feel and inspect the products and the risk of websites not delivering the product after receiving payment, trust is a highly important factor in providing ease of mind [33]. Thus, trust-worthiness is a critical ***risk-reduction*** factor for online shoppers.

In the context of website experience, this study postulates consumer perceptions of trust-worthiness to be an important factor which must be addressed, and in the case of e-commerce websites, the focus should be on perceptions of ***privacy*** and ***security***.

In today's world of sophisticated web analytics, privacy whilst browsing online is a major concern for web-users [34]. Consumers are concerned that their details are actually being collected without their knowledge, and that information would be used for a range of purposes, from something as innocuous as pesky spam e-mails pushing various products and services, to major problems like identity theft and credit card fraud [33].

Thus, it has been found that measures such as privacy statements have found to put consumers "at ease" and helped to foster feelings of trust and credibility with e-commerce websites [26].

Another factor influencing perceptions of trust is how ***secure*** customers feel about conducting transactions on e-commerce websites. As opposed to traditional stores where consumers can inspect product quality to ensure expectations are fulfilled, and physical store locations where product returns can be made, a higher amount of risk exists for consumers looking to purchase online, as such tangible cues are unavailable [30].

Therefore, customers may not feel secure entrusting their credit card or other financial details to a e-commerce website, where they are unable to examine how "secure" it would be to conduct financial transactions.

Addressing this concern, Belanger et al. [33] found that measures that help foster feelings of security such as third party security (i.e. certificates of authentication), product return guarantee, refunds, and use of reliable payment systems such as Paypal helped to increase perceptions of trust-worthiness amongst online consumers. Yoo and Donthu [16] also found evidence of how measures enhancing security help to increase perceptions of website quality.

As such, this study postulates that feelings of security and privacy helps engender perceptions of trust of Internet Retailers, resulting in the next hypothesis:

Hypothesis 7: *Trust is positively correlated with customer satisfaction*

2.5 Satisfaction and Loyalty

With the identification of attributes that comprise customer website experience of Internet retailer, this research shall explore the impact of said variables on the behavioral consequences of customers, and examine if a satisfying website experience can explain and predict consumer behavior towards e-retail websites in future.

It is important to note that in its emphasis on perceptions of website experience, this research is focusing on attitudes towards the website itself and not consumers intentions to conduct financial transactions, i.e. make a purchase. Consequently, in conceptualizing behavioral outcomes of a satisfying website experience, this study excludes intention to repurchase, and focuses on future behavior towards the website itself.

As such, for the purposes of this study, the outcomes of a satisfying website experience are proposed to be 1) intention of re-visit, and 2) likelihood of customer referral, which are indicators of attitudinal and behavioral loyalty.

Bansal et al. [35] found evidence proving a strong correlation exists between website performance satisfaction and website revisit intention. This helps to validate existing theoretical beliefs on how satisfied customers are more likely to engage in future revisits, and dissatisfied customers are more likely to leave and find alternative websites [36].

A more recent study by Loiacano et al [15] found further evidence proving satisfaction with website performance has a positive correlation with online customers intention to revisit. Another important behavioral outcome of website experience would be the likelihood of customer referral. Likelihood of referral is an indicator of positive attitude, and has been

proven to be a reliable indicator of future customer behavioral intention [21]. Indeed, prior research has found evidence supporting the link between satisfaction with website performance with likelihood of referral, where customers delighted with their previous purchase experiences have gone on to make positive product reviews online [37]

More importantly, evidence suggests 1) referrals have been proven to be a key driver of growth and profitability as in the case of Amazon and eBay [21] and 2) consumers find referrals and customer reviews more credible and trustworthy than commercial advertising and promotions.

As such, the above discussion leads to the following two hypotheses:

Hypothesis 8: *Satisfaction is positively correlated with Website Loyalty*

Hypothesis 9: *Satisfaction is positively correlated with Likelihood of referral*

3 Participants and Design

One hundred and sixty-eight post graduate and undergraduate business school students were recruited to participate in the survey. A $100 gift certificate was offered as an incentive to participate. The survey was conducted online. Participants were instructed to think of a product they were planning to purchase in the near future. They were then instructed to find a website where they could purchase the product, add the product to their shopping basket, and progress through the checkout process as far as they could until they were required to provde payment details. Participants at this stage could either follow through with their purchase, or abandon their cart. They were then asked to complete the questionnaire consisting of the model variable questions (table 1). All variables were measured on seven point Likert Scales.

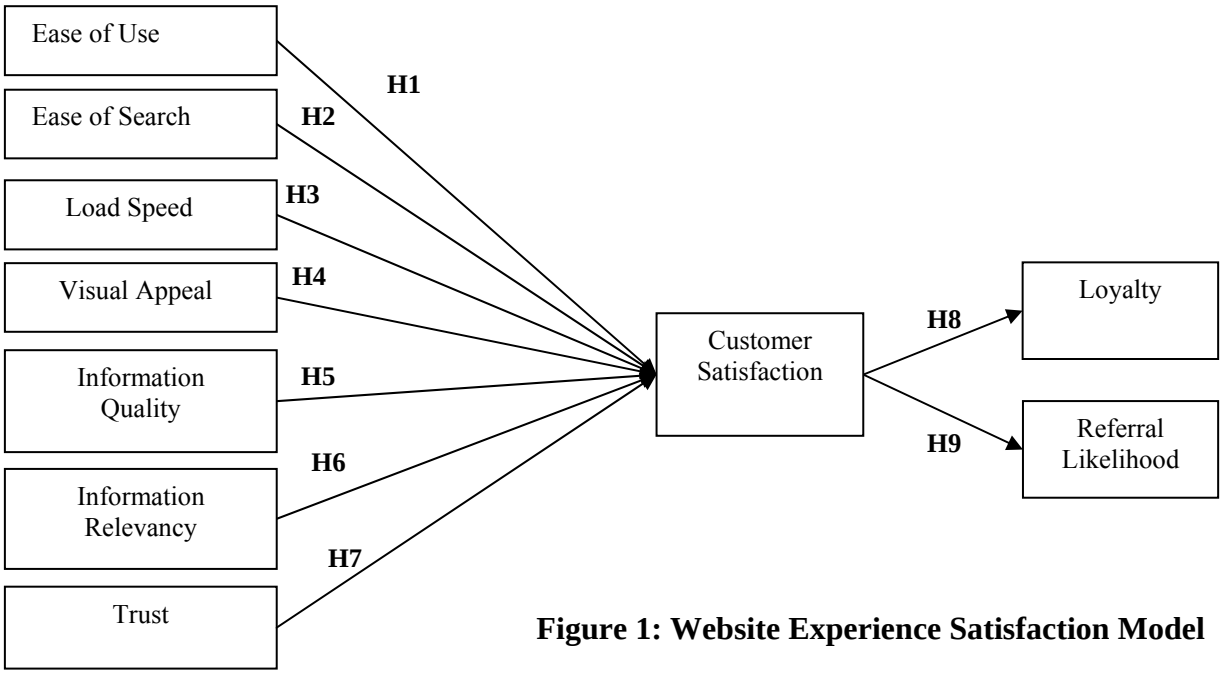

Figure 1: Website Experience Satisfaction Model

TABLE 1
Model Variable Measures

Variable Name	Variable Measurement
Ease of Use	How easy was it to **find your way around?**
Ease of Search	How easy was it to **search for information?**
Information Quality	How was the **quality of information?**
Information Relevancy	How **relevant** was the content?
Satisfaction	**How satisfied are you** with your experience?
Likelihood of referal	**Would you refer others** to this website?
Loyalty	**Would you visit this website again?**
Trust	**Do you trust** this website?
Load Speed	**How fast do the pages load** on this website?
Visual Appeal	**How attractive** is this website?

4 Results

The estimation converged to an admissible solution, yielding a good fit of data to the model χ^2 (89) = 246.53 (p < .001); NFI = .78; RFI = .70; CFI = .84; RMSEA = .10.

The structural equation model above gives you some indication of how much impact each dimension in general has on satisfaction, and how strongly website experience satisfaction affects loyalty and likelihood of referral. The standardized regression weights in the Webreep Structural Equation Model on the left suggest that Trust (.53) and Content Quality (.42) have the strongest impact on Satisfaction, followed by Performance (.31) and Navigation (.16). The model shows that website experience Satisfaction has extremely strong effects on Likelihood of Referral (.77) and Loyalty (.80). The model shows that 87% of the variance of website experience satisfaction can be explained by the six factors identified. This is statistically high suggesting the conceptualized factors explain customer satisfaction well.

5 Discussion

This research sought to develop and test a parsimonious model to capture website experience quality by measuring satisfaction, likelihood of referral, and loyalty. Specifically, the aim was to develop an instrument to capture the variance of each construct in the model that was brief enough to have practical usage as on online customer satisfaction feedback form. The result of our efforts is a ten item instrument with tight psychometric properties that captures significant proportions of website satisfaction variance. Since the instrument is only ten items, it can be practically deployed on a website as a quick measure of website visitor satisfaction.

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A Process-based Parametric Model for Product Cost Estimation

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Abstract - *A process-based parametric model for product cost estimation has been developed in this paper. In the model, the production activities of a manufacturing system are classified and their consumption characteristics (mainly the activity cost rates) are analyzed with the Activity-based costing (ABC) method. The relationship from product parameters (the order quantity and design parameters) to the usage amount of production activities is established by applying the statistical methodologies. As the critical parameters of a new product are determined, the detailed cost consumption in its manufacturing process then can be estimated from these parameters. A case study is finally given based on the heat-exchanger products of a manufacturing company, and its effectiveness is shown.*

Keywords: Product cost estimation; Parametric model; Process-based; Manufacturing process; Activity-based costing (ABC)

1 Introduction

Product cost estimation is a crucial task for a manufacturing company, and it can provide direct supports for decision-making such as in product quotation and pricing. When the costs are overestimated, it can result in loss of business and goodwill in the market; however, when the costs are underestimated, it may lead toward financial losses to the company [1]. In a competitive environment, the need for rapid and accurate cost estimation has increased in recent years.

Traditional cost systems are known to distort the cost information by using traditional cost calculation methods, in which only the direct materials and labor are traced directly to the products. Other cost consumption of products is treated as the indirect cost and measured with a same cost rate. Thus, the cost relevance loses, and the cost information cannot provide a reliable support to cost-related decisions [2].

Activity-based costing (ABC), on the other hand, has been recognized as a more accurate cost analysis method. The method was first discussed by Cooper and Kaplan [3]. The basic notion of ABC is that activities consume resources and products consume activities. It attempts to predict the cost consumption according to its causal consumption relationship, whereby the cost relevance and accuracy of estimation can be significantly strengthened.

The ABC method has been applied to various manufacturing systems and companies [4-6]. Aderoba [7] developed an activity-based cost-estimation model for job shops, in which the activities of a manufacturing system are classified into machine-based production, labor-intensive production, technical services and administrative services. The costs of new products and orders are then estimated based on the resource consumption of these activities.

The design and modeling procedures of ABC was discussed in [8]. Some modeling approaches, such as IDEF0 methodology [9] and simulation method [10], have been introduced to develop the ABC systems. Ben-Arieh and Qian [11] presented a methodology of using ABC to evaluate the cost of simple rotational parts. Tsai [12] presented a cost analysis model for joint products with ABC.

Although the approach can be utilized to provide reliable estimation results, it cannot provide a direct support to rapid cost estimation. Thus, estimating the cost of a new product is usually very time-consuming.

In this paper, a process-based parametric model for rapid and precise cost estimation is presented. In the model, the consumption characteristics of production activities (mainly the activity cost rates) are analyzed with the ABC method. At the same time, the relationship from product parameters (mainly design parameters) to usage amount of production activities is built by applying the statistical methodologies. Then the cost consumption of a new product in its manufacturing process can be estimated from these parameters.

2 Process-based parametric model

The development of process-based parametric model mainly contains three procedures: (1) the classification of production activities and their cost rates analysis; (2) constructing the relationship between product parameters and activity amount; (3) cost estimation based on product parameters.

2.1 Cost rates analysis for production activities

The products are manufactured by the production activities. For evaluating the cost consumption of products based on their manufacturing process, the cost rates of production activities should first be analyzed and acquired.

Each production activity is supported by certain production resources. By gathering its total cost consumption and total activity output during a period of time, the cost rate r of a production activity can be calculated. That is,

$$r = \frac{e + b + s + u + o}{y} \tag{1}$$

where y is the total output amount of the production activity, e, b, s, u are relatively the cost of equipment, labor, work space, and utility, o is the other cost consumed by the activity.

The equipment cost is mainly the equipment depreciation and the cost of auxiliary resources such as auxiliary tools. The labor cost is the salaries and allowances of workers. The total building depreciation of a manufacturing system can be allocated to each activity center according to its proportion of area occupied. The total utility cost is also allocated based on the usage percentage. Then, the cost of work space and utility for an activity can be obtained.

The cost rates of production activities may change with time. The current cost rates can be calculated with the data of a last period of time (such as the data in the last half year).

2.2 Relationship between product parameters and activity amount

The amount of a production activity or its workload is related with certain characteristic parameters of the products, including the design parameters and order quantity (or production quantity). Suppose the activity amount y is mainly determined by d parameters x_1, x_2, …, x_d, the relationship can be expressed by

$$y = f(x_1, x_2, \cdots, x_d) \tag{2}$$

With a detailed operation breakdown, a relatively precise relationship between these parameters and activity usage amount can be build. For example, in a machine-based activity center, the relation between the change of design parameters and the selection of machining parameters can be analyzed to obtain this relationship.

The statistical methodologies, such as regression analysis approaches, are often used to establish the relationship. If the relationship is non-linear and cannot be easily derived, a kind of approximate relevance can be built by the neural networks.

When the functional relationship is known, the activity usage amount of a new designed product can be estimated based on its characteristic parameters.

2.3 Product cost estimation

Suppose that the raw material cost of product i is $c_{\mathrm{m}i}$, and the product is manufactured by n manufacturing processes, in which the cost consumption of process j is $c_{\mathrm{p}ij}$, then the unit cost of this product is

$$c_{\mathrm{o}i} = c_{\mathrm{m}i} + \sum_{j=1}^{n} c_{\mathrm{p}ij} \tag{3}$$

In detail, the manufacturing process j of product i is supposed to be undertaken by activity center w_{ij}, and it is generally assumed that before its processing a setup is required, then

$$c_{\mathrm{o}i} = c_{\mathrm{m}i} + \sum_{j=1}^{n} [\frac{1 \cdot r_1(w_{ij})}{z_{ij}} + r_2(w_{ij}) h_{ij}] \tag{4}$$

where $r_1(w_{ij})$ and $r_2(w_{ij})$ are respectively the cost rate of setup operation (￥/time) and that of manufacturing operation (￥/hour) in activity center w_{ij}, z_{ij} is the manufacturing batch size through one setup, h_{ij} is the estimated processing hours in process j.

Among these variables, the cost rates $r_1(w_{ij})$ and $r_2(w_{ij})$ are obtain by the activity rates analysis; the manufacturing batch size z_{ij} of the product is determined by the production rules; and the processing time h_{ij} of product is estimated with its design parameters by the Eq. (2).

3 Case study

A finned heat-exchanger manufacturing company in China was selected for the case study. For a long time, the product costs were analyzed and estimated by the traditional technology, and it cannot provide effective support to its pricing decision. To fulfill the requirement for rapid and high-precision cost estimation, we developed a new cost estimation system for the company.

3.1 Manufacturing process of finned heat-exchangers

The products of finned heat-exchangers are assembled by U-tubes, U-shaped bends, fins, end plate, control module, and some standardized parts (such as nuts and rivets). The end plate, control module, and the standardized parts are purchased, and other parts (including the U-tubes, U-shaped

bends, and fins) are manufactured in-house. In different products, the design parameters, such as the U-tube length, the number of U-tubes and fins, and the number of fin holes, are different.

The heat-exchangers are manufactured by 11 processes, as shown in Fig. 1. The lacquer painting and rounding are two special processes determined by the requirement of customers. Usually the products are straight, and the rounding process is required only when they are round. Whether the products are painted or not is also specified by the customers. Other 9 processes are the basic processes always required for product manufacturing.

3.2 Process-based parametric model for heat-exchanger products

For product manufacturing, 11 production activity centers are identified. In three activity centers (*U tube*, *Stamping*, *Expand tubes*), setups are required before processing, while they are not required in other activity centers.

For activity center w, its activity amount, including the activity time t_w and number of setup times b_w, can be expressed as a function of product parameters. Suppose the specified processing batch size of activity center w is z_{sw}, then for manufacturing q units of product, q/z_{sw} times of setups are required (as an integer).

With a detailed activity analysis, the relationship between product parameters and activity usage amount is built. For example, in the stamping, a sheet of metal foil is inputted with many holes punched, and then it is cut into the fins. It is found that the cutting time is relatively very short and the stamping hours is nearly proportional to the number of holes. In the assembly activity, the U-tubes are passed through many pieces of fins (the U-tubes are assembled into fin holes). The assembly hours are not only proportional to the number of U-tubes but also proportional to the pieces of fins. All the relationships are shown in Table 1.

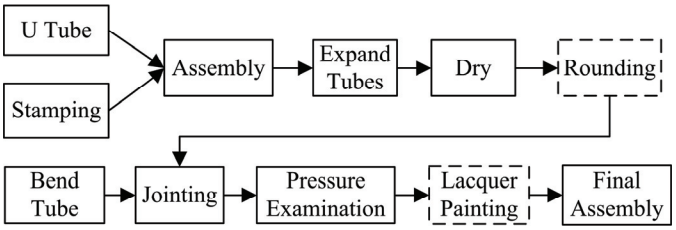

Fig. 1 Manufacturing process of heat-exchangers

Table 1 Relationships between product parameters and activity amount

Activity center	Activity	Product parameters	Activity amount	Work efficiency	Activity rate*	Activity cost (￥)
Bend tube	—	Number of bends n_b	$t_1=k_1n_b$	k_1=12s/unit	36.32	1.45
Assembly	—	Number of U-tubes n_u Pieces of fins n_f	$t_2=k_2n_bn_f$	$k_2=3\times10^{-4}$min /(piece·unit)	65.64	1.97
Dry	—	Quantity of product q	$t_3=k_3q$	k_3=5min/unit	79.02	6.32
Jointing	—	Number of U-tubes n_u	$t_4=k_4n_u$	k_4=24s/unit	150.06	18.01
Rounding	—	Quantity of product q	$t_5=k_5q$	k_5=6min/unit	155.52	—
Pressure examination	—	Quantity of product q	$t_6=k_6q$	k_6=8min/unit	123.26	16.02
Lacquer painting	—	Quantity of product q	$t_7=k_7q$	k_6=10min/unit	283.57	—
Final assembly	—	Quantity of product q Count of standard parts n_s	$t_8=k_8^{(1)}q$ $+k_8^{(2)}n_s$	Clean product: $k_8^{(1)}$=8min/unit Install nuts/rivets: $k_8^{(2)}$=20s/unit	47.26	8.98
U tube	Setup	Quantity of product q	b_9=INT(q/z_{s9})	z_{s9}=15units/time	7.28*	1.04
	U tube	Length of U-tubes l_u	$t_9=k_9l_u$	$k_9=6\times10^{-5}$min/mm	81.23	1.62
Stamping	Setup	Quantity of product q	b_{10}=INT(q/z_{s10})	z_{s10}=15units/time	149.73*	21.39
	Stamping	Number of fin holes n_h	$t_{10}=k_{10}n_h$	$k_{10}=1.4\times10^{-2}$s/hole	320.34	12.78
Expand tubes	Setup	Quantity of product q	b_{11}=INT(q/z_{s11})	z_{s11}=15units/time	55.65*	7.95
	Expand tubes	Length of U-tubes l_u	$t_{11}=k_{11}l_u$	$k_{11}=3\times10^{-3}$s/mm	137.87	6.89

*The cost rates of setups are measured by ￥/time, and the rates of other production activities are measured by ￥/h.

The activity amount and the product parameters are linked by work efficiency. The work efficiency of each activity is analyzed with the historical work data. With the data in the last half year, the total cost consumption and the total activity output of each activity center are summed, and then the cost rate of each activity can be calculated, as shown in Table 1.

3.3 Cost estimation for a new product

Recently, a new order for 7 units of product is received. The cost of the new product should be estimated for pricing it. According to the order requirements, the product is designed, and the main product parameters are determined as: l_u=979mm, n_u =18, n_b=12, n_f=285, n_h=10260, n_s=11. The product is straight, and is not required to be painted.

The main raw materials of the product are copper pipe and aluminium foil. Based on the current market prices, its material cost is determined as ￥508.90. The main task is to estimate the process cost consumption. With the relationship in Table 1, the activity amount of each manufacturing process can be estimated. Then by Eq. (4), the detailed activity cost consumption for manufacturing a unit of product can be calculated, as shown in the last column of Table 1. Thus, the total activity cost is 104.42￥/unit, and the unit cost of the product is ￥613.32.

It is found from practice that by the approach presented in this paper, the estimation error can usually be controlled within 2%. The estimation error is mainly caused by some factors that can not be exactly predicted (such as the changes of product demand and the fluctuation of raw material prices), which might be seen as an unavoidable error. Currently, the external competition forces the profit rates of products to decrease continuously, and the average profit rate of a heat-exchanger product has been lower than 10%. The costs of products estimated by the approach in this paper are closer to their real value. It can avoid and reduce the losses caused by the underestimation and overestimation of costs.

4 Conclusion

A process-based parametric model for product cost estimation is developed in this paper. With the ABC method, the production activities of a manufacturing system are first identified. By a detailed work analysis, the relationship from product parameters to the usage amount of production activities is established. Then the cost consumption of a new product in its manufacturing process can be estimated from these parameters rapidly and conveniently. The model is process-based and its estimation accuracy is also high. It can be used to provide a reliable support for decision-making in product quotation and pricing.

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Reasons for Failure of ERP Systems' Enterprise Application Integration

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Abstract— *Enterprise Resource Planning (ERP) projects spending at organizations worldwide has absorbed the attention, budgets, and energy of information technology professionals. Therefore, many organizations around the world attempt to increase their ERP functionality by integrating their enterprise packages with legacy systems and other applications via Enterprise Application Integration (EAI). EAI technologies provide the means to integrate strategic business solutions within and across the component parts of organizational information systems infrastructures. The adoption of EAI with ERP still suffers from frequent failure which affects the overall integration project success. This paper presents the most common reasons behind the failure in integration between ERP and other enterprise applications.*

***Keywords*— Enterprise Application Integration (EAI), Enterprise Resource Planning (ERP), failure factors, EAI issues, integration problems.**

I. Introduction

Over the past 10 years, there has been a significant trend towards the use the packaged applications; among the main popular packages are Enterprise Resource Planning (ERP) solutions.

ERP is a software infrastructure with the aim of improving the interaction and cooperation between all the departments in the organization such as finance, human resource, purchasing, manufacturing, sales, and inventory. In the era of globalization, it basically helps an organization in addressing needs like reduced cycle time, customer focus, sharing information seamlessly across the enterprise, real-time data access, and just-in-time (JIT) management. Deployment of an ERP system typically involves considerable business process analysis, employee retraining, and new work procedures, and hence, the cost of ERP implementation is high [12].

ERP packages have transformed the way organizations go about the process of implementing information systems. Organizations are now able to install well-integrated, internationally sourced packages that seek to provide best practice from IT systems worldwide rather than crafting each new information system locally. ERP systems help to manage company-wide business processes, using a common database and shared management reporting tools. ERP systems support the efficient operation of business processes by integrating business activities within the same organization [4].

Traditionally, although ERP packages offer advantages to enterprises, they are focused on optimization (planning, controlling and monitoring) of the enterprise-internal processes, and not supporting interaction possibilities with external autonomous and heterogeneous applications [12]. Therefore, ERP systems won't demonstrate their full potential unless they are properly integrated with other enterprise software application (such as legacy systems, e-business solutions, etc.) [2].

Furthermore, the failures of most ERP solutions to provide a complete functional replacement for legacy systems increased the need for EAI. Companies that attempted that approach largely determined that the cost and time involved in totally replacing legacy systems was far too high to be tenable. So, in other words, Instead of implementing new e-business applications, many companies have recognized that for the foreseeable future, ERP systems will co-exist with legacy systems. The emerging technology of EAI provides a robust structure to preserve the functionality of legacy systems while addressing critical connectivity and communications needs with leading-edge technology [10]. Some ERP vendors have tried to reduce the burden by developing their own integration technologies such as SAP Netweaver [13].

EAI "is a set of technologies that allows the transfer and exchange of data between different applications and business processes within and between organizations" [12]. The goal of enterprise application integration is to provide accurate and timely exchange of consistent information between business functions to support strategic and tactical business goals in a manner that appears to be seamless [16].

Many Companies and organizations are seeing the benefits of EAI; for instance, healthcare organizations linking systems to provide good administrators, caregivers, and payers the information they need to deliver care more effectively; manufacturing companies integrating their supply chain for

more accurate inventory replenishment and better anticipation of consumer demand; and, government organizations web-enabling citizens and businesses with self-services such as permitting, tax collection, licensing, payments, and polling or voting [3].

Although the integration is a way to exchange information in one organization automatically, it still suffers from problems and failures. Unfortunately, most developers and mangers consider EAI as a big challenge for the success of synchronizes all applications within the organization.

A. Problem of the Study

In an enterprise system, it is a critical that ERP systems and other critical application systems operate seamlessly. Getting applications to work with each other remains a big challenge. Problems related to integration cause great delays in enterprise operations. A lot of work has to be done manually, for instance, data from one system has to be printed out and then re-entered in a different format to a target system.

Furthermore, the cost of integration is high and growing as it is not limited to installing new applications only. There are many other expenses related to time and human resources associated with the huge responsibility of maintaining and controlling the integrated systems. Thus, the implementation of an integration project is critical investment for any organization or company.

According to Information Management [1] "enterprise application integration (EAI) remains one of the top priorities" for organizations. What may surprise many, however, it that more than 70 percent of these EAI projects fail in some way, where failure is rated as missing deadlines, blowing budgets or failing to deliver the service that the business was expecting."

Moreover, the research of Dr. Bernard Wong and David Tein [4] identified integration of systems as one of the Critical Success Factors in ERP implementation. The $110 Million SAP ERP implementation project of the Hershey Foods Corporation's had failed as a result of the improper testing of the integrated systems [4].

IS evaluation group [14] from Brunel university, publishes the result of an empirical survey involving ERP problems and application integration as follows "Integration is another important problem of ERP Solutions, the most serious problems focus on the integration of the ERP solution with existing applications such as legacy systems (82%), or with new business software (e.g. supply chain management, e-commerce applications etc) (46%). Therefore, integration is extremely difficult to be achieved through these integrated suites."

From the previous studies and research we can realize the integration of ERP requires significantly more than a simple data exchange focus. The application integration projects with ERP draw upon technical skills, business process, reengineering skills, and business acumen to discover rich opportunities and avoid the failures.

B. Purpose of the study

In order to help companies succeed with their business integration, the study's main objective is to identify the most common causes of ERP integration failures from the different literature on ERP and systems integration and to present it to the reader in an ordered and organized manner. This should help managers of such implementation projects to avoid such problems and the potential causes for failure

II. Enterprise Application Integration

A. What is EAI?

Different definitions of EAI were found during the literature review: "Enterprise application integration (EAI) is the process of linking such applications within a single organization together in order to simplify and automate business processes to the greatest extent possible, while at the same time avoiding having to make sweeping changes to the existing applications or data structures" [6]. EAI is also defined as "unrestricted sharing of information between two or more enterprise applications. A set of technologies that allow the movement and exchange of information between different applications and business processes within and between organizations" [10].

In general, systems integration in an enterprise can take place on different levels in an IT system. Many technologies and tools fit into one of these levels. Currently, the new trend in the industry towards IT applications achieving multiple integration levels [7]. In the data integration level, the integration takes place between data stores. Data is extracted from one site's database and used to update another system's database after suitable data formatting modifications. The application interface integration level is an interface that gives access to three types of services including business, data, and objects provided by a custom system or a standard package. In the method (business process) integration level, the applications are integrated through the enablement of the sharing of a set of common methods. In user interface integration levels, also known as "screen scraping," applications are integrated through the user interfaces, i.e. information are accessed from user screens by programmatic mechanisms [7, 10].

The infrastructure of Application integration is based on a set of technologies that allows information to be exchanged between different systems and business processes within and between organizations like remote procedure calls (RPCs), message oriented middleware (MOM), distributed objects, database oriented middleware, XML, and, enterprise service bus (ESB), etc.

B. ERP Integration Options

The integration between different systems such as legacy, e-commerce and other applications with ERP suites from vendors like SAP AG, PeopleSoft, Oracle, J.D Edwards, and Microsoft Dynamic can be performed in different ways. Each integration approach has its own challenges and limitations.

The options vary from off-the-shelf data-sharing products such as middleware, EAI tools and ERP connectors to develop home-grown connector components, or application programming interfaces (APIs) available within the ERP system. Depending on what the systems we are working to integrate and the level of integration, developers can use one of the following options[15]:

1) *ERP APIs today*: ERP vendors are providing their software with low-level APIs that support simple data access. If the data is going to be shared between two or three ERP modules, this approach can work very well. The drawback of this option is that APIs in general work well in providing data access but not in providing integration of business processes such as workflow.

2) *Data-Sharing Tools*: A Number of tools are available in the market for facilitating simple data sharing between ERP packages and other applications, such as manufacturing applications.

3) *Transactional Integration Tools:* Due to the increasing need for corporate ERP systems to work with different ERP, e-commerce and e-procurement application platforms outside a company, transactional infrastructure is important in this kind of integration. The drawback of this option is that firewalls will not be adequate.

4) *Sticking with Standards:* The developer must select an approach and a product that fits with the current standards used in the enterprise. A few popular standards are available like Enterprise JavaBeans (EJB) and Microsoft's Common Object Model (COM). Staying with common standards such as EJB, COM, CORBA and XML also helps ensure that future integration projects will be somewhat easier to accomplish.

III. Causes of Failure

The failure of enterprise application integration is not a small problem; it is a critical factor for the success of the entire organization. In general, it is important to know what does failure mean? from the previous studies we can answer this question as follow: If the EAI solution runs less efficiently than the old systems it replaced (end to end transaction), it will be deemed a failure, or EAI project goes over budget, or produces less-than-hoped-for results, or any combination of these cases, the EAI solution will be considered to have failed [10, 11].

In this paper we have summarized the reasons for failure discussed in related works and categorized them, based on their potential for occurrence during the EAI project life cycle, into four major types: organizational problems, implementation problems, architecture & design problems, and, operational problems.

Organizational problems include issues related to management and cost, planning, scope, communication, business prospective, and user resistance (Table 1).

TABLE I
ORGANIZATIONAL PROBLEMS

Reason Category	Ref.	Details
Management and Cost Issue	[5]	- The implementation of EAI is expensive and more complex than expected.
	[11]	- The nature of EAI is dynamic and requires dynamic project managers to manage these changes.
	[8]	- The cost of EAI project could be 5 to 7 times higher than other IS projects. - Top management often does not understand what exactly the cost of integration is.
	[16]	- Management by magazine where the decisions are made without performing an appropriate analysis. - The need to obtain and maintain sponsorship and financial commitment at all levels of the organization for the duration of a potentially lengthy project.
Planning Issue	[5]	- At the initial implementation of Integration Project, the entitlements are often not considered. EAI integrate multiple existing applications, each of which supports its own security, a suitable entitlements system must be in place in the beginning of implantation.
	[11]	- Change is constant; the frequent change requires changes in different components that spread across different companies.
	[8]	- Inflexible plan for changing within the implantation. - Management usually does not understand that integration is not a one-time activity or a singular success. - The lack of appropriate change plan repeatedly leads to rejection of the EAI strategies.
Scope Definition	[8]	- Scope creep.
	[16]	- The scope for the integration effort is not adequately defined.
Communication	[5]& [16]	- Bad communication between Business units in drafting /documenting the end-to-end Business Processes.
	[8]	-Some departments do not wish to share their information which leads to conflicting redundancy of data.

Conflicting of Business Perspective	[11]	- Sometimes departments have conflicting requirements; there should be clear accountability for the system's final structure.
	[8]	- Different departments can have different, often conflicting, views of the same business processes.
	[16]	- Lack of business case or drivers.
Resistance of User	[11]	- In general, IT staffers tend toward analysing the requirements to build an appropriate interface design from the scientific view. This approach could lead problems because the proposed solution may not be acceptable for users.
	[8]	- The biggest challenges are employees who continually refuse any change, for better or for worse, and obstruct the process.

Architecture & Design problems include issues as shown in Table 2 that are related to integration architecture, data sense, and, the infrastructure of integrated application.

TABLE 2
ARCHITECTURE & DESIGN PROBLEMS

Reason Category	Ref.	Details
Integration Architecture	[5]	- EAI involves considerable research and design activity against little development work but using regular conventional application implementation approaches and techniques that do not usually work for EAI implementation.
	[11]	- EAI is not a tool, but rather a system and should be implemented as such.
	[16]	- Organizations focus on the wrong sets of issues in developing enterprise architecture, where the enterprise architecture is essentially a planning activity, rather than a development activity. But in practice, there is no distinction between planning and development.
Data Sense	[5]	- Data Models mismatches between applications complicate communications and data mapping.
	[11]	- Information that seemed unimportant at an earlier stage may become crucial later.
	[9]	- Lack of visibility into the data and metadata within the organization.
ucture of Integrated Applica	[5]	- It is difficult to align data models between two applications that will communicate via integration
	[8]	- Almost 70% of critical business data is still stored in complex, cumbersome, legacy applications written in third generation programming languages and the maintenance and support of legacy applications is expensive.
	[16]	- The legacy systems designed from unplanned, stovepipe development or were developed as batch or Single Tier. - The legacy systems were not initially designed for new quality-attribute requirements and are being affected by needs for interoperability, performance, security, and usability. - Poor Design: some systems create their data which is specific to the applications, and data was not designed for sharing.

Implementing the plans for EAI projects requires methodology different than other IS projects and resources. Problems associated with this phase include issues related to integration methodology, necessary expertise of integration, inappropriate technologies, and testing (Table 3).

TABLE 3
IMPLEMENTATION PROBLEMS

Reason Category	Ref.	Details
Integration Methodology	[5]	- There are no standardized methodologies when defining topologies including security, fail-over, and load balancing.
	[11]	- Within the EAI field, the paradox is that EAI standards themselves are competing. Therefore, companies should budget for testing and validation because standards can't guarantee interoperability.
Expertise of Integration	[5]	- Some organizations ignore the need for a different skill set for integration projects than what is needed for application design.
	[11]	- EAI requires knowledge of business and technical aspects both.
	[8]	- Due to the difficulty of integration that requires a lot of technical and business decisions, expert are only capable of making tough decisions. - Most enterprises try to do integration projects depending on their own people with no experience.
Inappropriate Technologies	[8] & [9]	- Selecting the wrong technology as a result of bad consideration for real limitations, drawbacks, and overall suitability of selected technology for current situation. - In the planning phase of EAI projects there is no planned time for technology evaluations.
Testing	[5]	- There are few tools that support integration testing. - No specialized tools for stress testing EAI exist.

	[4]	▪ Lack of adequate testing.

After the EAI project has been completed several operational problems may arise. These include the issues of knowledge transfer and documentation, maintenance and up-front contingency plans, and performance (Table 4).

TABLE 4
OPERATION PROBLEMS

Reason Category	Ref.	Details
Knowledge transfer and Documentation	[16]	▪ Providing inadequate training.
	[8]	▪ The documentation is often neglected which leads to unnecessary dependence on outsourced IT consultants. ▪ Writing documentation is a time-consuming and expensive process.
Maintenance and Up-front Contingency Plan	[5]	▪ Poor end-to-end system management and monitoring.
	[8]	▪ Most failed integration projects did not have an up-front contingency plan from hardware and software vendors in case of disaster.
Performance	[5]	▪ There is a problem because the lower granularity communications means an increased amount of messages is required to achieve overall functionality that negatively affect the performance.

IV. Conclusion and future work

This paper introduced the necessary background to understand EAI and the reasons of failure of projects involving ERP systems.

As a future work, we plan to conduct a field study involving real situations of integration projects at some selected companies that are facing troubles with integration which can be useful to augment our current study and the possible discovery of additional causes of failure and difficulties with ERP EAI. We then hope to develop a best practice model which can be considered as a useful decision-making integration solution that could help produce significant benefits in the area of enterprise application integration.

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SESSION

LEARNING METHODS, TOOLS, AND RELATED ISSUES

Chair(s)

TBA

Channel Financing: The Transformational Paradigm in Supply Chain Management

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Abstract - *Channel financing (CF) has emerged as a transformational paradigm in supply chain management. It is an effective tool for managing the interdependencies between the physical and the financial supply chains. It is also a win-win proposition for all the supply chain partners. In this paper, 6 dimensions of CF have been identified. Organizational study has been carried out in 60 Indian companies to find out the challenges faced by them in CF and determine desirable solutions. Perceptual study has been carried out with 300 CF experts to identify and examine the desirable characteristics of CF information technology (IT) platform. It comes out that visibility of entire supply chain financial information; channel collaborations; and leveraging external expertise for financial risk sharing are the cornerstone of value creation. Furthermore, integrated CF IT platform provides better security for financial information exchange as well as better data consistency for process integration over singular optimization.*

Keywords: Channel financing (CF), information technology (IT), supply chain, working capital management (WCM), accounts payable (AP), accounts receivable (AR)

1 Introduction

The supply chain represents the processes involved in trade – which can be categorized into two different parts: the physical and the financial supply chain. The physical supply chain describes the activities involved in planning and executing the movement of goods, including manufacturing, assembling, storing, moving, and locating products and their documents (e.g. purchase orders, letters of credit, bills of lading, customs documents etc). It involves procurement, sales and trade compliance. Financial supply chain parallels the physical or material supply chain and represents all transaction activities related to the flow of cash from the customer's initial order through reconciliation and payment to the seller [1]. The financial supply chain includes the movement of funds resulting from the physical supply chain [2]. Various authors have used the term financial supply chain interchangeably with channel finance, financial value chain and supply chain finance. In this paper, use of any of these terms has been used to imply channel financing (CF).

CF describes the activities involved in planning and executing payments between trading partners through various financial instruments, including exchange rates, and credit and country risks. It involves cash flow, working capital and corporate risk management. It provides visibility of the status of purchase orders/invoice approval/payment status/potential discrepancies, information on the size, deadlines for trade discounts and the movement of funds/credits in the supply chain. For organizations to be effective leaders in driving cross-functional trade processes, they must clearly understand the interdependencies between physical and financial supply chain processes.

CF is the process of exchanging payments, related documents and information between buyers, sellers, financial institutions and other involved parties. It is a combination of trade financing provided by a financial institution, a third party vendor, or a corporation itself, and a technology platform that unites trading partners and financial institutions electronically, and provides the financing triggers based on the occurrence of one or several supply chain events. CF technology incorporates both transactional financial supply chain automation and access to financing/credit; extended by the participating financial institutions or supply chain partners themselves. Cash velocity can be a significant competitive differentiator and companies need to access a variety of breakthroughs in working capital management (WCM) to keep pace with their peers. The overall goal of CF is to optimize accounts payable (AP – liability item that appears on buyer's books), accounts receivable (AR – asset item that appears on seller's books), cash management, working capital, transaction costs, risks and administrative costs throughout the end-to-end supply chain for both buyers and sellers. In short, the ultimate aim is to integrate the movement of inventory and cash.

2 Need for channel financing

CF is a transformational paradigm in supply chain management. The core objective of CF is to provide integrated commercial and financial solutions to the supply and distribution channels of a given industry.

Company, suppliers, distributors, agents and dealers are the typical partners of a channel. Company is the manufacturer of products, suppliers supply raw materials to the company, distributors sell the products to dealers and finally dealers sell the products to the customers. All the channel members have their own financing needs to carry out their businesses. Cash flows are important to all channel members. By faster cash flows, channel members can reduce their dependence on working capital. This helps them to increase their return on investment (ROI) and consequently, economic value added (EVA).

On the supply side, suppliers want to reduce the length of their credit cycle. Companies want to achieve unprecedented

levels of order accuracy, inventory planning and cycle time reduction across end-to-end network. On the customer side, clearing and forwarding agents (CFAs), distributors, dealers etc need credit facility to carry out their businesses. The primary action that buyers take is to extend payment terms for their suppliers, which often have constricted access to short-term financing and a much higher cost of money. This cost-shifting to suppliers' results in better Days Payable Outstanding (DPO) statistics but generates a domino effect, whereby suppliers getting stretched by buyers also stretch their payables [3].

This credit cycle has negative impact on company's cash flows, increases its working capital needs and reduces its ROI. Company has to incur high collection cost for these credit facilities. Lot of sales force time and effort is also used in the process. Besides, there are also chances of credit indiscipline in the market that leads to bad debts. All these have implications on company's cash flows, AR, working capital needs etc. Channel partners might not be able to avail the commissions, discounts etc for timely payments.

These days, buyers are using CF to optimize working capital, improve cash flow forecasting, improve days payable outstanding (DPO) metrics, reduce supply base risk, reduce product unit costs by taking advantage of arbitrage opportunities, and facilitate end-to-end supply chain access to credit and low-cost capital. Suppliers are using CF to improve customer retention and grow sales, while lowering their days sales outstanding (DSO) and improving their access to capital. CF aims to provide companies with more control over their financial processes and more options on how to use cash and credit. By leveraging better visibility and control over supply chain transactions, today's CF options also enable financing to be done at many more points in the supply chain – raw materials, intermediate production, point of transportation, customs clearance, arrival at vendor managed inventory hub etc.

Banks want to extend credit facilities to small and medium enterprises (SMEs) in order to improve their profitability. SME's is also an attractive segment because of the presence of relatively large number of members. But there are risks associated in financing distributors/dealers. Here, the traditional concept of priority sector lending mandated by the Indian government acts as a boost for CF as SMEs are covered under it. Presently, Indian banks have to maintain minimum 40% of their loan book under it, compared with 32% for foreign banks [4]. So, banks have to conform to RBI guidelines to finance SMEs. At the same time, getting company as a partner helps banks to hedge risks and to extend credit to SMEs. So, CF presents less risky and profitable opportunity for banks as they can get additional business at lower risk.

Hence, CF is a win-win proposition for all stakeholders like company, suppliers, distributors, dealers, banks etc.

3 Objectives of research

This is an exploratory study that intends to unravel the mystery of CF. Following objectives have been set for this research work:

i. To identify different dimensions of CF.
ii. To find out the challenges faced by organizations in CF and present desirable solutions.
iii. To identify and examine desirable characteristics of IT platform for CF.

4 Dimensions of channel financing

From the extensive literature study, following research dimensions of CF have emerged:

• CF for working capital management – With the increase in complexity of modern businesses, working capital is increasingly being trapped in the supply chain processes [5]. With current economic slowdown and credit crunch, these inefficiencies get even more amplified [6]. So, organizations require greater visibility over their receivables to optimize working capital [7]. CF is an effective tool for WCM [8][9].

• CF for credit decision making – Credit decision-making is a critical as well as complicated issue faced by modern organizations. CF greatly facilitates credit decision-making by helping in the effective integration of the physical and the financial supply chain. CF enables effective integration with banks to help in the process of credit limit setting and assessing the creditworthiness of the customers [10][11][12]. CF also helps small suppliers to overcome their credit problems [13].

• CF for organizational management – CF facilitates organizational management by enabling streamlined business processes, low cost processes, enhanced competitiveness, operational visibility, better coordination, management of financial risk etc [14]. It also helps to overcome the problems faced by organizations as a buyer as well as a supplier [15] [16].

• CF automation – Automation is considered as an important element for CF implementation [17]. The supply chain processes of the organizations are moving from manual to automatic thereby leading to significant benefits such as improvement in efficiency, acceleration of payments, decrease in operating costs, enhancement in visibility of end-to-end processes, certainty of AP/AR processes etc [18][19].

• CF IT platform – IT platform plays a critical role for CF implementation. It provides effective integration between buyers, sellers and financial institutions [20]. At the same time, developing specialized CF IT platform consumes significant time and resources [21]. So, organizations should determine the hurdles in the implementation of CF IT platform. They should also identify the nature of information and type of features desired in a CF IT platform.

• Monitoring of CF performance – It is important for organizations to monitor their CF performance [22]. It acts as a control technique as any significant deviations can be corrected by organizations. Therefore, organizations employ different performance monitoring techniques [23][24].

5 Organizational study

Organizational study has been done to find out the problems faced by organizations in CF and to present desirable solutions to those challenges. For this study, data has been collected on the basis of an organizational questionnaire from 60 Indian organizations involved in CF. The executive responsible for or closely associated with CF program filled the organizational questionnaire. Organizational questionnaire contains multiple choice objective questions as well as subjective questions to solicit the views of organizations on critical CF issues. In most of the multiple-choice objective questions, respondents could give their own view too.

5.1 Sampling methodology

The selection of organizations is based on the following criteria:

i. The sample organization should have either fully adopted or partially adopted or planned to adopt the enterprise resource planning (ERP) or such other application package.
ii. The sample organization should have demonstrated potential with regard to business needs and resources to adopt modern financial supply chain practices.
iii. The organization should be seriously planning to adopt or already adopted CF initiation a systems basis.
iv. The sample organization should have a turnover of at least Rs. 100 crores.

5.2 Sampling design

For the purpose of designing a sample, an individual organization is chosen as sample unit. The organizations that fulfilled the criteria of sampling methodology and indicated willingness to participate in the study were sent the organizational questionnaire. In all, 153 organizations were sent the questionnaire. Finally, the responses were obtained from 60 organizations representing a response rate of 39.2%.

5.3 Organizational challenges and desirable responses

Table 1 shows challenges faced by organizations in CF and desirable solutions suggested by them for overcoming the challenges.

Table 1
Organizational challenges and solutions

Main challenges	Selected	Desirable solutions	Selected
Difficult to obtain clear picture of cash flows, inventory and financial commitments	66.7%	Improve visibility in ordering activity, inventory and financial commitments	60.0%
Lack of collaborative technology to manage end-to-end processes	50.0%	Implement collaborative processes for cross-departmental coordination	50.0%
Inadequate financial risk management systems	40.0%	Leverage external expertise for financial risk sharing	35.0%
Decentralized organizational approach to financial processes	25.0%	Link financial metrics to supply chain processes and strategies	23.3%
Complexity of transactions place stress on internal skill sets	6.7%	Simplify transactions to reduce stress on internal skill sets	6.7%

5.4 Analysis of challenges and desirable responses

As per Table 1, two-third majority of the organizations identified lack of visibility into projected cash flows, inventory movement and financial commitments as the topmost challenge faced by them. Three-fifth majority of the organizations agreed that improving visibility in ordering activity, inventory and financial commitments is a desirable response to the above challenge. This shows the importance of visibility of information about cash flows, inventories and fulfilment capabilities found not just between immediate buyer and supplier, but also among trading partners constituting the entire supply chains.

The increasing realization in the minds of organizations is that they alone cannot face up the emerging competitive pressures. Most organizations are experiencing that it becomes critical to work closely with their business partners so as to succeed in the competitive world. It becomes apparent from the organizational survey in which one-half of the organizations recognized lack of collaborative technology to manage end-to-end processes as the second topmost challenge. Implementation of collaborative processes for cross-departmental coordination as desirable solution to this challenge is suggested by one-half of the organizations. It is quite evident that organizations are fast recognizing the need of channel collaborations. They are realizing that the ultimate core competency they hold today comes from collaborative alliances with their supply chain partners.

Improvements in transportation, growth in trade and advancements in IT have resulted in the widening of trade networks. Presently, organizations do take a higher amount of risk when dealing with new buyers and suppliers. In the organizational survey, two-fifth of the organizations

opinioned third key challenge as inadequate financial risk management systems. Risk may take the form of credit risk, interest rate risk, loans and security investment, compliance risk from disclosures to channel members and process/transaction risk from service failures resulting from operational or technical problems. Leveraging external expertise for financial risk sharing is recommended by 35.0% of the organizations as the corresponding solution.

Decentralized organizational approach to CF processes is seen as the fourth most important challenge by one-fourth of the organizations. This silo approach leads to lack of coherence in the organizational processes. In order to overcome this challenge, linking financial metrics to supply chain processes and strategies is advocated by 23.3% of the organizations. This provides organization with the ability to seamlessly communicate within as well as outside organization thereby enhancing visibility.

6.7% of the organizations viewed complexity of transactions that place stress on internal skill sets as the last challenge. Similar number of organizations supported simplifying transactions to reduce stress on internal skill sets.

6 Perceptual study

Perceptual study has been done to gain experts opinions in order to identify and examine characteristics of IT platform for CF. For this study, perceptual questionnaire has been employed to determine the views of 300 CF experts working in Indian organizations. Individual depth interviews have been carried out of some CF experts to gain insights on certain issues related to perceptual questionnaire. CF experts of various organizations have filled this questionnaire. The responses received have been analyzed on a five-point Likert scale from the perspective of strong disagreement (S-D), disagreement (D), indifferent (I), agreement (A) and strong agreement (S-A).

Factor analysis has been carried out using Statistical Package for Social Sciences (SPSS) 16.0 for Windows to extract critical variables. The goal was to identify a smaller set of variables, which is similar to the approach adopted by Choi and Hartley [25] and Kannan and Tan [26]. For the analysis of perceptual questionnaire, principal component analysis with eigenvalues greater than 1 has been used to extract variables and Varimax rotation with Kaiser Normalization has been used to facilitate interpretation of the factor matrix.

Correlation analysis has been carried out to determine the type of correlation between the variables. Correlation measures the extent to which the variables are related. Pearson's correlation coefficient (r) is a measure of linear correlation. The correlation coefficient is a numerical number between –1 and 1 that summarizes the magnitude as well as the direction (positive or negative) of association between two variables. Guilford [27] classified the nature of relationship between two variables on the basis of levels attached to correlation coefficient. It is shown in Table 2.

Table 2
Value of correlation coefficient, type of correlation and nature of relationship

Value of correlation coefficient	Type of correlation	Nature of relationship
0.00 to 0.19	Negligible correlation	Almost negligible relationship
0.20 to 0.39	Low correlation	Small but definite relationship
0.40 to 0.69	Moderate correlation	Substantial relationship
0.70 to 0.89	High correlation	Marked relationship
0.90 to 0.99	Very high correlation	Very dependable relationship
1.00	Perfect correlation	Perfect relationship

6.1 Sampling methodology

Following criteria was employed to select the CF experts:

i. The expert should be working in a reputed Indian organization that has implemented CF.
ii. The expert should have at least 3 years work experience in CF.

6.2 Sampling design

For sampling design, an individual CF expert is selected as a sample unit. The CF experts that fulfilled the sampling methodology criteria and showed willingness to participate in the study were sent the perceptual questionnaire. Out of 721 questionnaires sent to CF experts, responses were obtained from 300 of them, representing a response rate of 41.6%.

6.3 Experts responses

Desirable characteristics of CF IT platform have been studied after considering experts' responses to the five statements on CF IT platform. The statements are shown below:

I Integrated CF IT platform is preferable over singular optimization.
II CF IT platform can be blended with inter-organizational processes to develop higher order capabilities.
III CF IT platform facilitates the secure exchange of sensitive information between buyers, sellers and financial institutions.
IV CF IT platform provides data consistency for enabling process integration.
V CF IT platform provides cross-functional as well as across-functional channel management application system integration.

The experts' responses are summarized in Table 3.

Table 3
Experts' responses

Question / Opinion	I	II	III	IV	V
(S-D)	5	16	21	22	24
(D)	25	40	32	45	49
(I)	57	131	62	79	120
(A)	159	79	150	119	82
(S-A)	54	34	35	35	25
Total	300	300	300	300	300

6.4 Factor analysis

Table 4(I), 4(II) and 4(III) shows the total variance explained, Table 5 presents the rotated component matrix and Table 6 displays the correlation matrix of CF IT platform.

Table 4(I)
Total variance explained (Initial eigenvalues)

Component	Initial eigenvalues		
	Total	% of variance	Cumulative %
1	3.921	78.428	78.428
2	1.030	20.597	99.025
3	0.044	0.875	99.900
4	0.005	0.100	100.000
5	-2.81E-016	-5.62E-015	100.000

Table 4(II)
Total variance explained
(Extraction sums of squared loadings)

Component	Extraction sums of squared loadings		
	Total	% of variance	Cumulative %
1	3.921	78.428	78.428
2	1.030	20.597	99.025

Table 4(III)
Total variance explained
(Rotation sums of squared loadings)

Component	Rotation sums of squared loadings		
	Total	% of variance	Cumulative %
1	2.740	54.792	54.792
2	2.212	44.233	99.025

Table 5
Rotated component matrix

	Component	
	1	2
I	0.971	0.200
II	0.256	0.961
III	0.960	0.267
IV	0.849	0.521
V	0.297	0.952

Extraction method: Principal component analysis.
Rotation method: Varimax with Kaiser Normalization.

Table 6
Correlation matrix

	I	II	III	IV	V
I	1.000	0.454	0.977	0.919	0.470
II	0.454	1.000	0.496	0.709	0.983
III	0.977	0.496	1.000	0.957	0.544
IV	0.919	0.709	0.957	1.000	0.754
V	0.470	0.983	0.544	0.754	1.000

6.5 Inference

From Table 4(I), the initial eigenvalues of component 1 and component 2 are 3.921 and 1.030 respectively, both of which are greater than 1. The rotation sums of squared loadings show 54.792% variance for component 1 and 44.233% variance for component 2 (Table 4(II)). Cumulatively, component 1 and component 2 account for 99.025% of the data (Table 4(III)). Thus, they can be extracted for analysis.
From Table 5, variable I possess the highest value of 0.971 in column of component 1. Similarly, variable II possess the highest value of 0.961 in column of component 2. Both variables I and II are also better representatives than their closest values as they are comparably less correlated to the corresponding values of the other column.
Therefore, two key variables can be extracted for inference of the factor analysis. They correspond to the statements I and II viz:

- I: Integrated CF IT platform is preferable over singular optimization.
- II: CF IT platform can be blended with inter-organizational processes to develop higher order capabilities.

From Table 6, the correlation between I and III is 0.977 and between II and III is 0.496. The relation between I and III is very dependable (Table 2). So, it can be stated that integrated CF IT platform provides better security for exchange of sensitive information between buyers, sellers and financial institutions over singular optimization.
The correlation between I and IV is 0.919 that shows a very dependable relationship. The correlation between II and IV is 0.709 that suggests a marked relationship (Table 2). So, it can be stated that integrated CF IT platform provides better data consistency for enabling process integration over singular optimization. The data consistency for process improvement can be further improved by blending CF IT platform with inter-organizational processes to develop higher order capabilities.
The correlation between I and V is 0.470 that shows substantial relationship. The correlation between II and V is 0.983 that suggests very dependable relationship (Table 2). It may be stated that blending of CF IT platform with inter-organizational processes provides cross-functional channel management application system integration to develop higher order capabilities.

7 Conclusions

The conclusions of the research are as follows:

• CF is a new frontier for the creation, delivery and deployment of financial services. For organizations to be effective, interdependencies between the physical and the financial supply chain should be properly managed. CF greatly facilitates this process by integrating the movement of inventory and cash.
• CF provides integrated commercial and financial solutions to supply and distribution channels. It helps to improve the cash flow on the supply as well as customer side. It hedges financial risk and enables banks to extend credit to SMEs.
• There are 6 dimensions of CF. They are CF for WCM, CF for credit decision making, CF for organizational Management, CF automation, CF IT platform and monitoring of CF performance.
• Organizations are facing certain challenges such as uncertainty of cash flows, inventory and financial commitments; lack of collaborative technology; inadequate financial risk management systems etc. So, they are looking to improve physical as well as financial supply chain visibility, form collaborative alliances, hedge financial risk etc.
• Integrated CF IT platform provides better security for exchange of sensitive information between buyers, sellers and financial institutions over singular optimization. Integrated CF IT platform also provides better data consistency for enabling process integration over singular optimization. This shows the abundant potential of harmonized approach over modular optimization as it leads to the development of higher order capabilities.

8 Recommendations

Based on the extensive research work, the recommendations are given below:
• CF should be used to identify financial improvement opportunities by estimating the impact of current inventory practices on the cash conversion cycle and the return on capital. CF should also be used to improve the transparency and predictability of cash flows and accuracy of operational budgets. Moreover, CF should be deployed to better use cash on hand and increase the return on short-term investment.
• CF should be deployed to integrate physical and financial supply chains in order to bridge the information divide and mitigate financial risk. Therefore, effective financial risk sharing arrangements should be implemented by building long-term relationships with trading partners, collaborating with banks/financial institutions and partnering with other channel organizations.
• Organizations should work on making their accounts payable/accounts receivable (AP/AR) automation systems a source of competitive advantage by upgrading to systems that facilitate access to CF at various stages in the supply chain.
• Organizations should adopt a trade compliance and documentation foundation to ensure classification consistency, accurate costing, error-free documentation and uninterrupted flow of goods across the supply chain. This can be made possible by adopting an integrated single enterprise-wide CF IT platform.
• Web-accessible, on-demand CF IT platform with automated discounting and invoice reconciliation capabilities that links buyers, suppliers and financial institutions should be developed.
• Organizations should continuously upgrade CF IT platform to handle trade complexities in areas such as cash management, financial analytics, transaction accounting, AP/AR automation, early payment program management etc.

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Quality in Blended Learning in Higher Education.

A proposal for an evaluation model.

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Abstract - *This paper presents an analysis of different models used to assess the quality of formative actions, considering classroom learning and distance education courses. Taking as starting point one of the analyzed models, the paper sets out the necessity of developing a new model that could measure the quality of a blended formation process, by selecting the applicable indicators and proposing some new. The model is composed of seven different categories, which include a sum of thirty five indicators. They will be used to represent courses quality level in Kiviat's diagrams. This model is currently being put into practice in a real university environment.*

Keywords: e-learning; b-learning; quality evaluation model;

1 Introduction

Nowadays online education has become one of the preferred methodologies among students and enterprises, due to the flexibility and work-life balance offered to students [1]. In recent years, this kind of learning, which is no longer in an early stage, has suffered a quick development, leading to the need for developing new competences and abilities to improve its practice.

To adequate patrons and procedures from traditional face-to-face classes to the online environment is not enough. This was one of the most serious problems professors, instructors and teachers found when they began to upload the contents on-line. It is necessary to define a global strategy, both from the administrative and the methodological point of view, in order to fit the objectives of the course to the new environment offered by technology [2].

It is important to remark the different ways in which education has progressed through decades. Nowadays traditional classroom learning is quite similar to the one offered in a XIX century classroom. Although professors now use audiovisual support in class, like PowerPoint, slides or videos he (or she) still has the leading role. However, it is unthinkable that in a distance course a student still uses the same tools used decades ago: Personal computers, Internet or cell phones didn't exist then. Using this comparison we can get an idea of the evolution distance learning has suffered, motivated mainly by the technological support. This justifies that throughout the paper we mainly focus on the study of the recent contributions in the field of distance education.

Referring to formation in general, and in virtual formation in particular, there is a growing concern about how to assess the quality of the different actions taking place during the training period. After all, if learning is considered as a product or service, it must undergo some measurement mechanism to guarantee quality of service. The main point when evaluating formation quality is to be oriented to enhance educational processes and to find excellence in processes and products. Therefore, quality is not only focused on the evaluation of results, but on the evaluation of the elements that take part in the organization of the course: the processes and the resources used.

Traditional formation and classical learning methods have been developing for a long period of time, being analyzed and evaluated. However, new factors appear in online formation, like the use of technology and new styles of learning that require a special attention when evaluating. Therefore, the measurement of quality of these processes becomes an essential requirement to validate the new formative models.

For these reasons, quality assessment emerges as a problem in a blended learning environment; where face-to-face and online learning coexist. Classical models are not of use in this situation, neither are the purely online formation methods. We must think about a new model that allows us to complete the process and study the criteria that may best be applied to the quality measurement in a scenario in which online and in-site classes complement each other.

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2 Theoretical background

There is a vast amount of models for measuring quality in education that have been developed through history, the oldest ones used to evaluate classroom learning methodologies, , and the modern ones evaluate the online learning. We will review the most relevant ones below.

One of the first tendencies started with the principles of total quality, following the evolution of its main consideration: in a first moment, the focus was on the "product", then the "process", later "the workers", and finally, "users' satisfaction". There are some studies that define total quality in education as: "a process which implies the following: satisfy and defy client's expectations, continued enhancement, share responsibilities with the employees and reduce waste and re-elaboration" [3]. This point of view considers formation like an industrial process, which can be measured and improved. It is a first approach to measure quality, although involves numerous limitations. After all, university environment cannot be considered as a business organization, as people involved are culturally very different [4].

On the other hand, in the area of education quality, institutions like ISO or AENOR have dedicated a great effort to publish and promote rules related to this topic, such as the norm ISO 900x,which is a series of rules in which a new definition of quality appears. According to ISO, quality refers to "the whole of properties and characteristics of a product, process or service that conveys its aptitude to satisfy an expressed or explicit need (or needs)" [5], a much more adequate definition within the educational field.

Studying in depth online education, we find recent norms that gradually form not only the quality parameters, but the methodology used to measure them. Norms *ISO/IEC 19796-1* [6] and *ISO/IEC 19796-3* [7] are remarkable, as they define the metrics and categories that must be measured, and the suitable methodology, with some remarkable examples. Interestingly, AENOR, in 2008, presented the first quality standard in virtual formation, elaborated in Spain as norm UNE 661818 [8].

These days we find ourselves in an environment in which there is a great concern for standardization and definition of rules for the growing and development of education to guarantee its quality. There are researches that make a compilation of all the standards and institutions that everyday work for a needed convergence to common and interchangeable standards. These standards support the definition of recommendations and new standards within specific fields of activity that regulate the online learning process: from norms that regulate educational contents or how to pack them, to standards that define how they must be labeled and presented. [9]

As far as online formation is referred, two large classifications of tendencies can be done, although the mechanisms of parameterization of quality vary with context and with the proper concept of quality. These classifications are related to the current practices of measuring quality in institutions and projects that use e-learning as teaching activity with proper entity. These are the global and the partial focus. The main objective centers on looking for criteria and indicators that answer the questions set out by the quality evaluation in specialized environments, with specific tools and meant to people with a profile that differs from the one of the traditional group of students [10].

2.1 Partial focus of evaluation

The partial focus describes separately each element. Concrete aspects of formation are considered, like the learning processes, the resources used, or the technological platforms on which the process is based.

Among the models of learning process evaluation we find some contributions, such as:

2.1.1 Systemic Van Slyke model

It is based on a previous-to-formative-action study, analyzing a series of factors and key characteristics that will preview the learning success [11]. It analyzes four dimensions: the institution, the target of the formation, the course characteristics and the environment in which the process is developed.

2.1.2 Marshall's and Shriever's Five-levels Evaluation Model

It focuses on the study of five leves that have influence on the formative action [12]. In this case the emphasis is focused on the teacher/professor as the main actor, as he will dinamize the virtual environment. In this model, the interest in the quality of the teacher's abilities is recovered, becoming a strategic factor, as he/she will accompany the student during the entire development of the course and the interaction with him/her will determine the success of the formative action. The evaluated dimensions are: the teacher/professor, the course materials, the curricula, the modules of the courses and the learning transference.

2.1.3 Kirkpatrick's Four-levels Model

Commonly used in traditional learning, it is recommended by various authors to put into practice in e-learning. It analyses four dimensions: users' reaction to different elements that conform the formative action, the contents and abilities acquired by the students during the course, the transference generated by the development of competences, and the impact produced by the improved

formation, measured economically or in the level of innovation [13].

As far as resources and educational materials are concerned, their quality is essential. They are the main tool students will encounter to face the formation. The evaluation of these resources is one of the main areas of research, because of their diversity and the special attention they require in order to develop the course correctly. There is a large amount of researches and recommendations associated with the principles of quality, standing out some projects that analyze with detail the diversity of resources using a double focus: on the one hand, the pedagogic resource criteria and on the other hand, the criteria related with the aspect [14].

The evaluation of technological platforms has the objective of estimating the quality of the virtual environment or virtual campus where the e-learning is being developed. The great number of existing platforms, created differently: open source software, private-own-developed, licence-adquired… reveals the need for standardization. In the same way platforms are different from each other, there are different ways of assessing their quality. Some European initiatives are remarkable [15], based on the revision of different solutions, trying to result in a global vision of the quality measurement.

2.2 Global focus of evaluation

There is a global focus that considers the global group of elements that take part in an e-learning solution at the moment of establishing criteria to evaluate quality. Specifically in this focus, it is notable a model developed by the Institute for Higher Education Policy (IHEP), sited in Washington, DC [16], formed according to different organizations' researches, which identified seven categories with which all the aspects related to on-line learning are analyzed. Indicators are distinguished within each category, in order to assess the quality. It is called "evaluation based on benchmarking", and the categories are: the process of teaching/learning, the evaluation and assessment, the support for the teacher, the course structure, the development of the course, the support for the student, and the institutional support.

3 Proposed model

The quality model based on benchmarking is an excellent starting point when evaluating quality in a formative process. The study was initially applied and contrasted in some organizations and universities like [16]:

- Brevard Community College. Sited in Florida, this college began offering distance education courses in 1974.
- Regents College. This institution began in 1971 with distance programs as the External Degree Program of the University of the State of New York.
- University of Illinois at Urbana-Champaign. It is one of three participants in the University of Illinois. Offers more than 20 degree over the Internet.
- University of Maryland University College. Virtual institution founded with the mission of providing continuing education to Maryland's professional workforce. Over 25 years experience in distance education.
- Utah State University. This institution has been involved in various forms of distance education since 1911.
- Weber State University (WSU). This institution launched its first completely online course in 1997 and currently offers two-thirds of the online learning courses in Utah.

All these institutions were visited, conducting personal interviews and surveys. In all, 27 faculties, 62 administrators, 16 individuals who were both a faculty member and an administrator, and 42 students were interviewed and/or completed a survey, for a total of 147 respondents.

At the beginning, the model was composed by 45 indicators classified in seven different categories. These indicators were contrasted by the sample described above, as the people interviewed used a Likert scale to value the indicators relevance. This study revealed that several indicators were duplicated, and they were reduced to 24.

The benchmarking model measures the quality through the analysis of the seven categories; therefore, the larger the levels of the different indicators are, the larger the level of quality is.

We present below a new version of the model, based on the benchmarking model of IHEP [16], which has been adapted to assess the quality of blended learning. For that reason, a series of indicators has been included to complement the on-site part of the course, which was not considered in the initial approach. From the 24 original indicators, 11 have been added, based on the review of other analyzed models, resulting in 35.

This model has been chosen because it has been contrasted and used by numerous institutions. It takes into consideration the whole process with generic categories that may be adapted to the on-site part including more indicators. The new ISO/IEC and AENOR norms also present some categories that can be related to the selected model, but they do not describe in detail the indicators needed to assess their quality. Furthermore, the benchmarking model is better oriented to university formation.

The proposed model is composed by the following categories and indicators:

3.1 Category: Process of Teaching/Learning (A).

These indicators measure the quality of aspects related to the pedagogical activities: interactivity among students and teachers, students' collaboration, tools that make the process easier, etc.

- A1. Forum participation: students and teachers.
- A2. Participation in class: students and teachers.
- A3. Communication tools for participants.
- A4. Available documentation quality.
- A5. Quality of the teachers' contributions when correcting.

3.2 Category: Evaluation and Assessment (B).

This category measures the educative effectiveness of the program, the processes of evaluation used, the level of success of the participants, etc.

- B1. Number of registered students.
- B2. Number of students that have passed.
- B3. Number of students that have attended the evaluation process.
- B4. Level of objectives accomplishment.
- B5. Tools for evaluation.

3.3 Category: Support for the Teachers.(C).

In this category, the indicators show the level of quality in activities oriented to help teachers in their adaptation to the online teaching, and available help during the process.

- C1. Administrators' availability.
- C2.User's guides available for the teachers.
- C3. Usability of the system tools destined for the teachers.
- C4. Availability of the technical means for the classes.
- C5. Tools for the teachers' organization.

3.4 Category; Course Structure.(D).

This category analyzes the quality related to students' and teachers' expectations about the course. It includes the procedures to transmit the objectives of the courses to the students, as well as the availability of the libraries' resources, the kind of materials delivered or the response time.

- D1. Students' satisfaction with the course.
- D2. Teachers' satisfaction with the course.
- D3. Students' perception with the methodology used.
- D4. Level of adaptation of the spent time and the complexity of the course.
- D5. Complete documentation during the course.

3.5 Category:Development of the Course. (E).

Within this category, the quality is measured with indicators related to the development of the course, elaborated by the teachers (or university departments), experts in the topic of the organization or commercial enterprises. It includes the revision of materials in order to fit them with the design of the course.

- E1. Enough available resources to get a complete development of the course.
- E2. Enough available resources to get a complete development of the course according to the student's perception.
- E3. Ease perceived by the teachers about the tracking of the course.
- E4. Tools that support the students' management.
- E5. Administration of the course.

3.6 Category; Support for the students. (F).

This indicators measure the quality including indicators referring to the services offered to students, both in the formative level and the technical support in the use of technologies.

- F1. Administrators' availability.
- F2. User's guides available for students.
- F3. Usability of the system tools destined for the students.
- F4. Utility of the tools destined for the course tracking.
- F5. Possibility of adaptation to the needs of the student.

3.7 Category: Institutional Support. (G).

This category shows the level of quality with indicators that include the electronic security measurements that guarantee the performance of the quality, integrity and validity norms of information. It also includes the reliability and centralization of the system as support for the creation and maintenance of the infrastructure of distance education.

- G1.Security and privacy of the services.
- G2. Accessibility of the system tools.
- G3. System reliability.
- G4.Information validity.
- G5. Added-value services for the students.

The categories of the model are interrelated among them covering all the educational process. Therefore, if we assess the quality of every category, we will be able to observe some conclusions. To measure the levels within each category we will use the five-point Likert scale, commonly used in questionnaires and surveys with research purposes.

In order to complete the model with a graphical interface, we depict theses indicators on a Kiviatt diagram. Radial axes represent the seven different categories, while the intersections of radios and circumferences represent their respective values.

This representation will consider the value of each category aggregating the measurements of its different indicators. Besides this, by using other Kiviatt diagram, it will be possible to illustrate the indicators within each category, to determine which measures should be implemented to enhance the global quality of the formative process.

The figure 1 shows some examples of possible case studies according to the quality levels in the different categories.

These examples are extreme cases, useful to make a classification and explain the characteristics of the diagram. Three items must be considered:

- Covered area: the larger the covered area in the diagram, the greater the final quality of the global educational process. In the same way, the smaller the covered area, the lower the quality.
- Symmetry: Without taking into account the area, the measurements of different items can be very different, shaping the result towards different points of the diagram. This will demonstrate a process oriented to specific categories in terms of quality.
- Regularity: if we find an uniform shape, we can say the process is compensated; meanwhile, if the shape is not well-balanced, it means a part of the process has a lower quality than the others.

In the example, the 1st case is the perfect one, with the highest level of quality, and the 2nd case has a very low quality in every aspect. We have represented other situations, like case 3 or 4, with a high unbalance. In the 3rd case, the quality is more oriented to the student, while in the 4th case it is oriented to the teacher, leaving the student on a secondary role. Furthermore, cases 1 and 2 are regular through all the process, but the 3rd and the 4th are quite irregular.

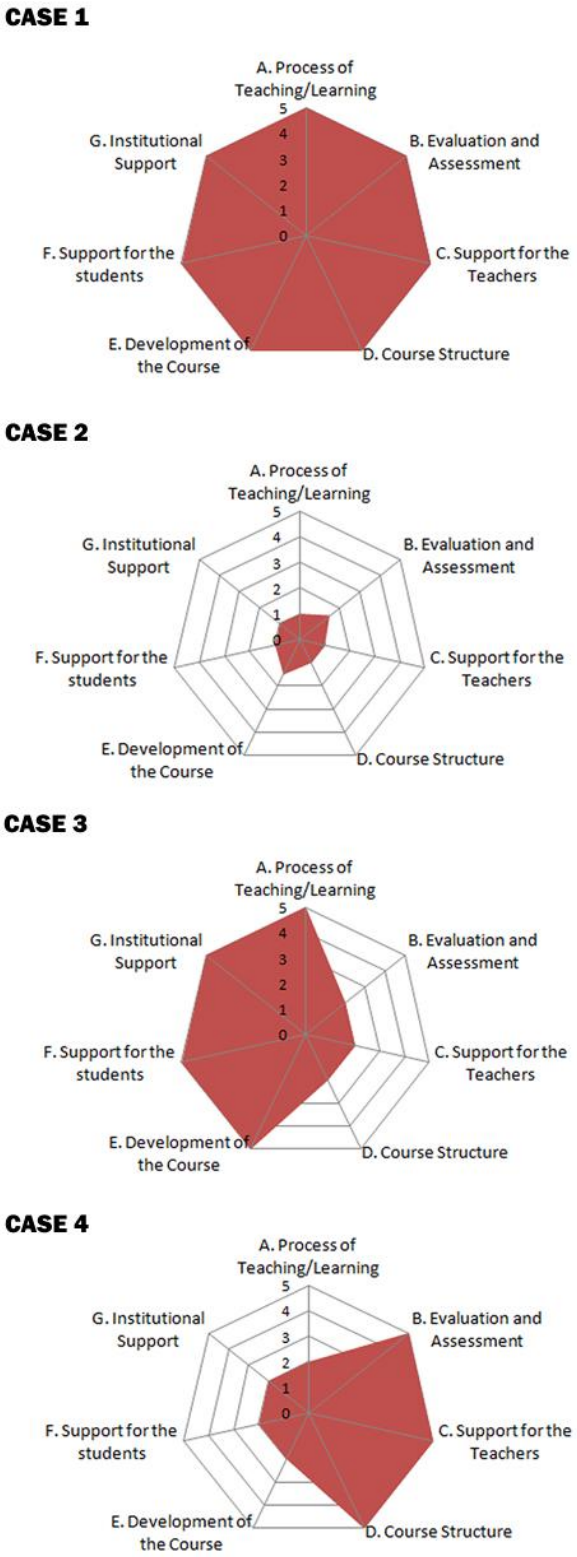

Fig. 1. Case study examples. Extreme cases to show the meaning of the Kiviat diagram that represents the proposed model.

4 Conclusions

We have designed a model based on other one, which was contrasted and consolidated in different organizations and institutions, mainly in universities. The presented model is being applied in a real Spanish university case, at the EUI - UPM (*Escuela Universitaria de Informática - Universidad Politécnica de Madrid*, Informatics Engineering Faculty - Technical University of Madrid). The data will be analyzed and reviewed in order to define a more refined model. As it happened with the original model, it is expected that some of the indicators may be cut out, as correlations with other/s may be found.

Data collected in the study will be analyzed in depth, not only valuing the categories but also the indicators levels independently. The final expected result will be a diagram like the represented above, in which we can consider the area, symmetry and regularity of the formed shape, to make a diagnosis of the quality offered by the formative process of blended learning.

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New Instructional Design Model for Learning Objects: AAUF Model

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Abstract-- *In today's learning and education systems, educational technology and E-learning systems become an integral part of the school environment. A successful E-learning system requires different components such as IT infrastructure, smart classrooms, learning gateways, and digital content or E-content. The e-content, is an important component due to the fact that any digital content must match the expectations of both educators and students. The core of an effective digital content is the design and development of the Learning Objects. Building interactive Learning Objects incorporates both pedagogical and technical factors. The development of LO's must consider several factors such as the instructional design, graphical design, and usability. This paper introduces a new development model of Learning Objects that incorporates both the pedagogical and technical issues. The new model integrates interactive factors related to the instructional design process and blends them with the factors related to the software development.*

Keywords: E-learning, E-content, designing Learning Objects, interactive E-learning, Usability.

1. Introduction

Recent years have witnessed a vast growth in educational teaching and E-learning implementation at primary schools and in higher education. International initiatives have been implemented world-wide to blend the educational technology with the conventional teaching environment. Examples of these initiatives can be found in Canada, Malaysia, Japan, and USA to name a few [13]. E-learning is a general term that relates to all training and education that is delivered with the assistance of new technologies. The delivery of E-learning can be done by using the Internet or shared files on a network. It gives any learner the freedom and flexibility to learn anytime and anywhere. In addition, it provides the learners with an ability to research a wide range of subjects at any level. Stockley defined the E-learning as " E-learning involves the use of a computer or electronic device (e.g. a mobile phone) in some way to provide training, educational or learning material" [17]. E-learning system requires different components such as IT infrastructure, smart classrooms, learning gateways, and digital content or E-content. The e-content, is one of the most important components due to the fact that any digital content must match the expectations of both educators and students in order to keep them motivated and attracted to the system. In this paper a new development model to develop Learning Objects will be proposed. The new model called AAUF include the usability factors in the different phases and combine the ADDIE and ARCS models.

2. E-LEARNING SYSTEM

An interactive E-learning system should facilitate the collaboration between the instructors and learners in addition to the learning materials. Hence, providing a complete E-learning system requires many components and building blocks in order to provide the required functionality such as the infrastructure, the learning portal, the e-content, a smart school and classrooms, and the awareness and culture change. The infrastructure The learning environment should be able to absorb the flow of information resulting from the use of services and applications of information and communication technology in the E-learning system.

- *Learning portal:* Is the primary interface for E-learning, which meets the instructors and learners, administration and managing activities of learning and teaching in terms of lessons education, training, and exercises.
- *E-content:* is one of the most important pillars of E-learning systems, E-content is provided in interactive, structured, comprehensive on the network or the internet where it is accessed at any time and any place.
- *Smart schools and classrooms:* The aim of the smart schools and classrooms is to provide means of better education by using advanced methods of teaching to improve the learner's skills. It aims also to improve teaching skills and developing new methods of explanation to make lessons more effective and attractive. The smart school project includes smart- board, Wireless school, and One-to-one computer.
- *Awareness and culture change :* Mentioned above, the E-content is the most important pillars of E-learning. The E-content is a combination of Learning Objects, so in the rest of this chapter the concentration will be on the E-content and the models that are used to develop the Learning Objects [9].

This paper will focus on the E-content and the learning objects.

3. Electronic content

The E-content is a "collection of sharable interactive Learning Objects that are developed using multimedia technologies and can form a certain curricula that can be tracked by an LMS or utilized offline" [13]. E-content will enable learners and instructors to interactively access and retrieve reference material, reduce learning time and

increase knowledge retention rates, and effectively integrate information access into routine education processes. Also the e-content will enable to reduce the resource requirements that are necessary to maintain reference material, enhance educational system, and enable to develop teaching methodology and techniques. The E-content is defined also as a collection of related Learning Objects where these LO's are stored in a shared repository. Online courses are created from these repository after that the Learning Content Management System (LCMS) integrates the LO's into a course, then publish the course via LMS system (see Fig 1).

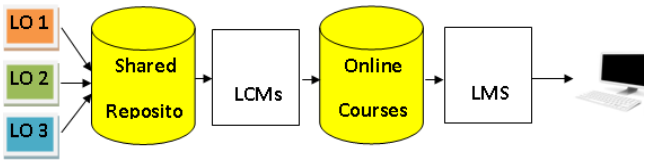

Fig 1. Learning Object Management System.

4. Learning objects

A Learning Object is a resource, usually digital and web-based, that can be used and re-used to support learning. Learning Objects offer a new conceptualization of the learning process. Rather than the traditional "several hour chunk", they provide smaller, self-contained, re-usable units of learning [2]. Learning Objects are defined as "interactive of the web-based tools which support the learning process by using the enhancing methods, amplifying, and guiding the cognitive processes of learners"[1].

5. Existing models used to develop LO's

There are different models for developing LO's. our new model is based on three models that will be described in this section. The first model is ADDIE model that include five steps; the Analysis, Design, Development, Implementation and Evaluation [9]. The steps overlap and are interrelated (see Fig 2).

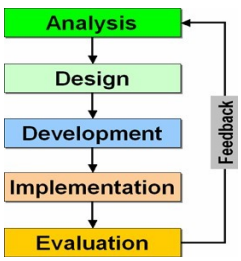

Fig 2. ADDIE Model.

The second model is ARCS Model that includes four components the Attention, Relevance, Confidence, and Satisfaction [6], see Fig 3.

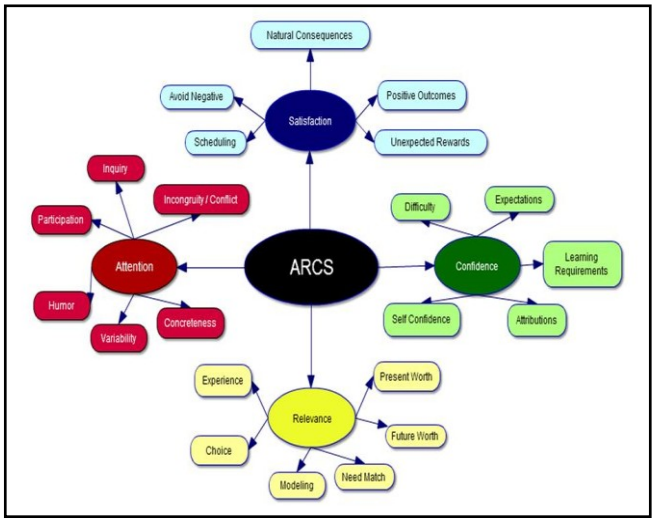

Fig 3. ARCS Model [11].

Design Based Research (DBR) is the third model that is a combination of learning objects and learning designs. It is a blend of theory driven design and the empirical educational research of learning environments. DBR methods targeted to uncover the relationships between designed artifact, educational theory and practice. Design based research (DRB) is a method to understand when, how and why educational innovations work in practice [5].

6. Usability criteria for learning objects

Usability in E-learning is defined as "ability of a learning object to support or enable a very particular concrete cognitive goal" (Feldstein, 2002). Considering usability in education to design Learning Objects means that the Learning Objects should be designed with ease of use and interoperability, and is characterized by such elements as technical characteristics of related programs. So the features of Learning Objects should meet the criteria in order to contribute to their achievement of educational goals and usability in a specific environment. The Usability is one of the nine criteria in the Learning Object Review Instrument (LORI) developed by Vargo et al. [12], and improved by Nesbit et al.[16], and Li, J. Z. et al.[7]. These criteria will be explained in the following section when designing the new Model for creating interactive Learning Objects.

7. New model for developing interactive learning objects

To produce a new interactive model for developing Learning Objects, we will choose two models for designing the Learning Objects then, we will add the usability factors as described in Fig 4.

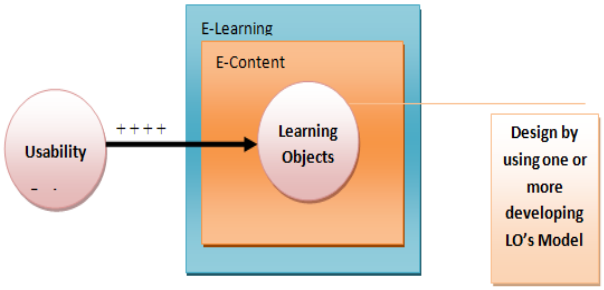

Fig 4. Adding usability factors to Learning Objects.

8. Developing a new model for interactive learning objects

Our new Model for designing Learning Objects combines two existing models introduced below which are ADDIE model and ARCS model. Also, we add the usability factors in our new model. Fig 5 shows how to combine between the two existing models. So, that the usability factors will be added in each stage of the ADDIE model when developing the Learning Object. Our new model is called the ADDIE ARCS USABILITY FACTORS (AAUF) model (see Fig 6).

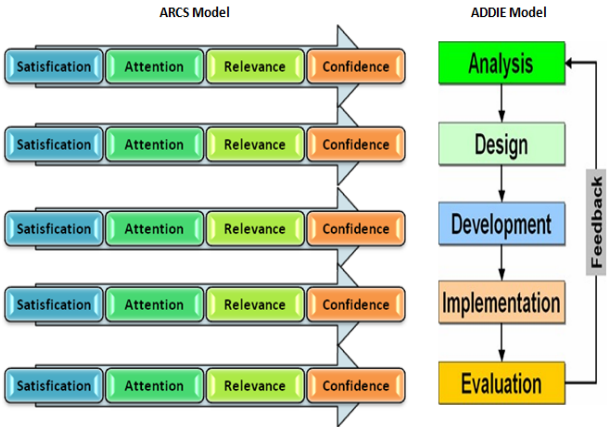

Fig 5. Combination between ADDIE & ARCS Model.

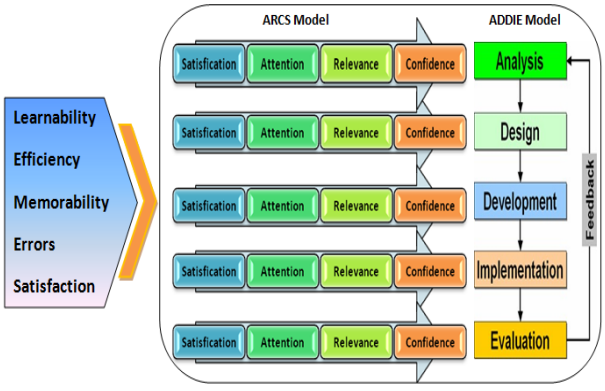

Fig 6. A new ADDIE ARCS USABILITY FACTORS (AAUF) Model.

Table 1 illustrates the main elements that our model will get from including the usability factors in the different phases and combining the ADDIE and ARCS models.

The Analysis stage : during this stage it is essential to plan to produce an interactive educational courseware carefully before authoring it on the computer. The developer must precisely define the needs for developing the educational software, in which a target audience must be specified, the educational background and the requirements of the learning materials must be analysed and assessed, and the objectives must be specified. In addition, the educational setting and learners' characteristics, environments, and culture must be understood [4]. In this stage, many factors should be determined such as the courseware's objectives and the objectives of each learning object, the learning outcomes, deviding the courseware into learning units, and the evaluation strategy. In addition, the technical side of creating the courseware shouldn't be neglected. Usability factors affect the technical side to define the proper applications and tools needed to improve the effectiveness and accuracy of the program. Also the designer should consider the ARCS elements such as the confidence, and relevence mentioned in table 1. The important criterias in this stage is the courseware content which is "an educational software entity that contains different knowledge components, yet it resembles the objectives of a traditional course [14]. The courseware should be designed according to many parameter such as: the course objectives, the learners characteristics, the estimated time for each educational unit, and the educational environment etc.

TABLE 1 : ADDIE development stages, ARCS motivation elements, Usability Factors

ADDIE Development Stages	**ARCS Methods (Motivation Elements)**	**Usability Factors**
Analysis *Design* *Development* *Implementation* *Evaluation*	*Gain the learners Attention:* Humor, using specific examples, the variability, the conflict way. *Relevance* Needs matching, the experience, future usefulness, the modeling, the choices.	Learnability:How easy users can understand the layout and the interlace of the program. Efficiency:How quickly can users perform tasks? Memorability:How easily can users remember how to use the site or program? Errors: How many errors do users make, how severe are these errors, and how easily

	Confidence Provide objectives and prerequisites, grow the learners, learner control, the feedback. *Satisfaction*	can they recover from the errors? Satisfaction:How pleasant is it to use the design?

The Design stage: this stage consists on specifying the structure and the style of the software. The Design stage is one of the most important stages for preparing the Learning Objects because the instructional designer will translate the courseware units into visual scenes. This translation is done to deliver the educational information and achieve the determined goal. During this phase, the elements of ARCS Model (Attention, Relevence, Confidence, Satisfication) shall be used to verify the learners' motivation, interest, and enjoyment when using the Learning Objects. In addition employing usability factors like (Learnability, Effeciency, Memorability) will create user-interaction and user friendly interface(see table 1). When designing the courseware and user interface many important factors should be considered such as, *the educational units design* that should be designed to be correlated with the educational goals and the behavioral objectives. The best educational unit practice is to include scenes such as objectives, activities, practices, and tests. Educational units shall be designed by creating the storyboard for each scene. The *Designing the interface* also should not be neglected. The goal of the interface is to make the organizational structure and content visible and to facilitate the interaction. Designers of educational interfaces should be aware of the cultural features of the program in which it is important to have a mechanism to understand the cultural elements of the target user. These mechanisms are needed not only to provide "good" cultural educational multimedia interfaces to users across multiple cultures, but also to serve as tools for users that have specific culture. The instructional designer document should be produced at the end of this stage.

Development stage: Based on the design stage we develop the content and the educational tools. In this stage instructional designer should consider the elements of ARCS Model and the usability factors as mentioned in table 1. To develop Interactive Learning Objects, some important criteria's can be derived from this stage such as the user interface, multimedia, interactivity and control, assistance and orientation, and accuracy and safety. The development of the user interface should be independent of the production of media. The following are the most important Criterias that shall be focused upon when designing user interface.

Hyperlinks and Navigation Tools: Hyperlinks are the most basic interactive component between a learners and the educational software. Navigation tools Hyperlink guide the learners to move through the educational unit. That's why, it is important to overlook hyperlink and navigation tools when designing the educational software.

Consistency: McCracken and Wolfe define Consistency as "making related items look the same"[8]. The designer should provide consistency between all the parts of the educational software in regards to course structure, links, activities, colors, etc.

Accessibility: is defined as the ability to receive, use, and manipulate data and operate controls included in electronic and information technology. The learners must be able to access and interact with the educational unit in easy and fast way.

Usability: defined as the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

Effective courseware consists of combination of multimedia elements such as audio, text, graphic, and animation [11]. In this stage the developer should be aware when choosing the multimedia; the following are the most important multimedia elements that will be taken into consideration during this stage:

Text: Designers of multimedia learning programs should consider how to present text in an acceptable way to ensure the efficiency of their applications. Boyle outlined some recommendations regarding the use of text in educational multimedia programs [3]. The designer should be consistent in using fonts, size, colours in each screen, avoid single spaces, use different typefaces, fonts, sizes for titles, subtitles and headings, and choose convenient combinations of text and background colours.

Graphics and Static image: Graphics can be incorporated with multimedia applications in order to illustrate facts, and to add realism to the multimedia application. It is recommended not to use graphics just to add interest, but to help learners to understand and remember what's on the screen, and emphasized to use high quality images to encourage recognition.

Video: Videos can play different roles such as: motivational in which it motivates the learner, cognitive where the learner can learn from it, and experimental in which it fulfils experimental objectives. Zhang et al. specify that Students in the e-learning environment that provided interactive video achieved significantly better learning performance and a higher level of learner satisfaction than those in other settings. However, students who used the e-learning environment that provided non-interactive video did not improve either [15]. Also, Poláčková et al. In their paper specify that students will be able to transfer their theoretical statistical knowledge into practical situation and real life and, therefore, improve their personal development process [10]. Many issues should be considered when designing the Video, Such as the time of video that should be suitable, the synchronization of video shot with the texts, the suitability of sound speed (comment) with the video shot, selecting the appropriate video shot with the educational situation, and adding the ability of control to stop or set the sound. Many issues should be considered

when designing the interactivity and control of the educational program, Such as the possibility of selection among the different patterns of interactions between the learners and the courseware content, provide the courseware with special records for each learner to note in it his data and numbers of his entry and his period of time in each time, providing the courseware with a method of interaction to receive the enquiries of the learners and facilitate the link between the instructors and the learners, deliver a list by the name of learners and their emails to keep in touch with each other, provide the learners with a space to publish whatever they have from ideas or suggestions for their colleagues and their instructor without any need for the email, and provide the instructor with the sufficient time to give his response Also the instructor shall control the concatenation of the content show. The users shall be provided with the assistance and the proper orientation to avoid the mistakes of the program and gain the users' acceptance and their satisfaction of this program. There are many issues that should be considered when designing the assistance and orientation such as the guidance in every page to help users when using the courseware, and feedback such as textual animation or audio alert when users make a mistake. Also there are many issues that should be considered when designing the accurancy and safety, such as the purification of the courseware from any repetition, the text that should be free from any designing or programming mistakes, orienting the students to keep the student's data in secret, and the record of each student should be secret and no one except him shall be able to view it .

The Implementation (Operation) stage: during this stage the model will be implemented (operated) by delivering the materials to the learners. After delivery, the effectiveness of the program is determined. The important criteria that can be derived from this stage is the performance. Many factors can affect the performance such as the user cognitive inputs of ability, the user skills, the user prior knowledge of courseware, the motivation, the user ability, and the amount of user's control offered which are linked to the elements of ARCS Model and the usability factors.

The final stage is the Evaluation stage: During this stage, some determined tests will evaluate the educational software. The first test will evaluate the software from getting the feedback from the reviewers. And the second test will be used on the educational software to be sure of its usability. The evaluation of the model will consists of formative evaluation and summative evaluation. Formative evaluation presents in each stage of the AAUF process. And summative evaluation consists of a tests that have been designed regarding to related criterias and providing opportunities for feedback from the users. So during this stage the instructional designers and users should test the availability of the ARCS elements and usability factors mentioned in table 1.

9. Conclusion

This paper presents a new instructional design model for Learning Objects created in order to achieve the quality standards of electronic content. This paper focused on different elements, such as introducing guidelines for designing interactive educational programs, developing effective tools and technologies to build interactive educational environment, identifying new criteria's (AAUF) model to measure the quality of educational programs, use clear methodology to design a motivating and interactive Learning Objects based upon integrating interactive multimedia, and examining the effectiveness of educational software used in primary schools based on the newly developed criteria's (AAUF) Model.

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The Steps of Designing an IT-embedded Costing System for Higher Education Institutions

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Abstract - *The article presents steps of constructing a computer-based costing system for a higher education institution. Activity-based costing was chosen as the underlying cost accounting methodology. The structure of the costing model for a hypothetic university was described in the paper. The model was created in an attempt to find out how costly is a process of education performed for a study programme, with particular attention given to how high are costs of delivering particular courses, and how costly it is to educate a group of students in each semester. Significant emphasis was put on the model implementation in the information technology environment. The Oros Modeler – a component of SAS Activity-Based Management package – was used as the modeling and calculating software. Finally, results of the costing procedure performed with the use of assumed data were presented.*

Keywords: Activity Based Costing, ABC model, higher education, teaching costs

1 Introduction

Analysis of costs of teaching and learning has been crucial for higher education institutions. This results from a high share of these cost in the total expenses of universities, an increasing competition between educational institutions on the Polish education services market and the demographic changes. Moreover, latest legal alterations force Polish universities to count actual costs of educating [2]. Thus, reliable costing of education services has recently become a priority for Polish higher education institutions.

Generation of reliable information on costs of education services is highly possible thanks to activity-based costing [1, 3, 4, 8, 9]. Efficiency of ABC in this area has also been noticed in Poland [5], [6]. The aim of the article is to present the subsequent steps of constructing a computer-aided system of activity-based costing for education of students. The described model of ABC has been embedded in a hypothetical university that offers only one study curriculum for regular and weekend full-time undergraduate students.

2 Idea of Applying ABC for Costing Education Services

Every model of a costing system built upon the activity-based costing notion should consist of three modules:

- resources unit,
- activities unit,
- cost objects unit.

In relation to each of the mentioned modules the model of education services costing offers specific elements and solutions in the area of cost accounting. A general model of ABC developed for the purpose of costing the education services which is limited to solely one undergraduate study curriculum is depicted on Figure 1.

The resources unit of the model consists of:

- university teachers,
- education infrastructure (classrooms, laboratories, etc.),
- materials required for the study processes,
- department administration (salaries, office stationary, phones, etc.),
- other common resources (e.g. library).

In the activity unit there are processes of teaching both regular and weekend students, and processes that are not directly linked to education itself, such as managing the university or servicing students. Every teaching/learning process consists of separate activities of delivering each course of the study curriculum in a prescribed form (e.g. lecture, class, laboratory class, project class, etc.). Ultimate cost objects are individual students who attend any major path on each semester.

Activities of servicing students in the timespan of their study are differentiated with respect to three periods into [7]:

- the first semester, when recruitment costs are incurred;
- the particular year, when students are obliged to choose their major resulting in changes in types and sizes of student groups,

- the diploma year, when the number of courses students attend is lower but the time burden for teachers brought about by the diploma assessment is higher.

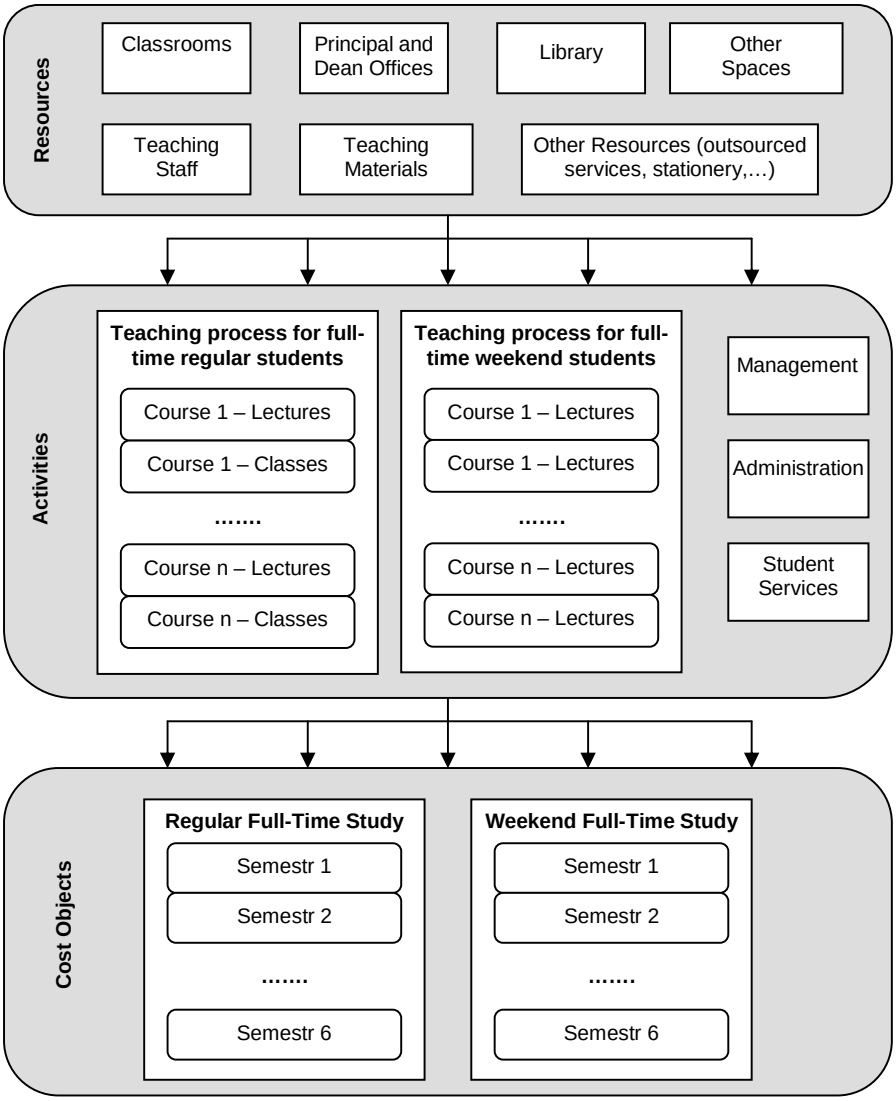


Figure 1. The ABC-rooted Structure of Higher Education Services Costing
Source: own preparation

Costs of resources that are consumed for delivering scheduled courses should be assigned with the use of resource drivers, such as teaching hours of teachers or hours of occupation of classrooms. Costs of particular courses are then assigned to related semesters of studies.

3 Aims, Assumption and Steps of Constructing the Costing System

The aim of the costing model was to obtain answers to the following questions concerning the full-time regular and full-time weekend curricula:

- how costly is a process of education performed for a study programme;
- what are costs of delivering particular courses;
- how costly it is to educate a group of students in each semester;

- how high is unit cost per student for every semester.

Constructing the system required the following steps:

1) elaboration of assumptions to the costing model,
2) defining the model of the costing system with the adoption of ABC,
3) implementing the model in the IT environment,
4) preparation of input data required for the costing procedures,
5) inputting data, calculating unit costs and interpreting the results.

For the sake of the model the following assumptions for a hypothetical university have been made:

- university leads just one curriculum called "Business Administration",
- studies last 3 years (6 semesters) and are possible in the regular or weekend way,
- management bodies of the university are the Principal, the Dean and the Chancellor,
- administration units are: Dean's Office, Finance and HR Department, Maintenance Department, Social Department, and the Library,
- university hires all offices (for the management and administration),
- the university rents all teaching rooms (three lecture theaters, one large and two smaller, three class rooms, one language laboratory, two computer laboratories, three laboratories and one gymnastic facility),
- teaching staff is: 8 professors, 30 PhDs, 24 MSc fellows,
- administration staff is 18 people in total,
- remuneration of tutors depends on teaching hours delivered and their position in the hierarchy.

The presented ABC model for costing education services consists of:

- 23 GL accounts for posting costs by nature;
- 16 types of resources in 6 groups (teaching staff, the Principal and Dean office, Finance and HR, Allumni Career and Marketing Center, Library and teaching rooms);
- 5 processes (including: 2 educational processes for both regular and weekend studies, „Strategy" process, Student Services" process and „Administration Activities" process);
- 12 cost objects (a particular cost object is each of 6 semesters during both regular and weekend curricula);
- 697 costs flow paths with over dozen of resources cost drivers and activity cost drivers.

Subsequent steps of the ABC model implementation to the IT system will be presented in point 4 of this text.

The preparation of input data necessitated making detailed assumptions concerning the costs by nature. In particular, salaries for teaching, administrating and managing staff, rentals for infrastructure and amounts of other costs (e.g. office stationary, telecommunication, marketing and promotion) have been estimated. In order to apportion costs by nature to the university resources defined in the ABC model it was crucial to estimate square meters of teaching and office areas, the number of computers and phones installed in every classroom or office room and to establish certain bases for natural costs apportionment, such as for example marketing, stationary, utilities or outsourced services, to the university resources.

As far as the assignment of resource costs to activities is concerned, it was necessary to assume the number of teaching hours for every single course, and the lecturers designated to deliver courses, the teaching rooms to be occupied for each course. Another crucial information that influences the number of hours realized in the form of tutorial classes or laboratory classes was the number of groups the students were divided into.

In the case of assigning activity costs of courses to cost objects the number of teaching hours of each course realized in each semester was needed. In order to allocate costs of other activities to cost objects the number of students during each semester was required.

The final step of the entire project was to put the assumed data into the model, launch the costing procedure and interpret the outcomes.

4 Implementation of the Model in the IT Environment

OROS Modeler was the IT environment upon which the model has been based. This tool is now part of *SAS Activity Based Management* software package developed by SAS Institute and is said to be one of most popular tools of the stand-alone type for ABC modeling.

The implementation of the model in the OROS Modeler was carried out in the following steps:

- defining GL cost accounts for costs by nature;
- defining a cost center for each group of resources and a cost account for each item of resources;
- defining a cost center for each process and a cost account for each activity,
- defining a cost center for each group of cost objects and a cost account for each cost object,
- defining resource cost drivers and activity cost drivers,
- assigning costs by nature to resource cost accounts;
- defining cost flow paths from resource cost accounts to activity cost accounts;

- defining cost flow paths from activity cost accounts to cost object accounts.

The Figure 2 depicts the structure of adopted cost accounts in the "Resources" unit and the Figure 3 – in the "Activity" unit. The "Cost Objects" unit looks similar.

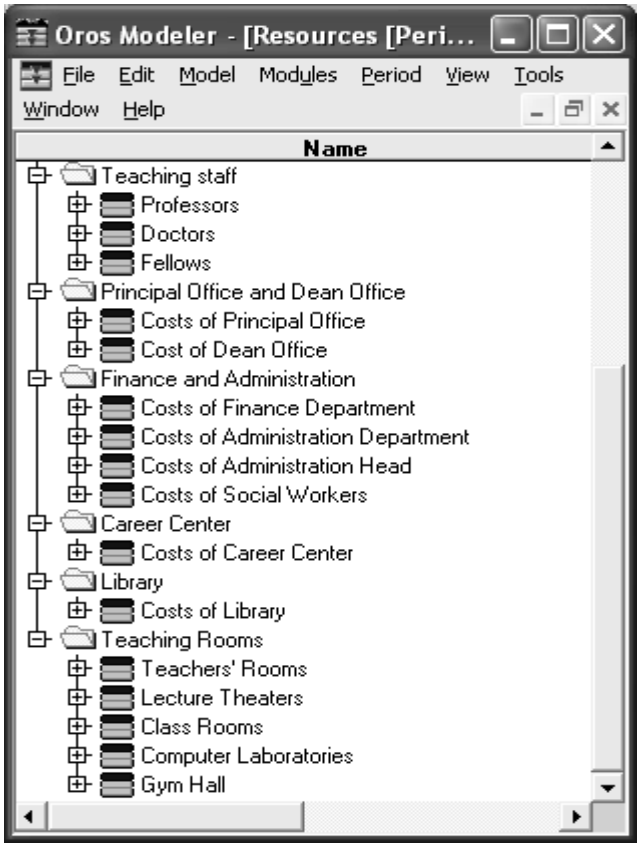


Figure 2. The "Resources" unit

In the next step, cost allocation paths with suitable resource cost drivers and activity cost drivers have been defined. A cost allocation path shows how costs flow from resource cost accounts through activity cost accounts to the accounts of cost objects. Examples of cost assignment paths with linked drivers are given in Figures 4 and 5.

In the last step of the model implementation in the *OROS Modeler* environment the unit presenting "Education Unit Costs" was prepared. It was designed by adding two additional columns, i.e. „number of students" and „unit costs" to the „Cost Object" unit.

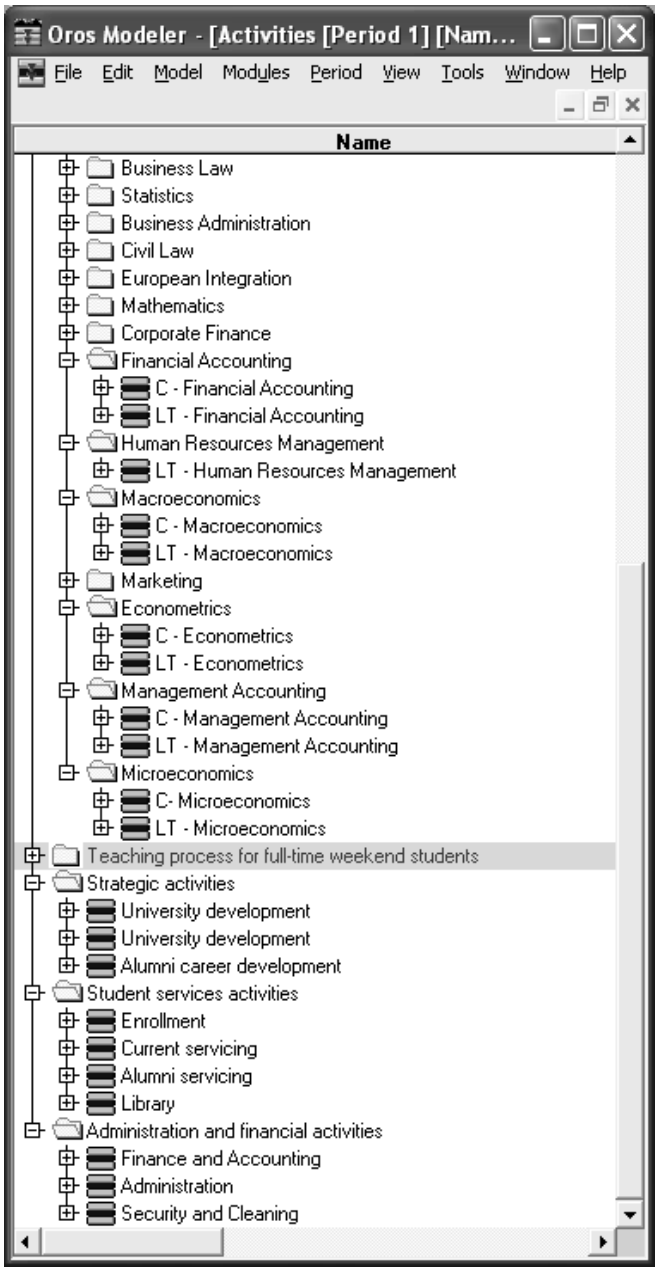


Figure 3. The "Activity" unit

After the structure of the model had been designed, which means that cost centers and cost accounts for resources, activities and cost objects had been defined and cost flow path had been depicted, the following data have been prepared and input to the computer:

- the amounts of natural costs which were estimated upon underlying assumptions;
- the values of resource cost drivers , i.e. cubic meters of teaching and office areas, percentages of apportionment of several natural costs to resources, number of telephones, computers and employees in particular organizational units, hours of usage of

teaching rooms by particular courses, teaching hours for particular courses;

- the values of resource cost drivers, such as the number of teaching hours for particular courses during each semester which was required to allocate the costs of delivering courses to semesters, and the number of students in particular semesters which was necessary to allocate costs of other activities;
- the numbers necessary to calculate the unit student costs, i.e. the number of students in particular semesters of regular and weekend studies.

After having input the above mentioned data, the calculation functions have been launched. This resulted in obtaining the unit cost per student of both regular and weekend curricula. The outcomes of the costing procedure have been showed in the Figure 6.

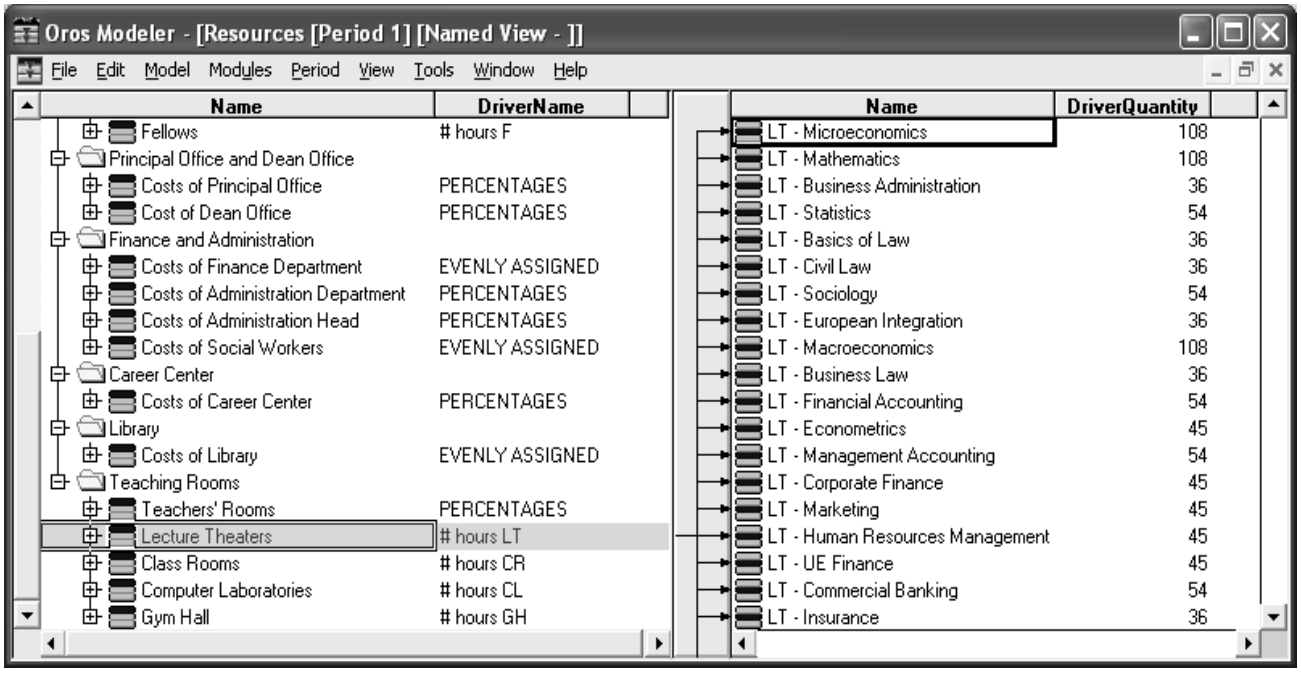


Figure 4. The Example of Allocation from Resources to Activities

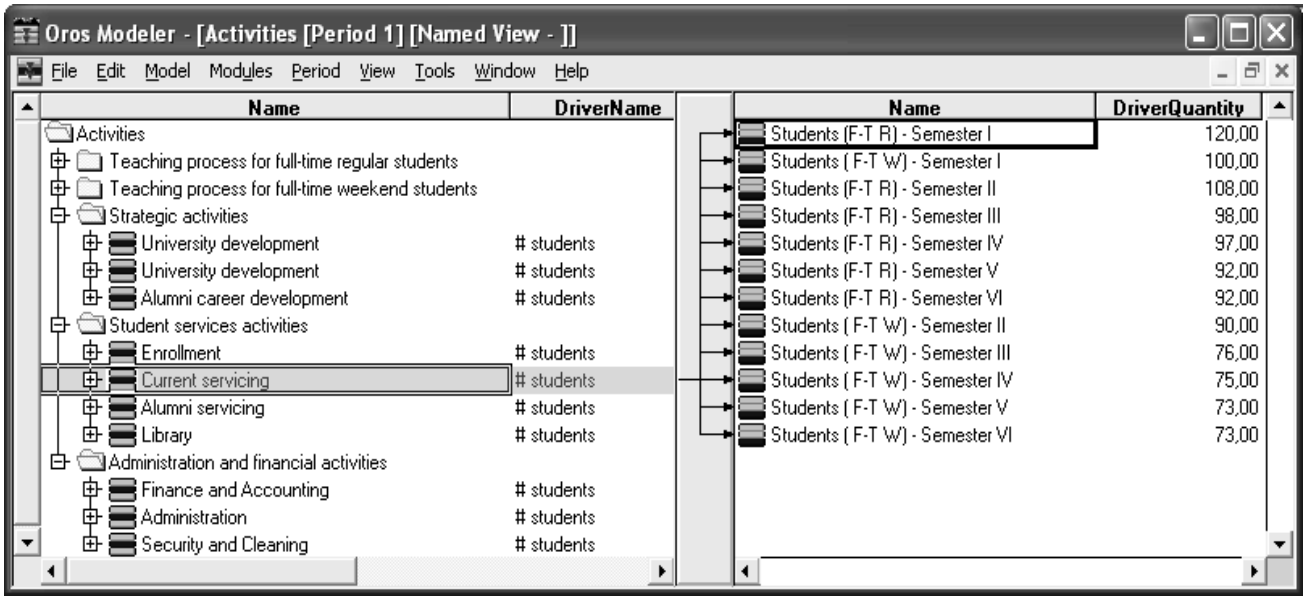
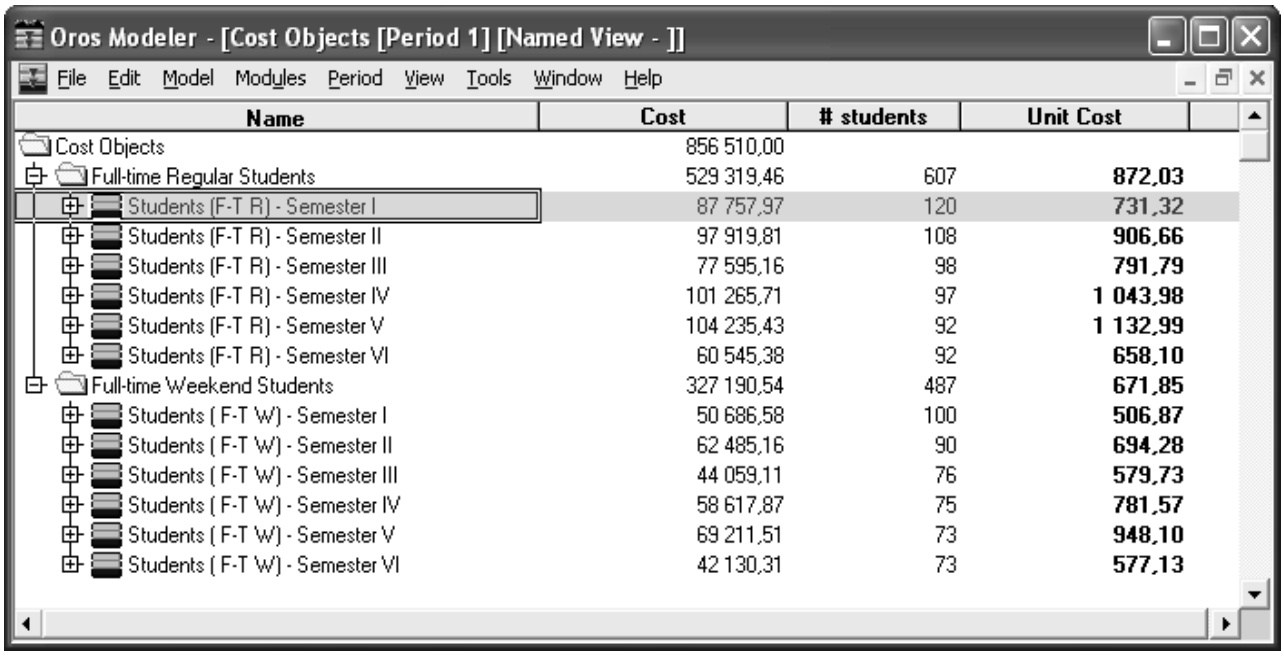


Figure 5. The Example of Allocation from Activities to Cost Objects



Name	Cost	# students	Unit Cost
Cost Objects	856 510,00		
Full-time Regular Students	529 319,46	607	**872,03**
Students (F-T R) - Semester I	87 757,97	120	**731,32**
Students (F-T R) - Semester II	97 919,81	108	**906,66**
Students (F-T R) - Semester III	77 595,16	98	**791,79**
Students (F-T R) - Semester IV	101 265,71	97	**1 043,98**
Students (F-T R) - Semester V	104 235,43	92	**1 132,99**
Students (F-T R) - Semester VI	60 545,38	92	**658,10**
Full-time Weekend Students	327 190,54	487	**671,85**
Students (F-T W) - Semester I	50 686,58	100	**506,87**
Students (F-T W) - Semester II	62 485,16	90	**694,28**
Students (F-T W) - Semester III	44 059,11	76	**579,73**
Students (F-T W) - Semester IV	58 617,87	75	**781,57**
Students (F-T W) - Semester V	69 211,51	73	**948,10**
Students (F-T W) - Semester VI	42 130,31	73	**577,13**

Figure 6. The Teaching Unit Costs per Student

5 Conclusions

The results show a significant difference between education cost of students of the regular and weekend types. The teaching process of regular students turned to be 62% higher than that of weekend ones (529 319 PLN for regular study compared to 327 191 PLN for the weekend one), the main reason being the limited number of teaching hours delivered to students of the weekend education. The difference is much lower if we take into account an average teaching cost per student per semester which is 30% higher in the case of regular education (872 PLN to 672 PLN). This is mainly due to a higher number of weekend students than those of regular type.

Significant differences between the total and unit cost of education in relation to particular semesters can be observed as well (Figure 6). In the case of regular study the highest unit cost is for semester 5 which is by 72% higher than that for semester 6. Even bigger differences occur for weekend study, where the most "expensive" semester 5 is by 87% more expensive than the "cheapest" semester 6. The spread in total cost of education between different semesters mainly results from two reasons: first, various numbers of teaching hours for each course and second, delivering courses in the form of tutorial classes and laboratory classes. The latter brings about a rise in the number of student groups and in consequence augments the numbers of hours and thus the amount of education costs.

In the authors' opinion the costing methodology described above can be a basis for shaping the pricing policy for a higher education institution.

At the end one specific feature of activity-based costing for higher education institution is worth emphasizing. The model structure is decisively more complex in the part that relates to allocating resource costs to activities and allocating GL accounts of natural costs to GL accounts of resources in comparison to the part which refers to allocating activity costs to cost objects. The latter step of the costing procedure requires only two activity cost drivers, i.e. the number of students for each semester and the number of hours for each course delivered in each semester when a particular course lasts more than a single semester. Costing models for merchandise and production enterprises are usually significantly more complex in both steps of the costing procedure.

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ERP vs BoB: Influence on Performance of SMEs in Malaysia

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Abstract *- In recent years, the business environment has become extremely competitive for small and medium sized enterprises (SMEs). SMEs has began to look into the potential of implementing enterprise software systems in adding value towards their businesses. Thus, the objective of this paper is to investigate whether Enterprise Resource Planning (ERP) or Best of Breed (BoB) system, will lead to better productivity, flexibility and ROI and whether in the process of achieving this outcome, it is moderated by technological, organizational and environmental (TOE) factors. The results revealed that out of three performance measures: productivity, ROI and flexibility, the ERP systems is seen to outperform BoB in terms of productivity and flexibility. Additionally, technological factor is not a significant moderating variable on the differences in productivity, cost and flexibility of ERP and BoB, but organizational and environmental factor is. This study provides an avenue for further exploration on the potential of ERP implementation among SMEs.*

Keywords: *ERP, BoB, TOE, software, enterprise, integration*

1 Introduction

In recent years, the business environment has become extremely competitive, with heightened competition due to the globalization of product markets. To survive, it has become vital to achieve sustainable competitive advantages. Recently, the outsourcing trend to gain competitive advantage and operational efficiencies by multinational corporations (MNCs), have created a new business opportunities for SMEs [13]. Therefore, Malaysian SMEs are benefiting from these opportunities, provided they are able to meet the requirements set by the MNCs and government linked corporations (GLCs). The factors that influence decisions by MNCs and GLCs to appoint SMEs are mainly quality, efficiency, ROI and delivery system. Under this circumstances, both practitioners and researchers have begun to observe the types of enterprise software system which can effectively manage the business operations to help SMEs reduce costs whilst increasing the productivity and quality. The types of software system which are closely connected in improving the business processes among organizations are Enterprise Resource Planning (ERP) or Best of Breed (BoB) system [29]. SMEs view both types of system as strategically important and as a source of enhancing its competitive advantage. As it stands today, SMEs literature lacks empirical evidence that examines which enterprise software system could directly relates to their operational productivity, flexibility and cost. Therefore, this study is an attempt to fill this gap. Specifically, the objectives of the study is to investigate whether ERP system outperform BoB system on operational productivity, flexibility and cost and whether operational productivity, flexibility and cost resulting from engaging ERP or BoB system is moderated by the TOE factors.

2 Literature Review

Enterprise software (ES) systems covers a wide range of business functions and being regarded as one of the most complex and costly implementation in any organizations which could affect the productivity, flexibility and cost factors of an organization [21]. The two predominant approaches currently exist for ES are ERP and BoBs [1]. ERP is the implementation of a software solution from a single vendor that provides functionality and interconnectivity across all departments of the company where else BoB is the implementation of multiple software applications from different vendors, each providing optimal functionality for operations and creating interconnectivity within the company [30].

Many aspects need to be considered during the implementation phase. The need for ES to be aligned and fitting with overall company strategy towards increasing efficiency and produce a good ROI is important [9]. Many company has failed to maximize the return on investment (ROI) from the enterprise software systems due to a poor implementation strategy [4]. As an example even multinational companies such as Aerogroup, Boeing, Dell, and Foxmeyer were plagued with ES implementation crisis [23]. Therefore, it is crucial that the chosen ES, the modules implemented, the modifications and customizations undertaken, and the link to existing legacy systems, if applicable, be carefully considered. The final implemented design of the ES should then be able to effectively support the company's goals, reflecting its requirements, constraints, and peculiarities. For example, Berry and Hill [2] stressed the need for manufacturing planning and control systems to be aligned with productivity, while Gattiker and Goodhue [11] presented a model of the organizational impacts of ES once the system has gone live based on flexibility and costing.

Enterprise systems (ES) are complex and their implementation can be a challenging, time consuming and expensive undertaking for any company [5, 10, 21]. Additionally, there is no guarantee of a successful outcome, even with significant investments in time and resources [14]. Therefore, it is crucial that the chosen ES, the modules implemented, the modifications and customizations undertaken, and the link to existing legacy systems, if applicable, be carefully considered. The final implemented design of the ES should then be able to effectively support the company's goals, reflecting its productivity, flexibility and cost [21].

Many aspects must be considered when implementing and designing an ES. For example, whether the system is adapted to the firm's processes, or whether the processes are modified to fit the system, is an important decision that can have long-term ramifications on the productivity of the system [24]. Similarly, whether to maintain legacy systems whose processes cannot be replicated in the new ES, as well as their potential interlink with the package ES, is a choice that needs to be made. Furthermore, the selection of the system provider, and the implementation of a single system or the practice of a best-of-breed approach needs to be well thought-through as it involves a check on the flexibility [28]. Above decisions should result in an ES that is ideally suited for the company, fitting its unique needs and objectives [20]. However, depending on the firm's situation, the structure of the system can become quite complex; for instance, when legacy systems have to be interlinked with new components [28]. As ES evolve and grow over time, this complexity can increase exponentially. Therefore, based on the above studies ES has contributed towards productivity, flexibility and cost and hence decisions to implement ES must be carefully evaluated to ensure it meets the relevant objectives [20].

2.1 ERP

Integrated ERP systems are single integrated enterprise applications that are purchased from a single vendor and provide a broad functionality and interconnectivity across all departments of the SME [8]. This type of enterprise application can provide an opportunity for the SME to eliminate inefficiencies through the implementation of new work systems [19], may offer a broader functionality for the operations of the SME, and assist in the creation of work processes that might have not otherwise been considered [3, 7]. There are significant benefits for an SME that has informal operational processes, as the ERP system can provide new processes and increase structure.

If implemented correctly, an integrated ERP system can offer operational efficiencies, reduced staff requirements, and the ability to improve information technology capability seamlessly through vendor supplied upgrades [19]. The benefit of implementing an ERP system can be great, as an organization has to maintain a relationship with only one vendor, the vendor provides services to implement, maintain and upgrade the system and as such, the organization does not need to rely significantly on internal information technology expertise [19]. The information technology expertise that will be required in the operation of the ERP system will necessitate only a single skill set from the information technology department and therefore, potentially require fewer employees in the management of the system. For an SME that is focused on outsourcing, does not want to invest in the development of internal information technology expertise, and does not mind the control of daily operations being in the hands of an external party [25], the ERP system should be considered.

Despite the ability to integrate functionality from each department and improving efficiency, it has its disadvantages. Emphasis has been placed on the benefit of dealing with a single vendor; however, should this vendor be unresponsive, inefficient, or financially unstable, the SME could be left with an ERP system that no longer has optimal utility [8]. By placing the functionality of all operations in the control of a single application and a single vendor, the SMEs do face some information system risks. Furthermore, ERP is not easily modifiable and could pose a challenge during new product launches, new acquisitions and other activities [3].

In order to obtain the full benefits of the ERP system, the recommended implementation plan for all organizations is adaptation of 'best-practices work model' approach to accommodate the functionality of the software. However, in order to adopt such an approach, SMEs must have sufficient resources and time to review their business processes.

2.2 BoB

The BoB system offers functionality through the implementation of multiple software components from different vendors. Each of these applications is developed by a vendor who is generally focused on one business problem and as a result, BoB systems can provide a very rich functionality for each business process [3].

The main advantage of the BoB system is its' flexibility and the ability to choose a collection of software applications that may each individually suit a need of the SME [19]. The BoB system does not demand the employees of an organization to change their business process and roles but instead the software will be fine-tuned to meet their tasks.

In order to effectively implement a BoB system, there must be an information technology infrastructure in place. Without the existing hardware, software, and internal information technology expertise, implementation of a BoB system would be very expensive as this infrastructure would need to be developed [25]. The disadvantages of the sytem is that the organization need to maintain the interconnectivity of

a variety of application and this requires different skills and knowledge [19]. Hence, usage of BoB could increase the cost in long term due to recruitment, training and renewal of multiple software licensing [3].

Another factor that must be accounted for by the SME in implementing a BoB system is the requirement to work with and facilitate cooperation among multiple vendors. BoB systems necessitate the development of relationships with multiple parties on the part of the SME, and require BoB vendors to work together to create interconnectivity [8]. Despite the potential costs of working with multiple vendors, the SME does mitigate risk when implementing a BoB system, as the demise of one vendor or one application is not likely to denote the failure of the entire system [19].

2.3 ES Adoption Framework

The TOE framework argues that ES adoption is strongly influenced by three factors; technology, organization and environment [27]. Since its establishment, many studies have used the TOE framework as an ES Adoption Framework to evaluate the performance of ES towards the business objectives e.g. [22, 18, 17, 12, 3]. Some studies have modified the TOE framework to suit their research needs in the area of Enterprise Information system [19]. The intent of the study is to answer the questions pertaining to the SMEs' productivity, flexibility and cost implication of adopting the ERP or BoB within their businesses. In order to produce high-quality product or services as well as business diversification, it is essential that the enterprise software provides a competitive levels of productivity, flexibility and cost.

Hypothesis 1: ERP and BoB implementation will result in different level of operational productivity, flexibility and cost.

In this study, the ES selection and performance relationship were moderated by the TOE factors. The selections of these two elements are largely based on the literature review. Other elements, which may have impact on the relationship, are the company policies and international exposures. However, they are not widely discussed and supported in the literature and hence are excluded in this study.

Hypothesis 2: The impact of enterprise software selection strategy on operational productivity, flexibility and cost are moderated by TOE factors.

The technological factors, which is making major breakthroughs among SMEs will ultimately, determines the labor productivity and other inputs. It is one of the three competitive forces that were introduced by Tornatzky and Fleischer's [27]. Usually SMEs will go through several levels of ICT implementation. Recent advances in technology have had a huge impact on the value chain [26]. IT affects the firm at all levels: from primary activities, including the likes of automated warehouses, flexible manufacturing, automated order processing, telemarketing and computer scheduling and routing of repair trucks; to support activities, such as planning models, automated personnel scheduling, computer-aided design and online procurement of parts. The enterprise software system allows businesses to reduce operational costs by decreasing material, procurement and transaction costs, resulting in lower prices for intermediate and finished goods, and ultimately improves their value chain [7].

Hypothesis 2a: The impact of enterprise software selection strategy on operational productivity, flexibility and cost are moderated by technological factors.

Kuan and Chau [17] considered organizational elements such as financial readiness and human resource readiness, as perceived ones. Also, fast communication, proper structure to implement, enough financial resources, rich and competent knowledge and skills, and top management support are examples of organizational readiness. Organizational readiness, as perceived measure, will have positive impact on the attitude towards the selection of enterprise software adoption [16].

Hypothesis 2b: The impact of enterprise software selection strategy on operational productivity, flexibility and cost are moderated by organizational factors.

Many companies are willing to adopt enterprise software system not only because of internal capability but also because of environmental factors [15]. According to Stratman & Roth [26], external pressure refers to influences from the organizational environment. Thus the external pressure and support will have an impact on the attitude. A higher level of external pressure and support will have positive impact on the attitude toward the selection of enterprise software system and its adoption [5].

Hypothesis 2c: The impact of enterprise software selection strategy on operational productivity, flexibility and cost are moderated by environmental factors.

3 Research Methodology

Generally, organization practice mixed ICT implementation strategies depending on its operating environment and the perceived benefits that the new software system will bring along with the type of implementation strategy being adopted. The literature review thus far concentrated on the perspective of productivity, flexibility and ROI dimensions at product or component level when ERP or BoB system is empirically tested against those performance dimensions. Hence, the following diagram can depict the theoretical framework for the study.

Even though it is not explicitly cited that ERP or BoB systems give rise to the differences in productivity, flexibility and ROI, however, based on the arguments put forward, it can be indirectly generalized from the literature that ERP and BoB implementation strategy yield different levels of outputs in terms of productivity, flexibility and ROI.

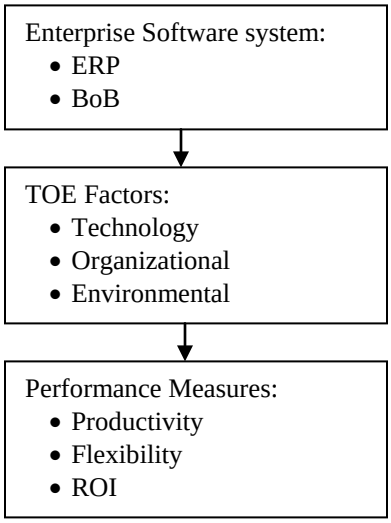

Figure 1: Conceptual Model

Table 1: Profiles of the respondents and organizations

Profile	Description	No. of respondents	%
Designation	Manager	67	55
	Executive	54	45
No. of emp	Less than 100	45	37
	101 - 300	60	50
	More than 300	16	13
Equity struct	Local	59	49
	Foreign	37	31
	Local and foreign	25	21

3.1 Method

The population for this study consists of SMEs located in Klang Valley, Malaysia comprising both manufacturing and service based industry. The population frame is drawn from about 150 companies listed in the SME Directory published by SME Corporation dated March 2009. The objective of this study is to identify which enterprise software system strategies, ERP or BoB, will yield greater level of productivity, flexibility and ROI. Therefore, the samples of interest in the population will be restricted to those organizations that practices both ERP and BoB for the same or similar type of departments. The data of SMEs' productivity, flexibility and ROI were collected at departmental level. Hence, each organization selected may response to more than one questionnaire.

The design of the questionnaire is primarily derived from the issues and questions raised in the literature. Section A consists of five general questions where respondents were requested to provide some general information pertaining to individual and organizational profile. Section B has six questions dealing with the same or similar departments where the firms have implemented a partial of ERP and a part of BoB system. Section C with 13 questions, measuring three performance dimensions with ERP implementation. They are related to productivity, flexibility and ROI measures. Section D consists of identical questions set as Section C with the respondents are now requested to rate the BoBs. Section E contains six questions of the TOE factors related to the identified departments. Each item is also measured on a 6-point Likert scale anchored by 1 (Strongly Disagree) and 6 (Strongly Agree).

So as to ensure the reliability of the measures, the multiple statements dealing with enterprise software systems' productivity, flexibility and ROI as well as TOE factors were first assessed for reliability using Cronbach's alpha. The reliability coefficient obtained ranges from 0.78 to 0.92 indicating acceptable reliability (Nunnally). Data collection is accomplished primarily by email and by personal delivery.

3.1.1 Respondent and Organization Profiles

A total of 150 questionnaires were sent and only 121 were collected from the respondents in this survey. Table 1 provides the descriptive statistics for the sample.

Table 2: Departments and Enterprise software profiles

Profile	Description	No. of respondents	%
Depts	Production	30	25
	Finance	39	32
	Inventory	23	19
	Sales	15	12
	Others	14	11
ERP	Local	10	15
	Foreign	25	38
	Both	31	47
BoB	Local	13	24
	Foreign	19	35
	Both	23	42

4 Data Analysis and Findings

4.1 Descriptive Analysis

It can be seen that the mean on technological influence is rather low (below than the average-2.83) on a six-point scale, indicating that the current ICT infrastructure in the firm's departments play a limited role in the selection of enterprise software system. The mean for ERP's ROI and BoB's flexibility are about the average. The rather high mean of ERP and BoBs' productivity indicates both the software are producing efficient productivity rate in the departments. Additionally, high mean of ERP's flexibility imply that ERPs increases the flexibility in business process reengineering compared to lack of scale of flexibility as been mentioned in the literature review. Finally, the mean of 4.39 for organizational factor indicates that selection of enterprise software generally depends on the top management support and organizational readiness in adopting enterprise system. Subsequently, the ERP's ROI has the lowest mean indicating that the respondents have difficulties to meet the ROI for ERP implementation compared to BoB. The standard deviation for all variables is very small, indicating that most respondents are very close to the mean of all variables.

Table 3: Description of the composite variables

Variable	Means	Standard Deviation	Variance
ERP			
Productivity	4.56	0.96	0.92
Flexibility	4.20	1.03	1.06
ROI	3.97	0.91	0.83
BoB			
Productivity	4.17	0.93	0.85
Flexibility	3.64	0.89	0.75
ROI	4.01	0.92	1.02
Business Environment			
Technological	2.83	1.41	2.00
Organizational	4.39	0.87	0.76
Environmental	4.25	0.85	0.75

4.2 Impact of ERP and BoB system on Productivity, Flexibility and Cost

Each respondent is requested to rate the ERP and BoB for the same or similar departments, which the responding organization implemented partial ERP and partially from BoB related system. The performance measures are with respect to productivity, flexibility and ROI. The parameter of interest is whether firms that use ERP or BoB will result in different level of enterprise softwares' productivity, flexibility and ROI. The performance is the difference between the performance of ERP and BoB among the SMEs. Table 4 summarizes the paired sample t-test for the differences in system performances from the two enterprise software. On all measures of performance, ERP has outperformed BoB except for ROI.

Table 4: Summary of the paired samples T-Test

Performance Dimension	Mean rating		p-value
	ERP	BoB	
Productivity	4.5634	4.1683	0.000
Flexibility	4.1998	3.6402	0.003
ROI	3.9682	4.0092	0.001

4.3 Impact of ES Selection Strategy through Moderating Factors

To test hypotheses 2, 2a, 2b and 2c, the differences in performance of ERP and BoB were regressed against the moderators, technology, organization and environment. Table 5 further tabulated the results. In terms of flexibility all the moderators were not able to explain the variations in the differences in performance. However differences in productivity and ROI performances can be explained (approximately 60% of the variance) by the moderator variables. In particular we found that differences in enterprise softwares' productivity and ROI is negatively correlated to the organizational and environmental factor. This implies that the greater the influence of organizational and environmental factor, the greater the differences in productivity and ROI between ERP and BoB implementation. Hence, Hypothesis 2b and 2c is supported.

Table 5: Summary of the regression analysis amongst the variables

Attr	Difference in productivity		Difference in flexibility		Difference in ROI	
	Beta	Sig. T	Beta	Sig. T	Beta	Sig. T
Tech.	0.185	0.094	0.269	0.831	0.103	0.311
Org.	-0.003	0.000	-0.127	0.104	-0.692	0.000
Env.	-0.004	0.091	0.190	0.799	-0.103	0.342
R^2	0.114		0.104		0.610	
Sig. F	0.000		0.246		0.000	

*p-value < 0.01

From the result of the paired-samples t-test, it can be concluded that ERP implementation resulted in better productivity and flexibility. This seems to be inconsistent with other studies which explains that ERP has failed in being flexible towards the changes in operations. While the performance dimensions are different, the increased in market performance have been quoted by [13], citing that when a firm implement ERP system, it will provide the firm with potential single vendor advantages, assurance in quality through efficient and productive business process and delivery. Contrary to Nah et al. [22], technological factor is not a significant moderating variable, between the relationship of ERP and BoB selection strategy. The differences in ERP and BoBs' ROI and productivity are influenced by the organizational and environmental factors. The greater the organizational and environmental influence, the larger will be the difference in productivity and ROI between ERP and BoB.

5 Conclusions

Generally, the findings of this study are consistent with the literature, with ERP resulting in better productivity and flexibility as opposed to BoB. The literature have stated that BoB is much more flexible compared to ERP. Possible reasons for ERP being more flexible in this study could be due to the new generations of ERP systems being introduced by vendors such as SAP and Oracle which are more customizable and flexible. It should also be noted that most of the SMEs were having difficulties to meet their ROI expectations. The organizations may not be aware that ROI comes from the process improvements supported by ERP and hence if their business processes continue to be the same as in the pre-ERP days, it will fail. Thus they could have implemented inconsistent ROI expectations based on the wrong performance metrics. Hence, the organizations need to review their business process to suit the ERP model to gain a good ROI. This study also found that the difference in ERP and BoBs' ROI and productivity is influenced by organizational and environmental factor. A strong top management support, project team competence, interdepartmental communication, global business exposure and pressure from competitors affects the differences in ERP and BoBs' productivity and ROI. It is likely that if the companies have excess capacity, expertise and resources available for investment, they will opt for an ERP system. As with any studies, there are limitations in this study. The study used the key respondent approach to capture the relevant information. The responses could differ if they were answered by other personnel such as IT executives or users. A cross-validation with different group of respondents would have increased the robustness and confidence of the empirical results [15]. The findings in this study have both theoretical and practical implications. In theoretical context, this study extends a conceptual framework to analyze the selection and implementation criteria of ERP and BoB. In practical sense, the findings highlighted that ERP implementation success among SMEs requires diligent management of organization and environmental factors.

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Cooperative Information Technology Strategic Plan as a Service

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Abstract - Information Technology (IT) is the strategic for organizations, however, realizes that lack IT planning, IT governance, capable persons, methods, defined processes, indicators, internal controls, level accord services, information security, legality and economy. Against this scenario, you need a minimum of organization and control to the use of IT resources in order to increase the technical and administrative efficiency with focus on IT governance. The Information Technology Strategic Plan (ITSP) demand to know the necessity and resources of information technology for the organization to give directions for the technological and information architecture to its strategic objective. The Normative Instruction (NI04) forced the Brazilian organizations develop their Information Technology Strategic Plan (ITSP) to purchase products and IT services. In order to assist organizations in the development and control of your Information Technology Strategic Plan (ITSP), began building a service-based tool, available in the Cloud Computind that is a new approach that reduces IT complexity, leveraging the efficient creation of pools of virutual self-managing infrastructure, on-demand and consumed as a service. This article will show a development tool, a real case study and our conclusions.

Keywords: *Information Technology Strategic Plan (ITSP), Cloud Computing, Normative Instruction (NI), Cooperativity.*

1 Introduction

Over the years, many public and private organizations have their areas of Information Technology undervalued, in general, confined to supporting profile [1].

Typically, organizations start to use its technological resources in a natural way, with very poor level of planning where IT decisions are taken isolatedly, for various reasons and persons in its structure. [2]

Still, according to [2] as a consequence of this scenario, we experienced the following situations:

1. Discontinuity of projects by constant changes in priorities and objectives, or necessity to care emergency situations, particularly those that arise from isolated decisions of;
2. Bad sizing of computer resources and human resources to information technology unit
3. Information systems deployed without adequate compliance to the functionality, creating more problems than solutions
4. Desmotivation of involved professionals in the process and the managers, who often decide to reduce their investments in technology.

Nevertheless, the IT strategic plan is put in the background, so to reversal this situation it is necessary to develop a plan that allows to combine the strategic directrix and organizational intelligence to IT actions.

In Brazil, the establishment of a Normative Instruction (IN04), forced public organizations to develop a Information Technology Strategic Plan (ITSP), aligned with the strategic directrix of the institutions. [7]

Looking improve the construction process and its monitoring of the Information Technology Strategic Plan (ITSP), appear the idea of developing a tool to conduct, control and supervise the preparation of ITSP providing services to the tasks in a flexible manner.

Because of the geographical size and diversity of Brazilian public institutions, we chose to use cloud computing as a basis, so that the tool makes available its services in accordance with the necessity of the organization ensuring availability and avoid costly with IT infrastructure for the organization. The covered subjects, the proposal of the tool, the case study, the results and our conclusions will be detailed in subsequent sections.

2 Context

2.1 ITSP - Information Technology Strategic Plan

The increasing changes in the business environment of organizations has led to increased management attention, given to governance and strategic plan. At the governmental level, the big challenge is the use of information technology to improve services to society in terms of innovation, efficiency and effectiveness. The planning of electronic government systems has focused on setting priorities for: the development of new systems, maintenance of existing application and application of new technologies in systems [3].

The Information Technology Strategic Plan (ITSP) aims to guide an organization in the use of their information technology resources, leading to focus on continuous improvement processes of governance. An institution that has prepared her ITSP is based on principles of rationality, economy, uniformity and standardization, creating the technological basis for the deployment with enhanced efficiency and effectiveness of public policies. [9]

The lack of planning for IT can cause an insufficient understanding of the external and internal environment of the organization and emerging technologies that can add value to customer services. This situation can drive to inadequate investment in IT, considering meeting the necessity of the organization to overcome its challenges. In fact, ITSP is a strategic tool to direct and manage information technology resources in alignment with the strategic priorities of the organization's business. [8]

It's important highlight the dynamism of strategic planning due to the fact of the instability of technology environments, which are constantly evolving. Thus, the ITSP should be reviewed annually in order to the strategies are aligned with organizational mission, considering the action of the organ, as well as issues relating to the evolution of technology. [4]

The Secretariat of Logistics and Information Technology of the Ministry of Planning, Budget and Management (SLIT / MPBM) created the normative instruction number 4, May 19, 2008, that organs and entities of the Administration System of Information Resources and Informatics, have service hiring of Information Technology controlled by the normative instruction. The NI 04/2008 stipulates obligation of keeping a ITSP for public organs that wants contract services in a software house.[12]

2.1.1 ITSP Development Models

There are several models for the development of ITSP, including the model proposed by the Microsoft called Microsoft Methodology Consulting Service (MCS) which is based on technical recommendations of COBIT, and developed jointly with partners who specialize in this practice. [9] This model is divided into five phases where each phase has activities related to its responsibility. The first phase deals with the generation of the IT strategic plan, the second includes a survey of IT necssity, the third phase consists in mapping the desired situation, the fourth is responsible for preparing the strategic plan for IT, already the fifth stage is the implementation and monitoring of ITSP.[9]

The proposed model by [11], considers that the development of ITSP consists on three steps. The first step is the preparation which is elaborated throughout the framework to create a ITSP, the second step is to diagnose the current situation, where the organ has an exact notion of your stage, and the necessity are raised The final step is the planning of the desired situation which is the time of elaborating the ITSP. [11]

2.2 Cloud Computing

Cloud Computing is seen as an architecture or a model in which various computing resources, such as software, processing and storing data that is available on the Internet, aiming to provide resources and services to users and institutions. Such resources may be located in more than one geographical location, and users can access them from anywhere by the Internet. [6] One widely used service, which uses the philosophy of "cloud computing"is the webmail.

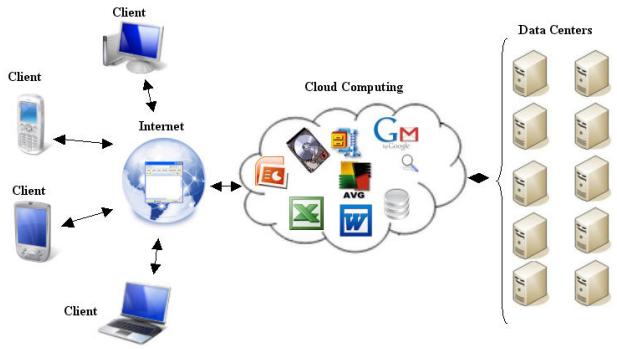

Figure 1 – Cloud Computing

The Cloud Computing architecture works as follows: First, any company interested in providing this type of service provides your applications in the network hosted in various data centers around the world. These services can be accessed from anywhere, reaching thousands of users. [5] One exemple of the companies that provide this kind of services is the Azure Services Platform, Microsoft, which provides the architecture for cloud computing that other companies can offer their applications. With this ready architecture, users can enjoy all the services offered by the cloud computing through a browser for instance.

Some of the services offered by the Cloud Computing model are:

- SAAS (Software as a Service) – Provides a particular application to millions of users who can access it through their browsers, without requiring the user to invest in rugged hardware, software installation and usage licenses;

- Utility Computing – These are packets of computing resources, such as storage and data processing. One of the benefits of this type of service is to reduce the cost of end users with hardware acquisition..

3 ITSP as a Service in the Cloud

3.1 Model

The proposed model provides a flow of activities divided into five steps and organized according to the characteristics of each activity and its chronology. This steps are: preliminary activities, diagnosis of the current state, analyzing and proposing solutions, consolidate the ITSP and approve the ITSP.

In the preliminary activities, the organization initiates the preparation of the structure that will support all subsequent steps. In the diagnosis of the current state is known all the organizational environment, giving an understanding of all integration points, the strengths and weaknesses, even at this step is raised the organizational structure, functions and tasks that make up the whole environment. In the analysis and proposing solutions is done a fusion with the previous step, because the diagnosis of the current state is the starting point to do the lifting necessity. In the following steps we have consolidation and approval of the ITSP.

3.2 Architecture

The tool consists of two main modules: the creation and management. Each module consists of a set of services that enables the creation and monitoring the development of ITSP. The figure 2 illustrates the architecture of ITSP system and how this modules communicate each other.

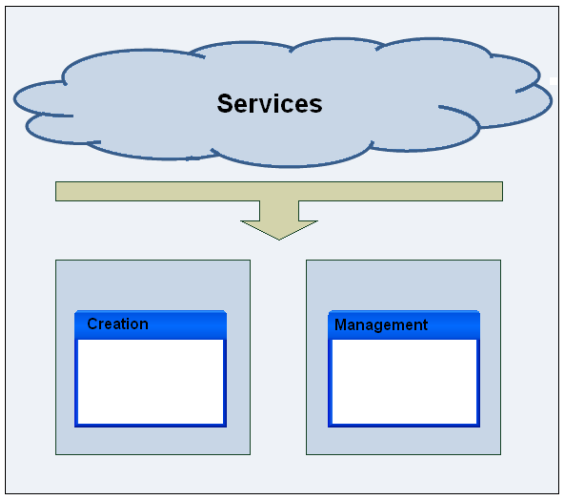

Figure 2 – Architecture

3.3 Proposed Tool

The tool is being developed with the purpose to support, coordinate and monitoring the creation of ITSP cooperatively, so that the managers follow and monitor its development. Another feature of the tool is that although it follows the model described in Section 3.1, it is flexible to allow the deletion of some steps according to the necessity of the institution's ITSP, allowing users to generate their own steps selecting services.

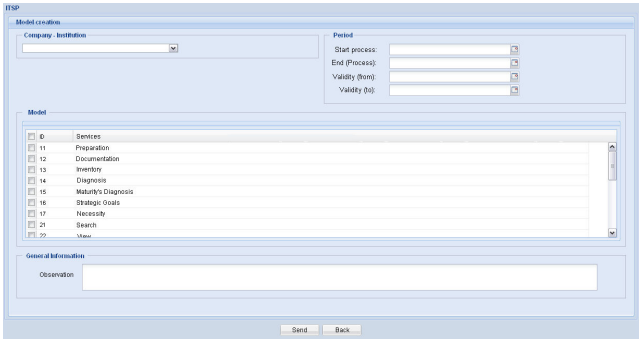

Figure 3 –Model creation

The diversity in size, computational resources and personnel in IT, allies with the difficulties of IT investments by Brazilian government organs motivated the creation of a tool consisting of a set of services available in a cloud in order to ensure flexibility in the development of ITSP, without investments in computing resources.

The final product generated with this tool is the Information Technology Strategic Plan of the institution. The proposed tool will be better detailed in the next chapter.

3.4 Modules

The tool is structured in accordance with the model presented in section 3.1, divided into two independent modules that communicate with each other:

- Construction Module - Responsible for developing the model and the construction of ITSP. In this module are available tools for identifying necessity, identifying the current situation and desired situation of the organ, etc;

- Management Module - Responsible for monitoring and enforcement of ITSP. In this module, are available tools for monitoring ITSP, approval, reporting, fault identification, etc.

3.4.1 Construction Module

The construction module provides an environment where the model for the generation of ITSP is assembled and the chosen services are used. This module is of particular use for the organs and institutions. In this environment, the user can get an overview of the model and monitor its progress. (Figure 4) The construction environment is divided into three parts, services that are on the left side of the screen, the model on the middle and the monitor panel on the right side of the screen.

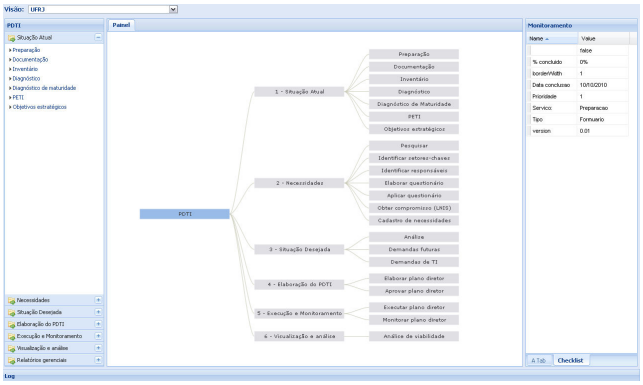

Figure 4 –Construction Module

3.4.2 Management Module

The management module is used by organs that is responsible for receiving and approval of ITSP. One of the biggest benefits that this tool brings to this module is the cooperation, where the organ can follow the development of ITSP and identify potential gaps or impracticality of implementation even before the completion of ITSP. So the whole process becomes faster and less costly.

3.5 Services

The services offered by the tool support all steps of the proposed model. The main services are presented in the table below:

Services
Scope definition
Team definition
Methodology definition
Schedule definition
Questionnaires definition
Inventory definition
Action plan definition
Necessity identification

Table 1 – Services

4 Case Study

This chapter presents a case study where an institution set up its ITSP using the proposed tool in this paper. The result of this experiment was compared with the results of the last ITSP accomplished without the aid of the tool. Finally, a questionnaire was filled by the executors of the process, seeking to assess the benefits of the tool.

4.1 Execution

The chosen institution was The Federal University of Rio de Janeiro whose its goals with ITSP are:

- Providing an overview of the current environment of Information Technology over the problems and difficulties of the priority goals described in the Target Plan;

- Actions establishment for the implementation, dissemination and monitoring of the changes needed to transition from the current scenario to the scenario proposed by the priority goals;

- Provide inputs to make decisions about modifications, improvements or additions to the infrastructure of IT.

The team responsible for developing the ITSP was composed of five people at a strategic level, one representative from each related area to inventory purposes, questionnaires responding and necessity indentification of the areas. Three peoples experts in the ITSP to represent the controller organ. The table below represents those involved in the development of ITSP

Responsibility	Quantity
Preparation of ITSP	5
Related area representants	10 (One representant of each ten related areas)
Controller organ	3

Table 2 – Team

The process began with a survey of the current status of all involved areas, including their necessities, after it was made a action plan to attend the necessities and monitor these changes in the institution. In the final step was established basement for decisions about improvements in IT infrastructure.

The results details of the comparative analysis and evaluation of the tool are described in the next session.

4.2 Results

The results are divided into three types of evaluations:

- Qualitative – in this evaluation was rated the quality of the final product generated with the aid of the tool in the current ITSP and without the aid of the same in previous ITSP;
- Productivity - in this evaluation was rated the productivity gains as reduction of total time in the construction of ITSP;
- Cooperativity - in this evaluation was rated the gains acquire by the cooperativity through the tool.

The qualitative analysis shows that the gains were substantial in percentage terms since the ITSP influences the company's strategic planning. The productivity gained with the tool was extremely important due to noticeable reduction of time spent during the entire process of creating ITSP. Finally, the cooperation shows to be a major factor in the process because it allowed the governing organs to identify faults during the development of ITSP, which was possible only when the process ends without the use of the tool. The table below illustrates the results and benefits that the proposed tool offers us compared with the procedure done without the tool where they are assigned weights ranging from 1 to 10 on each item, the higher the weight, the greater the gain.

Item	With the tool	Without the tool
Practicality	8	6
Spent time	9	5
Cooperativity	10	0
Productivity	7	4
Reliability	9	6
Security	7	5
Cost reduction	9	6
Return	8	7

Table 3 – Gain

Considering the table 3, we can represent the total gain in percentage terms according to the next table

Gain %	
With the tool	83,75 %
Without the tool	48,75 %
Total	**83,75 - 48,75 = 35 %**

Table 4 – % Gain

5 Conclusions

The Information Technology Strategic Plan (ITSP) aims to know the necessities and IT resources of the organization, enabling better management and IT developments necessary for strategic planning and therefore to the growth of the organization

The use of the proposed tool in this work, proved to be extremely important for improving the process of creating the Information Technology Strategic Plan, as it was presented, this tool showed us that the process of creating the ITSP as today, can be improved with the use of the tool.

In a survey conducted in Brazil about public institutions who need to build your ITSP, it was evident the need to have a tool to aid in the process, which raised the interest in using the tool. One other factor that inspire the interest of the institutions to using the tool is that it can be used in a cloud computing environment, which in itself brings great benefits to organizations.

There are some identified improvements points in the tool that already being treated to improve the process of creating the Information Technology Strategic Plan (ITSP).

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A common Document Exchange Model for Matrix Organizations

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Abstract— *Document exchange between diverse department within matrix based organization has been a huge challenge starting the last two decades. Complexity usually arises when an ideal model that deals with the precise exchange of document through different departments is needed. Taking into consideration the case of government architecture frameworks on a common country, exchange of efficient and most precise document is the key for a ideal decision. Document exchange within diverse nodes is still a challenge. In this paper, we propose a general reference model to integrate different documents centers systems working under different government departments. The purpose of this study is to introduce a general reference model to document exchange using meta-data models and software engineering method to build up and keep usable and precise domain ontology in turn to overcome interoperability issues of exchanging documents on a matrix organizations .*

Keywords:
Enterprise Information Systems.Enterprise architecture.e-Business. e-Government. Document exchange

1. Introduction

In a world where IT has become the most vital part of most organization (whether it was medical, industrial...etc) the need for electronic archiving system to replace the typical paper and file systems is urgent, while many organizations have developed their own electronic archiving systems, yet much more are still using the old typical papers and files systems or at most a very simple archiving systems that are based on scanning the papers and organize them into folders. Such idea might be useful for the time being but it will not be as good in the near future, the main problem with electronic archiving existing Systems is that each system operates individually and the systems cant exchange information or documents since there is no common to interface among these different systems to support data migration and retrieval. Most existing systems concentrate more on preserving data which is the main point of archiving but also they miss the need for communication specially in matrix based organization, data might be needed at more than one site so it will more convenient to establish a model that makes it easier to accomplish that, the system in [1] only address the problems of data preservation and site failure with no ideas about exchanging data or make them available for many sites, other systems like SAP data archiving pays more attention to the size of data stores, security issues and data handling [2], and takes no consideration to data exchange and communication within matrix based organization. Other point of concern would be the metadata, its well known that in order to retrieve data you will need to know some information about it and the way of how is stored into index, in the existing models this will depend more on the personal who would index the data but in the proposed model there are more than one step to achieve a better indexing method which will make data more available and with less efforts.

2. Matrix Organizational Structure

Assigning specialist from various departments to work on one project or more is the definition of matrix organizational structure [3]. In this structure, working on one project can be divided into sub groups which belong to deferent departments (for example department of treasury and department of foreign affairs). Each sub group has a project manager and functional manger as well. In order to work effectively, both mangers have to communicate and share their opinion [3].since projects can be divided over multi departments, the whole organization can work on multiple projects at the same time Fig.1 shows how goals can be achieved.

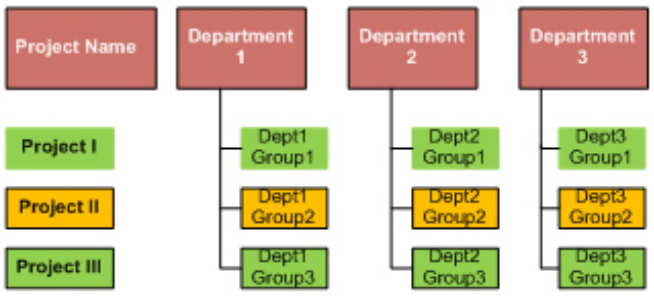

Fig. 1: shows the matrix organizational structure

Achieving Project1 goals can be done by working Dept1-group1, Dept2-Group1 and Dept3-Group1 with each other as illustrated in Fig.1. This organizational design can improve effectiveness and efficacy by maintaining the division of labor.

3. Resource Description Framework

The Resource Description Framework(RDF) is a model that describe information about resources over the web. This information[4][5][6], can be used to extract knowledge and classify the data to use it in easy way.RDF is used by crawlers or web spider to classify the data in order to build a strong ontology data base.RDF usually is written in XML format[5] there for, it is OS independent. Suppose we have a car, it already has been made by make and has owner, we can represent this information in RDF format in order to use it smoothly, in figure2 we gave a simple example of how would RDF be represented.

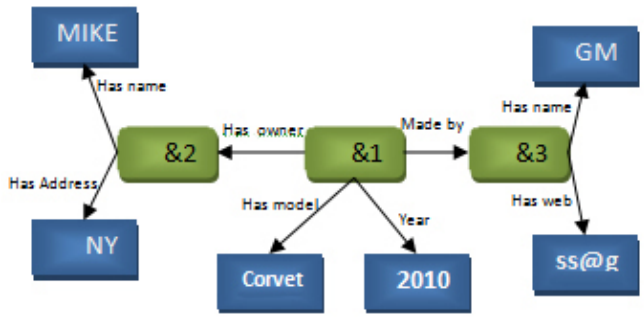

Fig. 2: a simple example of RDF

4. Web Crawlers

WebCrawler or Web Spider is web based service that allow user to find their need on the web by creating index of the web and passing their quires to that index [7].when user want to search for a site, he send his request to the server and in turn, it request the reference of the wanted data then retune it to the user Figure3 describes these operations.

Fig. 3: an example of simple Web Crawler

As it appears in Fig. 3, crawler always brows web documents and make index for each one then it store the result of crawling in the database.

5. Ontology

The area of ontology is the study of the classifying of things that can be found in some domain [8]. The result of such a study, in other words, is the method of classifying objects, features and characteristics according to their attributes and relations. Such classification can be donated as cataloging or indexing. Ontology is useful in data retrieval since all objects are classified and ordered into a recognized pattern, this will minimize the user effect. For example, most electronic archiving systems allow users to choose attributes for the objects; these attributes will vary depending on the user background among other factors. Using ontology reduces these effects and aids the process of having a unified indexing or archiving model which will help increase the rate and accuracy of data retrieval. An informal ontology may be distinguished by a catalog of types that are either defined or undefined only by statements from a natural language processing area. On other hand, formal ontology is specified by a relation types and collection of names for concept and organized by partial ordering by the subtype -type relationship. Furthermore, Formal ontology is distinguished by the way the super types are distinguished from their subtypes [8]:

5.1 Axiomatized ontology

Distinguishes subtypes by axioms and definition declared in a official language, such as logic or some computer-based notation that can be translated to logical information.

5.2 prototype-based

A type of ontology that distinguishes subtypes by a comparison with a typical member or prototype for each subtype. Large scale ontology frequently use a mix of definitional procedures and formal notations.

6. IDEF

Stands for Integrated DEFinition, it is a type of modeling language that is widely used in Software Engineering and IT and, used to state knowledge or information or systems in a structure that is declared by a consistent set of rules. The rules are used for explanation of the implication of components in the structure. [9]

7. Proposed Model and approach

Document exchange process can be considered more efficient with using distributed systems model, this will decrease count of transactions and utilize less failure. Document exchange process can be divided into two stages, Crawling and classification stage and Handling userâĂŹs query stage, these stages are described as follow:

7.1 STAGE I (Crawling and classification)

The web spiders access the RDF information periodically in order to index and classify each object, then The IDEF uses the index generated by the web spiders to unify an ontology extraction method out of these indexes. The unified ontology is refined by ontology development stage. At each site, documents are stored using its reference then that references is broadcasted at a defined span of time in order to update each site reference.

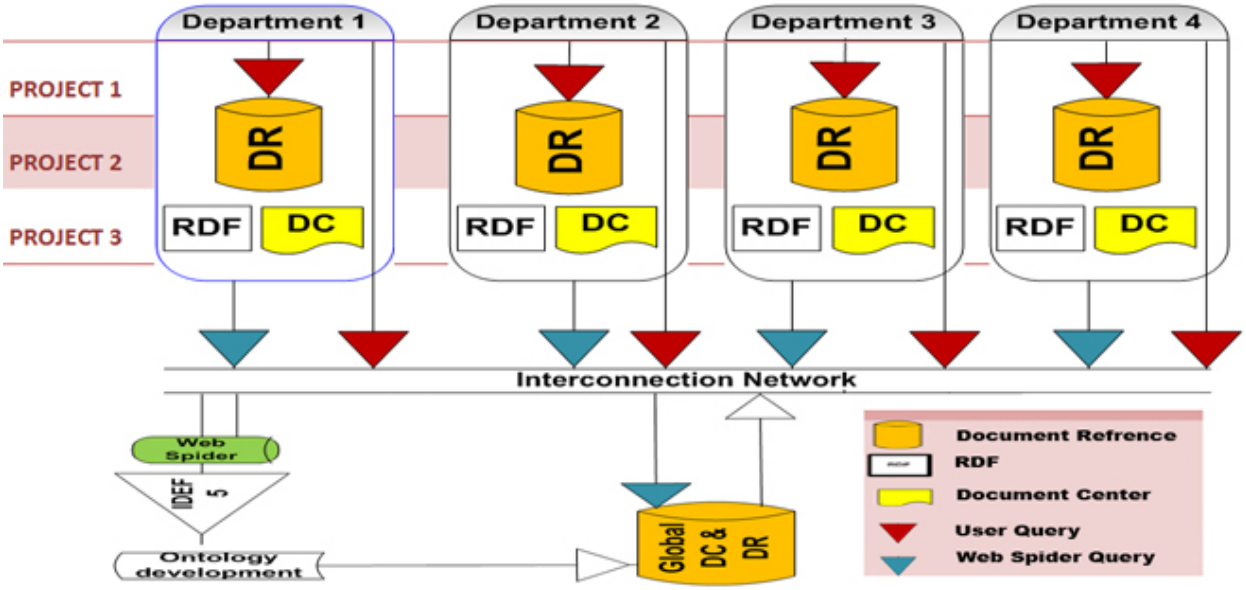

Fig. 4: Proposed Model and approach

7.2 STAGE II (Handling user query)

Each user queries are sent to their department reference database, if the local database contains the document, then the user will be redirected to that document. If the document is not found, then the query is redirected to the Global Documents Reference (GDR), if the desired document is found at the GDR, it will be retrieved to the initiator. If no document was found at GDR, then the document was not found in the system at all.

8. Conclusions

The proposed model in this paper solves many problems that exist in the current electronic archiving systems and also provide a solution to many challenges of the modern electronic archiving systems [10]. The proposed system accomplished the following: 1.Since data will be stored in a global directory and also in a local directory, the possibility of data loss is near zero with more than one site that is preserving data. 2.The number of communications is reduced due to the existence of local and global directories, each site will try to obtain data from its local directory before accessing the global directory which will reduce communication to minimum and reduce bottle necks on the NW. 3.By having more than one point, the system is capable of surviving and avoiding a single point of failure. Reliability and availability is high. 4.RDF, IDEF and web crawlers provide the most ideal mechanism to index data and create tables for it which will provide an easier way for data retrieval, the availability of data at all sites and a high exchange rate for high.

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Beyond Trust: Psychological Considerations for Recommender Systems

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Abstract - *The issue of trust is important in recommender systems. These systems are typically described in terms of perceived reliability of the recommender coupled with a content quality perspective. However, most studies do not address the complete user context and psychological environment of a recommender system. This environment and context are described here by three primary areas of consideration, which are cognitive dissonance, persuasion from social psychology, and flow and presentation. Cognitive dissonance provides resistance to mental change, forms the core of psychological aspects, and informs persuasion. Dissonance can be countered or leveraged in recommender systems to enhance persuasion and provide a more effective system. Emotional responses are important for persuasion, so recommender systems should incorporate the integration of flow, social links, similar user recommenders, enhanced user profiles, and use of imagery to create more successful implementations. This paper reviews these aspects of psychology and their impact on recommender systems.*

Keywords: psychology, persuasion, recommender systems, trust, cognitive dissonance, flow

1 Introduction

Recommender systems have become pervasive on the Web across multiple domains. The need and desire for recommender systems to help guide users to desired content and products expands as web content expands, and significant progress has been made on technical aspects and algorithms to improve recommendations. However, as recommender systems continue to expand beyond commercial applications to a broader range of web-based applications, further research is needed into the psychological aspects of both users and recommender systems. While research has been conducted on trust in these systems, additional psychological aspects of recommender systems exist and must be consciously accounted for by designers of these systems. Primary areas for understanding of psychological aspects for developers of recommender systems are cognitive dissonance, persuasion, social psychology, and the impact of flow and presentation.

Recommender systems can be classified into three categories: content-based, collaborative, and hybrid [1]. A content-based system is one that might recommend a book to a user, based on books that the user previously purchased. Recommendations are derived from content (i.e., items) and previous user interactions with that content. A collaborative system uses similar users as the source for recommendation of items. A hybrid approach is a mixture of these approaches.

Algorithms are constantly tuned and technical advances in these three approaches are made regularly on the programmatic level. However, investigations into external influences of recommender systems improvements are scarce. For example, Adomavicius and Tuzhilin provided ideas for improvements to recommender systems, including data mining to assist with navigation and developing comprehensive profiles of users and items [1]. However, this did not include an increased understanding of the user and psychological aspects of a user's profile for modeling in algorithms. Trust in recommender systems is important, but it has had limited scope in research with respect to interactions with other psychological considerations, such as dissonance, flow, and presentation.

2 Trust in Recommender Systems

Trust is a key issue for a recommender system. In the digital realm, where content can be created by anyone, recommender systems serve a practical purpose in narrowing the immense size of material to smaller, quality content [2]. A recommendation can be made for commercial or personal reasons, and a user's comfort in evaluating recommendations and establishing trust is a more important component in electronic commerce applications.

Trust has been described in several different ways in the literature. Tintarev and Masthoff offered that trust is derived from the accuracy and transparency of the recommender system. They contended that trust could be improved with a description of how the recommendations are created [3]. This formal implementation of transparency would then be available for the user to evaluate.

O'Donovan and Smyth defined trust in terms of the trustworthiness of users as recommenders [4]. They developed an algorithm that adds a trustworthiness metric used to select an item for recommendation. This metric is calculated by determining users who make a reliable recommendation. They defined overall trust as a combination of trust in specific users making the recommendation and trust in the underlying recommender system. An example of this in practice can be viewed as an aggregation of recommendations from all users such as Amazon's book ratings.

The impact of a low number of ratings or skewed initial ratings that are either low or high is an issue affecting trust in recommender systems. Massa and Avesani examined a method to replace or augment ratings in collaborative filtering systems with an algorithm when sparse data exists [2]. This

algorithm rates recommenders and items, considering such aspects as controversial items and user profiles (e.g., heavy recommender, causal recommender), in order to produce more accurate and trustworthy results.

Research has also been conducted on trust in recommender systems and user profile similarities. For example, Bonhard, Harries, McCarthy, and Sasse conducted a study evaluating how effectiveness of profile similarities, rating overlap, and familiarity affected the acceptance of recommendations [5]. Recent work in trust in recommender systems continued along these lines of improving similarity profile matching and creating trusted links by tuning algorithms with techniques such as a correlational rating of trust links in a network [6].

Another aspect of trust is the context for the recommender system. Company brand, reputation, and the product items themselves contribute to the amount of trust in a system. This overall perception of trust can be enhanced or reduced by the website itself. Well known issues in website design with psychological overtones include layout, images, color selection, usability, and flow. The trust context is composed of an aggregation of all of these components and psychological effects preceding the actual recommender system invocation and following the recommendations.

To summarize, the issue of trust has been examined from a user's relationship, association, or perceived reliability of the recommender. Trust is also impacted by perception of the quality of the content. Neither of these approaches fully addresses the complete context and psychology of the user. Therefore, recommender systems must be further explored, designed, and developed in the context of psychological considerations.

3 Recommender Systems Across Domains

A common, popular use of recommender systems is in electronic commerce. However, as web applications continue to expand beyond the domain of selling items, recommender systems are appearing in a wider variety of applications. This expansion into other domains requires an examination of factors used in these systems. Approaches have been used ranging from simple user history data extraction to create navigation recommendations to an application offering multimedia spiritual advice derived from a complex profile and network of recommenders.

Zaiane described a recommender system for electronic learning. Instead of determining product recommendations, this system assists in determining a course of action for navigating through a website. This system uses data mining techniques as a predictor of successful next steps based on previous successful user actions. It is ignorant of any psychological factors other than successful navigation of tasks [7].

Neal and Speers described a hybrid recommender system for providing psychological assistance to a user in need. This system created a comprehensive profile of personality and demographic data and user ratings of content [8]. They used a Pearson similarity metric to match similar users and items to predict which multimedia components should be combined into an online movie. The network of user ratings greatly influenced the content recommended to users. This approach began to address the issue Adomavicius and Tuzhilin raised concerning the need to understand both the item (e.g., media content slice) and user (i.e., significant user profile with demographic and psycho-spiritual data) [1].

These two systems from non-electronic commerce domains use significantly different complexity of approaches to provide recommendations that users need to trust. These approaches may function and consistently create acceptable or even excellent recommendations. However, the level of complexity varies significantly from one to the other. Clearly, different applications and domains require differing amounts of complexity and psychological considerations.

4 Psychological Considerations

To a large extent, all recommender systems strive to create a trust relationship with the user. However, there are many psychological interactions that occur as users access both the website where a recommender system resides as well as the recommender system's user interface and recommendation presentation. These interactions and the importance of the various psychological components are not easily understood. Weinschenk observed that most actions users take when accessing a website and making decisions originate from sections of the brain that are in the unconscious [9]. Thus, people do not know and cannot describe why they took the actions they did. Therefore, developers of recommender systems must study psychological aspects to achieve more understanding of these interactions in order to create a system as effective as possible.

Recommender systems serve two functions. First, they assist users in narrowing the massive amount of data on the Web into manageable and understandable order based on some criterion. Second, they attempt to persuade the user into making a commercial or other decision. It is the second case that will be examined in the context of psychological issues as recommender systems attempt to affect a person's behavior and decisions.

There is extensive literature on the psychological aspects of website design and social networking in Web 2.0. Johnson provided a survey ranging from 1983 to the present [10]. This survey consolidated user design principles for the previous 30 years from Norman et al. and Johnson and advocated practices such as simplicity, feedback, consistency, clarity, responsiveness, and user control [10]. These aspects of design, most rooted in psychological theory, also apply to recommender systems.

These concepts have been applied at various levels to many websites and recommender systems. However, there are psychological aspects that relate more directly to the specific domain of recommender systems, especially considering that recommender systems have expanded beyond simple product referrals. The most critical areas of psychological

understanding required for developers of recommender systems are cognitive dissonance, persuasion, social psychology, and flow and presentation.

4.1 Cognitive Dissonance

Festinger produced a seminal work in psychology exploring cognitive dissonance. This theory postulated that people are resistant to change that does not fit well with their existing beliefs [11]. This theory has direct application to recommender systems in two ways. First, resistance to a decision must be understood and addressed whether purchasing, selecting an entertainment option, or simply deciding which news article to read. Second, dissonance can be used to an advantage if user profiles are sophisticated enough to understand the user's preconceptions to use in the algorithm of the recommender system.

The first application is more actionable in a recommender system. Festinger stated, "It is clear that in order to eliminate dissonance completely, some cognitive element must be changed" (p. 21). He advised that, while this may not always be possible, it might be possible to at least reduce dissonance [11]. Unfortunately, it is not always clear when designing a recommender system what cognitive elements can be addressed. However, it is usually possible to understand the potential resistance to certain recommendations. For example, new and novel items may encounter dissonance if provided with no grounding context for the user's known comfort zone. Providing context in-line with acceptable conditions or similar items or services may lead to less dissonance upon encountering a novel or unique recommended item.

The second application of dissonance theory is more nuanced. If the recommender system can understand the resistance or potential resistance reactions a user may have (or has had) to recommendations, then the system can avoid recommendations of the same type or avoid the appearance of similarity of the recommended items to items of likely dissonance. For example, if the user makes a one star rating on a seven star Likert scale, then the recommender system should not offer the related item in the initial list of items, especially if those ratings are exposed. No matter what the commercial or practical motivations are, dissonance theory dictates that those items would likely be summarily dismissed. Interestingly, a strategy of narrowing items by a user can be enhanced by the addition of dissonance items in the recommended items list. While this approach might be ethically questionable in some applications, it may guide users to more predictable selections.

From the political information arena, Manjoo provided an extension of Festinger's cognitive dissonance theory to information seeking and acceptance. Manjoo offered that users employ selective exposure to limit where they receive their information [12]. Once a system is deemed comfortable and trustworthy in a user's mind, this site is more likely to be visited and trusted more with each use. Manjoo also introduced selective perception where users only agree and accept information that causes less dissonance and reaffirms their beliefs. The combination of selective exposure and selective perception, once established, can be used to reduce dissonance for users. Techniques to achieve these goals, such as encouraging the perception of successful outcomes by a system, should be considered by designers of recommender systems.

The issue of dissonance can be handled by a variety of methods. For example, Tintarev and Masthoff stated that a recommender system could affirm a user's tendencies and previous selections by offering the same or similar items affirming their choices [3]. This is a direct use of cognitive dissonance to provide affirmation versus conflicting advice. Weinschenk [9] agreed and observed that ratings on products often confirm pre-held beliefs leading to purchasing decisions and confirming dissonance in practice. Previous selections, product returns, and negative reviews should be data mined to create the input for this function.

4.2 Persuasion and Social Psychology

In its basic form, a recommender system is a persuasion system. Persuasion has numerous implications for recommender systems. With regard to persuasion and Web design, the depth and span of knowledge is advancing rapidly, especially with relevance to web applications [10]. Much recent work has focused on ambient persuasive technologies. For example, Kaptein, Markopoulos, de Ruyter, and Aarts provided a method for designers of systems to enhance the performance of traditional recommender systems. They stated that ambient persuasion technologies must take into account situational and context awareness of the user and system [13]. Additionally, ambient persuasive technologies can recognize individual, less obvious aspects (e.g., motivation, ability) of information. These systems are implemented with massively distributed devices that continuously collect information, context, and behavioral data as input to the algorithms.

One crucial component of effective persuasion is the psychological component of perception. Johnson offered several observations on perception. Key to persuasion was his assertion that perception is affected by the past experiences, present context, and goals of a user [10]. The decision-making process is complex, and users may not even understand themselves why a choice was made [9]. Therefore, developers of recommender systems must search for unique ways to discover and account for this experience (e.g., product satisfaction, related item purchases).

Recommender systems, especially collaborative and hybrid systems have a social component. Social psychology and evolution inform our understanding of social validation. Weinschenk stated that the need to be part of a social unit is a natural part of evolution even though people typically view themselves as unique and independent thinkers [9]. These unconscious acts often contribute to our looking for cues on how to behave, which leads to the phenomenon that others in a group have influence over us. Weinschenk added that the more a user can identify with a recommender, the more likely that user will trust the recommendation. Additionally, tying the recommender to similar users has a powerful affect as well. We listen to people who are like us [9]. Thus, a

recommender system that has access to user profile similarities should project the recommendations as coming from a similar person to the user. Systems that obtain and provide demographic information on recommenders have the potential to provide this function and be more successful.

Several other psychological factors relate to social psychology. These include the number of raters and the strength of the positive recommendations, and they affect a user's acceptance of the recommendation [9]. For example, a maximum rating by one user is not as powerful as a high rating by thousands of users. These data should be provided to the user evaluating recommendations when they are significant.

One overlapping area of social psychology and persuasion is the idea of self-personas. Weinschenk stated that self-personas, stories about oneself, are powerful contributors to decision-making [9]. People have multiple personas that typically map into their life. Weinschenk elaborated by asserting that appealing to social consciousness through personas can impact decision-making processes.

4.3 Flow and Presentation

An important area of investigation is the impact of ease of use, flow, and information presentation. Clearly, frustration and negative emotion impact a recommender system. However, positive experiences may do more than make the transaction simpler. For example, Csikszentmihalyi's flow theory may psychologically impact the acceptance of recommendations [14]. The theory described a psychological state during an activity when the user is completely absorbed and engaged in the activity, such as working on a website. Once in this state, dissonance is lowered and users may be more prone to suggestions. Uneven flow and poor interface design, however, may provide users pause and reflection, which may allow dissonance to affect the process [11]. In fact, ease-of-use, general usability, and design all contribute to flow, and reduce opportunities for dissonance.

An entire area of study concerns presentation of items and accompanying images and text. The order of presentation (i.e., which item is first), the time of presentation (i.e., when buying another item or an isolated purchase), and personalization of the interface mechanism (e.g., "*you* can use this to…") all significantly impact a recommender system's success [9]. These considerations must be seamlessly integrated into the presentation of the results.

Another area of presentation entails the use of imagery to appeal to users' emotions. With the proliferation of media on the Web, users often require a recommender system to assist in selecting appropriate media imagery for an application or specific use. Tkalcic, Burnik, and Košir examined the use of affective imagery on the effectiveness of content-based recommender systems. They used an emotion induction technique to measure the effect of using emotional metadata versus general metadata when having users select recommended images [15]. The purpose of the experiment was to determine if metadata tied to a user's emotions influenced a content-based recommender system. They concluded that affective metadata did produce more desirable recommendations. Thus, emotion does play a role in recommender systems.

A final topic concerning persuasion and social psychology is the effect of storytelling. Storytelling is an effective way to organize information [16]. It is a way to both grab attention and convey information. Pictures and images are often used to convey a story of the promise of a product [9]. Storytelling is also a well know paradigm and is used in both social and educational contexts [16]. Interestingly, product reviews are often filled with stories about using the product, interactions with the customer support representatives, and unknown or unorthodox uses of the recommended item. A recommender system that provides storytelling or supports the ability for stories to be added into the recommendations will likely be more successful.

5 Future Research

Considerable future research is required to understand the impact of psychological issues in recommender systems. One area is in Manjoo's selective perception and selective exposure with respect to collaborative recommendations and in-site recommendations [12]. For example, do personal recommendations on Amazon.com carry more weight than on Whatever.com? Are users associating the brand Amazon and using selective exposure and then selective perception to reaffirm their decision of Book 1 over Book 2? What dissonance factors are at play in these interactions, and how can these be better understood?

Ease of use studies now incorporate more depth than traditional computer human interaction principles. Psychological aspects such as Csikszentmihalyi's flow theory should be investigated to the extent that users achieve a positive feeling when flow of navigation, recommendation review, and selection is excellent [14]. The impact of poor or non-optimized flow should be investigated to determine its effect on dissonance and continued use of the recommender system. One variation of this would be to study the effects of ordering and known dissonance items in a list on selections. For example, would a user still be likely to choose the first item in the list if it is known to cause more dissonance than the second item in a list?

6 Conclusions

Recommender systems have become pervasive on the Web across multiple domains. The issue of trust is important and has been studied in terms of perceived reliability of the recommender coupled with a quality of content perspective. However, most studies did not address the complete context and psychological environment of a recommender system and its users' contexts. Understanding and designing for additional psychological considerations are critical to develop the most effective recommender systems.

There are three primary areas of psychological considerations. These are cognitive dissonance, persuasion in social psychology, and flow and presentation. Cognitive dissonance forms the core of psychological aspects and

informs persuasion. Developers of recommender systems need to understand dissonance and develop capabilities to counter or leverage dissonance in their systems. Additionally, the integration of flow, social links, similar user recommenders, enhanced user profiles, and use of imagery to evoke emotions may lead to more successful implementations. Finally, different applications and domains require differing amounts of complexity and psychological considerations.

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Taking into account users' privacy within TEL systems

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Abstract - *The personalization of Technology Enhanced Learning (TEL) is an area of active research, as proven by the numerous studies concerned with the design of Contextualized Attention Metadata (CAM) systems to offer customized services to learning. These systems, based on the collect of personal data of users, face with certain privacy rules and constraints they do not tackle. We propose in this paper a CAM framework that fills this gap, based on a highly distributed architecture and a set of open standards that facilitates the reuse of our approach in different contexts. A principle of our proposal is the partitioning of data storage: personal data are stored on the workstation of learners, while non-sensitive data reside on a central server. Even if data are geographically distributed, the proposed mechanisms and algorithms provide TEL with the capabilities to obtain a uniform view of all recorded data and to implement personalized learning services*.

Keywords: privacy, confidentiality, technology enhanced learning, contextualized attention metadata, personalization.

1 Introduction

Information systems based on web technologies and taking into account the individual characteristics of their users to adapt their behavior accordingly benefit from increased sales in the context of commercial applications, or an increase of importance in the case of information retrieval systems [9]. The first step to implement such systems is to collect a large amount of personal and behavioral data resulting from the interactions of users with different systems and resources; this kind of data is called Contextualized Attention Metadata (CAM). However, a study showed that over 50% of Internet users are concerned about the respect of their privacy [Maurice et al. 00]. These applications that collect users' CAM data face with privacy concerns, since most of them ignore the laws which regulate the collection, processing and transfer of personal data [8].

The personalization of Technology Enhanced Learning (TEL) is an area of active research, and numerous international studies [5][12] are interested in designing CAM frameworks to provide personalized learning tools. These systems, which are thus confronted with the rules of ensuring the privacy of their users, do not worry about the confidentiality of personal data: in many learning platforms, information such as user profiles together with their activities can naturally be consulted by various actors.

We proposed in [3] a CAM framework based on open standards, which collects and stores CAM data generated by users from various heterogeneous systems. This work, which aims at sharing and reusing CAM data, doesn't consider the problem of confidentiality of personal data. In this paper, we present how the introduction of additional components and functional principles in our existing architecture can provide a solution to ensure users privacy. Our approach consists in separating the storage of sensitive data from the storage of non-sensitive data: the users' personal data is stored in a native tool on his desktop PC, while their actions and behaviors are stored into a central server in order to be easily retrieved and shared.

The next section presents the privacy constraints that a CAM framework has to fulfill, and analyses how the existing TEL tools and research projects respect the users' privacy legislation. We briefly remind the basement of our work in the section 3, before proposing an extension and some functional principles that guarantee the confidentiality of users' personal data while ensuring the sharing of non-sensitive information. An implementation experimented by two use cases validates our approach in section 4. Finally, we conclude before outlining some research perspectives.

2 The privacy within TEL systems

An European Union directive [7] defines personal data as "any information relating to an identified or identifiable natural person ('data subject'); an identifiable person is one who can be identified, directly or indirectly, in particular by reference to an identification number or to one or more factors specific to his physical, physiological, mental, economic, cultural or social identity". Moreover, the privacy includes economic benefices on a macro-economic level where "in order to maintain vital knowledge-generating processes within a society, protected regions of life must be available". The discovery of personal zones then implies the existence of means to protect individuals from the consequences of their data: laws regulating the type of protection that personal data should receive, and the rights that individuals enjoy under their data. Thus, systems that collect data about their users are subject to numerous constraints [1]:

− data must be collected for a specific purpose, and only the data needed to achieve this goal must be collected;
− data cannot be stored longer than the time needed to achieve the target objective;

– a company which handles personal data must implement appropriate techniques to protect this data against destruction, accidental loss or unauthorized access.

To satisfy these constraints, [11] identified certain architectural and organizational requirements:
– to explicitly inform the user about the activation of personalization functionality;
– to ask for the « personalization consent » from the users;
– if it's technically possible, to provide a non personalized version of the system;
– to provide a security mechanism to ensure the data protection against the destruction, loss or non authorized access.

In the TEL area, many studies focused on the collection of behavioral data but most of them do not consider the confidentiality of such data. [19] introduced the Contextualized Attention Metadata (CAM) schema together with a centralized architecture in order to collect data resulting from the interaction of the users with different systems. A CAM metadata includes the observed application, the resource the user interacted with, the activity performed, and other information about the user. The user profile provides other sensitive elements such as the name, surname or email address, and the CAM indexing service does not offer any security features: the data recorded can be retrieved by any application by issuing a request to the search service. Furthermore, no organizational measures are proposed for data protection.

Gnowsis extends the operating system with features based on semantic web, and describes the user model using an ontology [17]. This approach ignores the privacy of users as all services and API installed on the user's computer are accessible by remote procedure calls, and thus the sensible data is available to anybody.

Another CAM framework, Dyonipos [16], automatically identifies the user's current task in order to provide him with various personalized information. The behavioral data is stored both on a central server and on users' desktop PC. The user then decides what information to share on the central server. While this approach ensures the users' consent to the process of sharing personal data, legislation on the storage and data protection measures are not fulfilled on the central server.

Finally, KnowledgeTree [4] collects, in centralized form, events reflecting the interactions of learners with multiple learning servers. The user authenticates to each server he interacts with, and its identifier on each server is used to associate its activities in the central system. The advantage of this approach lies in the fact that the user's identity cannot be revealed because he logs in the systems using an identifier (no personal data is used or stored). However, for a given learning system, only the information related to this system can be extracted and further reused from the central system.

Even if some TEL systems consider the issues of compliance with the privacy of users, we find that many efforts are still needed to comply with applicable laws. The next section outlines our approach which handles the issue of users' privacy within the TEL systems, based on an existing CAM framework.

3 Taking into account the users' privacy

We proposed in [3] a CAM framework for collecting, storing and sharing information reflecting the activities performed by users on heterogeneous learning systems. This section briefly reviews this approach before introducing the new architecture that ensures confidentiality of personal data.

3.1 The basis of our approach: a CAM framework based on a standard

The Distributed Management Task Force's efforts (DMTF) during the lasts 20 years led to a standardized solution for managing heterogeneous and distributed computing environments. To represent the information to be managed (processors, processes, devices, etc.), DMTF has developed a common meta-model (Common Information Model - CIM) [6] which offers the possibility of extending the existing native models in order to define information specific to a particular business domain. Thus, from existing models defined by the DMTF, we defined two sub-models: the first one describes the profile of a user while the other describes the systems and resources he/she can interact with, as well as activities he/she can perform.

3.1.1 The collected data

[15] defines a user's profile from a learning point of view which offers the possibility to define different profiles for the same user depending on his role within a TEL system: learner, teacher, tutor, etc. We consider until now that the learner profile consists of four sub-profiles (identification, cognitive, meta-cognitive, and preference). This model is extendable, thus new profiles can be derived. The reader is referred to the above article for further details.

In order to represent the tools that the learners interact with, we decomposed the TELs into 3 main entities:
- the systems describing the TEL tools such as learning object repository (LOR), learning management system (LMS) or intelligent tutoring systems (ITS);
- the resources which represent the elements incorporated in these systems such as learning objects, courseware, or posts in the discussion forums;
- the activities which specify all the actions that can be performed by a user on the systems and resources, such as consultation, downloading, updating.

A set of association and composition relationships allows one hand to link these entities themselves, but also to associate a user with the activities, systems and resources.

3.1.2 The initial architecture

Our initial framework is based on the Web-Based Enterprise Management (WBEM) [18] architecture proposed by the DMTF in order to support the CIM meta model. It is composed of three levels depicted on Figure 1:
- the first one represents the learning environment and contains the tools that the users interact with. These applications contain an agent charged of two distinct tasks: (1) to extract the information represented within our CAM models before transferring them to the intermediate layer, and (2) to retrieve, via the intermediate layer, CAM data in order to propose different processes of personalization;
- the CAM environment is conform to the WBEM specifications, and includes two components: the CAM repository (called central server in Figure 1) contains the classes and instances of the models specified earlier, and the manager exposes several interfaces dedicated to manipulation of data stored in the repository.
- the intermediate layer bridges the gap between the learning and the CAM environments by offering an easy access to the CAM repository. Thus, learning (or non-learning) tools are able to easily provide and/or retrieve CAM stored into the repository. The middleware layer contains two services: the model management service is responsible for managing the model classes (e.g. adding new properties or classes, etc.), whereas the tracking service makes it possible to insert new CAM information into the repository (through the manager) and to retrieve these CAM.

In this initial architecture, all collected CAMs are centralized on a single server, and no measures are implemented to ensure compliance with the privacy of users. Instead, the intermediate layer facilitates sharing and reusing of contained information within the CAM environment, thus very sensitive data can easily be retrieved and exploited by malicious users.

3.2 A new architecture to consider users' privacy

To satisfy the constraints of protecting personal data against loss, theft or destruction represents a heavy charge for any public or private organization. A solution to meet the legislation concerning privacy is to not save confidential data at all. However, today's applications need personal data in order to provide personalization features. In this context, a question arises as to identify the component(s) responsible for managing sensitive data.

3.2.1 Organizational principles

Within the security area, a general principle is to partition sensitive data rather than store it within a single and same information system. Thus, the risk that someone gets an overview of all the recorded information is very low [2]. We adopted this principle in our new architecture: the separation of the system storing the users' profiles, and the system storing the data reflecting users' interactions with learning systems and resources.

The resulting architecture shown in Figure 1 incorporates the initial architecture described above, and includes an additional level: the users' workstation. Indeed, the systems management approach proposed by the DMTF, that represents the heart of our approach, is natively integrated into most today's operating systems (Apple Remote Desktop for Apple, Windows Management Instrumentation -WMI- for Microsoft, or Open Pegasus for RedHat Linux distribution). These tools are composed of a CAM repository together with a CAM manager just like our CAM environment. The models of supervision they provide correspond to the specificity of the hosting operating system, but our CAM models specific to TEL and conform to the DMTF standard, can be easily integrated into these tools. Applications wishing to exploit this information can then communicate with the manager's native monitoring tool; the module called Plugin in Figure 1 represents such an application.

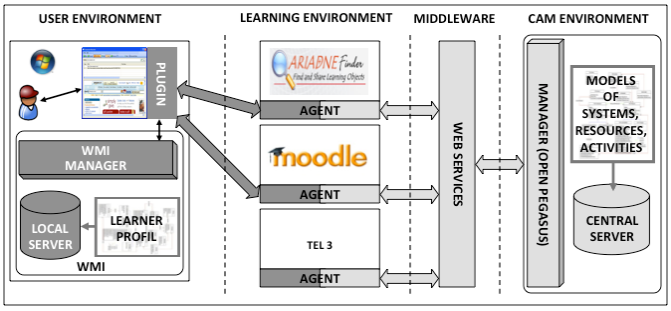

Figure 1. An architecture ensuring user's privacy.

Finally, the agents integrated within learning systems are equipped with an additional interface to establish communication with the users' workstation. The roles and interactions of different entities in our architecture are detailed in the following.

3.2.2 Functional principles

The roles of both the intermediate layer and the CAM environment remain unchanged, their goal is to centralize and facilitate access to CAM data coming from heterogeneous learning systems. However, the information model embedded within the CAM server describes a user just with a numeric identifier. Thus, no personal data is stored in the central server anymore.

The learning profile of the user is no longer contained within the CAM server but integrated within the management tool of the users' workstation. The Plugin integrated into a local application of the users' workstation (e.g. web browser) is a software component that interacts with the monitoring tool. This last is responsible for integrating the model corresponding to the users' profile in the local monitoring tool, and provides update or retrieval of information based on actions performed by the user. On the other hand, the Plugin also communicates with the agents integrated within the learning systems. Indeed, the functionalities of the agents have been extended to enable the reception and transmission

of information from/to the Plugin integrated within the applications of the users. The dialogue between the Agent and Plugin entities are detailed by two use cases in section 4.

The users' profile together with the information model describing the systems, resources and activities of TEL are stored in two separate CAM servers: one local on the workstation of the user, and the other central. Therefore, in order to be able to find in the central server, the activities of a given user, the IDs of users within the central server and local server must match. In the operating systems where the monitoring is delegated to a WBEM tool, the accounts of users on the system are uniquely identified through the SID property of the UserAccount class. This attribute is composed of a unique identifier of the system, extended by a local user ID. Thus, two SIDs are different regardless of the user and the employed system; this property is also used in the central server to uniquely identify a user.

3.3 Discussion

Our solution consists in storing and sharing on the central server data related to resources, systems and learning activities, and recording on the users' desktop computer his/her personal data. Another intuitive proposal would consist in storing all collected data on the workstation of the user, but this approach, even it totally solves the problem of privacy, has two major drawbacks: it prevents any form of collaborative filtering since a learning system will have information about only one user, and the process of sharing and reuse of attention metadata cannot be implemented anymore.

The components and functional principles that we have proposed ensures the confidentiality of personal data of users while preserving the sharing of information contained in the central server:
– the protection against loss, theft or destruction of personal data does not apply to the central server since no confidential information is contained;
– personal data is stored on the computer of the user in a WBEM native component where the protection for remote access is provided by the designers of the operating systems. An organization is thus relieved of any responsibility;
– the Plugin installed by the user on the workstation initiates the activation mechanisms for the distribution and storage of observed data, thus guaranteeing the consent of users;
– if the Plugin is not installed on the workstation of the user, he/she benefits from the native functionalities of the TEL systems he/she interacts with, and users who do not consent to personalization are not penalized;
– the interactions between the Plugin and the Agents are always triggered by the Plugin (see next section), a remote application cannot acquire personal data at its own initiative;
– finally, our approach fills the gaps of the KnowledgeTree project since a user is identified in the central server from its identity in the local server, and a view of all activities performed by a user on different learning systems can be established (see next section).

However, our proposal should be experimented to ensure that the identity of a user can not be revealed from the information stored in the central server. Even if the model integrated in this server does not represent sensitive data, elements that do not make sense on their own, can be combined to obtain information more and more significant until the identity of a person is disclosed [14]. In our context, may the combination of successive activities carried out by a given user lead to disclosure of the identity of a person? The answer depends on the nature and number of applications and resources observed: the risks of discovering the identity of a user are more important if the nature of systems is heterogeneous, and if the number of supervised entities is important. These recent works has just resulted in an implementation described in the section below, where two learning environments are observed: the MOODLE platform, and the learning objects search tool of the ARIADNE Foundation. Only a large-scale deployment and widespread use of these tools may provide some objective answers.

4 Implementation and use cases

The architecture presented in the previous section was implemented using a set of free tools. Within the learning environment layer, a MOODLE platform together with the ARIADNE Finder tool integrate an Agent activated by the action of authentication, consultation and download of courseware and learning resources. The communications between these agents and the intermediate layer are based on web services technology, whereas the central server is based on the Open Pegasus tool conform to DMTF specification. Further, the communication between the intermediate layer and Open Pegasus is ensured by an API provided by Open Pegasus.

Finally, at the user's workstation level, our implementation focuses on Microsoft Windows 7 operating system and the Internet Explorer 8 (IE8) web browser. This system contains WMI natively, and we developed a Plugin based on API Microsoft Platform SDK scripting, which establishes communication between the IE8 browser and WMI. Finally, the Plugin and the Agents interact via the HTTP protocol. The cooperation between the various components of our overall TEL system is exposed in the following two use cases: update of the user profile when logging into MOODLE, and the personalized recommendation of learning resources when a user submits a request within the ARIADNE Finder.

4.1 Update of users' profile using MOODLE

During the process of installing the Plugin, the CAM model describing the properties of the user profile are compiled in the local server WMI, thus the WMI manager is able to manipulate information about the learner profile of users of the system. When a user authenticates to the

MOODLE web server, the sequence of interactions between the different components of the architecture consists of two main phases illustrated in Figure 2.

The Plugin integrated within the IE8 browser of the users' PC is activated because the user issued a request to a URL specified in its configuration settings (ie http://myserver/mymoodle/login/index.php). The Plugin then sends a request to the Agent embedded in the Moodle server to update the user profile in the local WMI component. Indeed, the MOODLE platform includes a user profile specifying many details such as name, surname, email address, preferred language, or the interests of a user. These data are then extracted from MOODLE by the Agent and forwarded to the Plugin. Finally, it updates the user profile on the local workstation trough the interactions with the WMI manager.

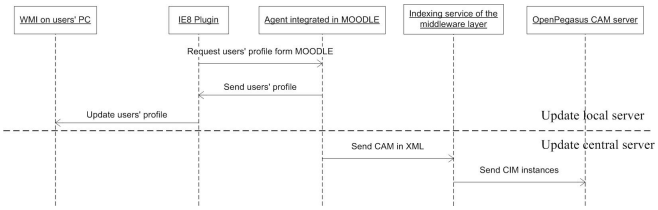

Figure 2. Use case: update learners' profile.

The second interaction concerns the updating of the central server. To ensure this process, the IE8 Plugin sends another request to the MOODLE Agent in which he specifies the SID of the user extracted from the native WMI server. The Agent processes the request by invoking the indexing service of the intermediate layer and transmits different information in the form of an XML string: the user's SID, the nature of the activity performed (authentication) and the target system (MOODLE) described by various properties. The indexing service completes the transaction by creating instances of the classes of our models before sending them to the manager of the Open Pegasus tool which records them into the central server.

4.2 Personalization of the ARIADNE Finder

ARIADNE Finder is a search tool developed by the ARIADNE Foundation [10] that supports the sharing and reuse of learning objects. Since this application does not offer personalization feature, we've added various capabilities that do not require prior authentication of the user. In this experiment, we consider that the central server contains a significant number of CAM data based on a test set generated manually.

When the user validates the search by keywords, the IE8 Plugin extracts the user profile from the data stored within the WMI repository and transmits it to the Finder's Agent. The latter is then able to sort the results returned by the ARIADNE search engine based on different properties of the profile of the learner. In our experiment, the sorting is based on the preferred language and the results are displayed in the central frame of the GUI (see Figure 3). In addition, the Plugin updates the interests of the user in the local WMI repository by storing the keywords of the query he submitted. Afterwards, a series of three requests from the agent to the intermediate layer services follows:
– the indexing service is first invoked to record the activity of searching for learning objects in the central server;
– based on the SID, the ARIADNE Finder Agent calls the CAM search service in order to obtain the various resources that have been previously consulted by the user in different systems (see left frame in Figure 3) and promote reflexive activities;
– the last query concerns the recommendation of resources. The Agent calls the CAM search service to locate learning objects that were previously downloaded by users who searched with the same keywords, and the results are recommended in the right frame of ARIADNE Finder (see Figure 3).

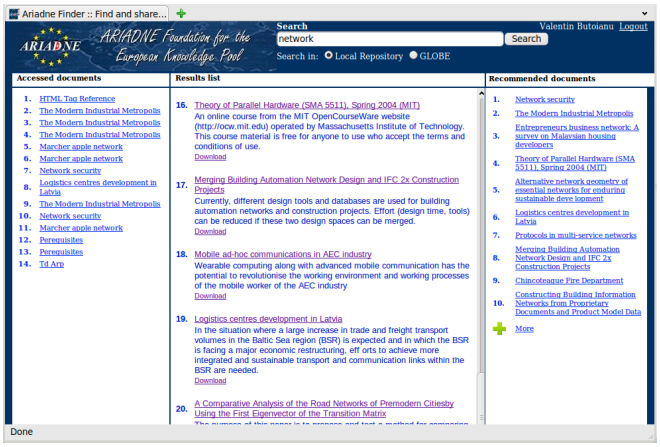

Figure 3. The personalization features within the ARIADNE Finder tool.

5 Conclusions and future works

We proposed in this paper a solution to ensure the confidentiality of personal data of the users within a TEL system. Various constraints and regulations are taken into account in our approach: the consent of users, security of personal data, protection against unauthorized access to data, and collecting and storing data in a central server limited to information necessary for the successful process of sharing and reuse. This work is based on a highly distributed architecture and relies on a set of open standards that facilitate the reuse of our approach in different contexts.

A principle of our proposal is to divide the storage of CAM data: personal data are stored on the desktop PC of the user, and non-sensitive data on a central server. The devices now available on the market for browsing the Internet are becoming more and more numerous (smartphones, PDAs, tablets, etc.) and it is not uncommon that a user has several PCs in his home or at work. In the case that a user uses

multiple machines to interact with a TEL system, the central server duplicates the user depending on the number of devices used (one SID per machine). To overcome this weakness, another identification mechanism must be implemented without the use of personal information, or the origin of the identifier of the user (in our case, the operating system of the users' workstation) must evolve. An intuitive solution is to ask the user for a username, but the benefits of the uniform identification of the user on his workstation and on the central server is lost.

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SESSION

FRAMEWORKS, TOOLS, AND STANDARDS

Chair(s)

TBA

Detection of Negotiation Profile and Guidance to more Collaborative Approaches through Negotiation Games

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Abstract - *Negotiation is an activity that involves complex human relationships which should be treated with great caution to prevent them from being injured or destroyed, ruining any future chances of further negotiations or agreements. Therefore, the improvement of negotiation skills is essential and an important part of this improvement is the discovery of one's negotiation profile. This paper presents an evolution into a module of a Negotiation Support System that enables creation and management of negotiation games. Such evolution now allows the detection of the player's negotiation profile and is able to guide the negotiator into more collaborative negotiation approaches*.

Keywords: A Maximum of 6 Keywords

1 Introduction

Negotiations can be responsible for maintaining a relationship and leading a project towards success or failure, depending on the performance of its manager on dialogue. Negotiation is, at least in some level, about interaction with other people or parties [1].

Therefore, to learn how to negotiate the school of hard knocks way, following the Aristotelian paradigm that "learn by doing what you're supposed to do" can result in disastrous negotiations that can imply in permanent damage to relationships and/or careers, destroying any further possibilities of dialogue and negotiation, and, as unilateral decisions in organizations are becoming increasingly rare, and negotiated agreements become more and more common, negotiation plays an important role in business world.

Thus, professional decision-makers must be well prepared in order to have a competitive advantage when negotiating agreements. Preparation is a key factor in the Negotiation process when it comes to the achievement of optimal agreements. But this preparation is not well obtained if the negotiation concepts are not well trained and assimilated by the negotiator, and, especially, if he does not know himself and his own negotiation profile.

Sections 2 through 4 of this paper present literature review concerning negotiation concepts, experiential e-learning and serious games. Section 5 describes the usage of the web tool and section 6 shows the results obtained so far. Finally, section 7 shows the conclusions and the references of this work are listed.

2 Negotiation concepts

Negotiation is "the ways in which people deal with their differences" [2]. "It is a process in which two or more parties seek an agreement to determine what each one should give or gain, or make and receive in a transaction between them" [3]. It arises out from the need of resolving a conflict in which the outcome may not be immediately the one that is desired, since individuals have different expectations and desires.

Negotiations are often pictured as smiling businessmen handshaking after a mutual advantageous settlement. They are, however, very present in daily life. Negotiation occurs in a dialogue between family members regarding the responsibilities of household chores. Among colleagues in a software project for the definition of fulfilment of tasks related to the system. Between couples when one wants, for example, to go to the movies and the other wants to go out for dinner, but both do not want to give up each other's company. Below, distributive and integrative negotiations, interests versus positions in negotiations and negotiation profiles are discussed.

2.1 Distributive and integrative negotiations

Negotiation is a process in which two or more parties share ideas, information and options to achieve a mutually acceptable agreement. Negotiation is a process that involves the exchange of proposals and assurances [4]. However, there is a common perception that negotiation is a "win-lose" process, that is, when one party wins, the other one necessarily loses. From this point of view, negotiation is merely another form of warfare. However, more and more people and organizations are seeking methods to find out solutions for mutual gain [5].

This “win-lose” view is also known as “fixed cake”, in which each party supposes that the other party has the same priorities regarding the various issues at stake. This bias can block the trial of finding a "win-win" solution. When both parties fail to recognize the complementarity of their interests, each one thinks the other one's priorities are the same as theirs, not reaching the optimal agreement [6]. This dates back to concepts that define distributive negotiation. In this case, the value at stake is fixed and each side tries to get the largest share –or the bigger slice of the cake –possible. It's like the

division of an apple: The larger the piece one party gets, the less the other party will have [7].

The counterpoint of this is the integrative negotiation, where both parties work to split the value and, at the same time, cooperate to achieve maximum benefits by aligning their interests in an agreement for mutual gains. In this case, it is important that the negotiator knows how to create value and also knows to claim and share the value created. This approach is used when negotiators perceive the opportunity for future relationships and both parties are concerned to achieve the interests of the other party [7]. In this case, one can picture the cake as being leavened, growing up as new values are created.

2.2 Interests and positions

Besides of being conducted under distributive or collaborative approaches, negotiations may be described as being conducted under focus on positions or interests.

In position-based negotiations, negotiators discuss positions, ie, a closed and specific proposal for resolving a particular dispute. Moreover, interest-based negotiations open the possibilities of conflict resolution, analyzing each issue involved, ie, each interest separately, seeking creative options to satisfy both parties. Positions are closed specific proposals prepared to meet a set of interests, ie, only one of the parties. Interests, moreover, are the needs, desires and goals that the individual is seeking to fulfill to reach his position. Thus, interests may be satisfied in different ways [4].

Fisher and Ury [4] propose an approach for principled negotiations:

- Separate the people from the problem: it is also important to note that negotiators are normal human beings, and as such they have emotions and are willing to maintain relationships for the sake of solving a problem. By understanding the emotions and perceptions of the other party, one can note what potential barriers affect a rational discussion, for example.

- Focus on interests, not positions: the authors recommend to observe the real interests of the negotiators. In general, there is little discussion about conflicts of interest, as opposed to discussions about rigid positions. In this case, it is suggested to ask the other party what are their interests in a particular position. By understanding the interests, one can offer more options for mutual gains.

- Invent options for mutual gain: A typical negotiator may think that to take the other party's options into consideration means to waste time or lose "points" in the negotiation. The authors, however, suggest the opposite. Although this may cause the negotiation to take longer, a deal rises faster. In this case, sincere dialogue and / or brainstorming can help determine creative options that satisfy both sides. The secret is to find out what concessions are easy to give, but have great value to the other party.

- Insist on objective criteria: it is possible to decide the basis for an agreement by an impartial reference. In general, patterns tend to be clearly recognized and understood for both parties. Criteria for other negotiations that can be compared with the current one, in general, are also acceptable.

2.3 Negotiation Profiles

As the term suggests, each individual has its own characteristics, personality, ways of act and think about the most diverse situations. Therefore, it is also natural to assume that each negotiator has a personal style in a negotiation. This style is influenced by several factors, such as his dominant skills [8][9], gender [10], culture of origin [11] and even the region of a country [12].

Thomas and Kilmann developed back in 1974 the Thomas-Kilmann Conflict Mode Instrument [13], which measures five conflict-handling profiles based on two basic dimensions: assertiveness, which measures how much one tries to satisfy his own needs and cooperativeness, which measures how much one tries to satisfy the other's needs. Figure 1 shows Thomas-Kilmann two-dimensional model of conflict-handling behaviors. The five profiles that can be extracted from this model are defined below:

- Avoidance (unassertive and uncooperative) – The negotiator does not try to reach his needs nor the other party's ones. He avoids the negotiation. Such attitude can be used to postpone the dialogue or withdraw from an uncomfortable situation.

- Accommodation (unassertive and cooperative) – The negotiator gives up his own interests in order to fulfil the other party's desires. Negotiators may use accommodating moves to try to immediately satisfy the other party, giving up to all the first issues negotiated, in order to use it as an advantage to "win" the next issues.

- Competition (assertive and uncooperative) – It's the complete opposite of accommodation. A competitive negotiator will not give up to any issue in negotiation if it makes impossible for him to completely achieve his concerns. A competitive negotiator often defends his position and uses everything at his power to win.

- Collaboration (assertive and cooperative) – A collaborative negotiator will try to reach his own concerns and the other party's mutually. He will try to find creative alternatives to conflicting issues and to understand the other party's point of view, negotiating by his interests, not positions.

• Compromise (moderately assertive and moderately cooperative) – A compromised negotiator is an intermediate between a competitive negotiator and a collaborative one. "Compromised negotiators give up more than competitive ones but less than accommodating ones. Likewise, it addresses an issue more directly than avoiding, but does not explore it in as much depth as collaborating" [13].

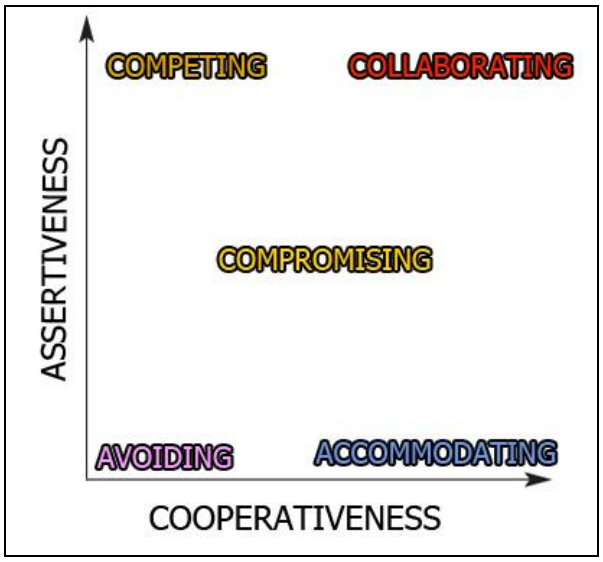

Figure 1. Thomas-Kilmann two-dimensional model of conflict-handling behaviors. Adapted from [13].

3 Serious Games

Man's relationship with games merges with human culture itself, and is perhaps just as or older than writing. More than 5000 years ago in the ancient Egypt, the oldest known board game was invented. The Senet, "Game of passing" [14], in which two players manipulated pieces of a board in which 30 squares were arranged in three parallel rows of 10 squares each. Ideograms dated from 3300b.C. in Merknera's tomb illustrate the game. In America, the Patolli was reported to the Spanish crown by the conquerors, but traces of its existence date back from 200b.C. [15]

Every human being, starting from a certain age in childhood, has an idea of what a game means. One can immediately think of card games; board games like chess. Computer games and video games; children's games such as hide and seek or hopscotch; sports like football, basketball and volleyball.

All these activities are very different: Some have mostly physical requirements, such as soccer, others have intellectual demands, like chess; they differ in their space requirements – when playing card games, the cards can be placed on any surface. On the other hand, chess requires a board; they demand different resources (balls, pieces, cards, boards) and have different rules. Yet, they are all recognized as games.

This paper presents test results from using a computer tool that aims at helping to create games that offer training in the concepts of a very particular human activity, negotiation. When it comes to computer games, which are software, they inevitably follow the rules of its programming code, and present a finite number of states. So, for the purposes of this study, a game will be defined as an activity with cathartic purposes, practiced by one or more individuals that are decision makers and whose decisions have uncertain outcomes (though within one finite set of possibilities), called players, and that is governed by a limited set of rules, space and time apart from the real world, which provide resources that can be used by players to interact, and that has goals and obstacles to achieving these goals, and in which the players may share the objective or fight over it.

Technological research in games, however, does not affect only the entertainment industry. Corporate and government organizations can also benefit from this technology [16]. Serious games, which attract the interest of various groups of different human activities, offering opportunities for training, simulation and education - technologies like 3D and the idea of interactivity presented in games can be used as representations of real world situations [17].

Cook [17] mentions that one of the main difficulties in defining the concept of Serious Games rests in the fact that a wide variety of groups are interested in such games and each one has a very particular and distinct understanding of what the term means. Some do not even think of "games", but in applications that allow simulating situations that represent their operational business processes. Moreover, there is a strong perception that the words "game" and "serious" are mutually exclusive and their use adjacent to each other is surprising to many [18].

To Michael and Chen [18], serious games are more than mere "edutainment", although it has the same objectives. They argue that, while edutainment aimed primarily at children up to 10 years, using TV characters as pedagogical agents, serious games aim at a larger universe of possibilities in education and job training. Still, these games do not have the fun and enjoyment as primary purpose but aim to educate, inform and train. Zyda [16] adds that serious games are those that add pedagogy to play.

Military applications stand out as significant share of the market for serious games, and the U.S. military is a major investor. The most famous example of a serious game of military use is America's Army [17][19][20], developed for the U.S. Army as enlistment propaganda, which ended up being used by the soldiers themselves. Core et al [21] present a representation model of virtual humans that interact in verbal conversations and are capable to react and show solidarity or doubt the actions of the player, who must

negotiate with a virtual doctor to move patients from an area of armed conflict.

The Tactical Language Training System (TLTS), used for tactical training in foreign languages [22], aims to assist the learning of basic communication skills in foreign languages and cultures, in order to support the American military training program DARWARS. In Brazil, the military use simulators based on game technologies, like a flight simulator at the Naval Academy assembled using an adapted PC and Microsoft game Flight Simulator [23].

In health, serious games are present in different specialties, from dentistry, in which [24] present a survey of more than 20 serious games related to oral health in the scientific literature, websites and educational campaigns, to neuroscience, with applications that aim at patients recovery after cardiovascular accidents [25]. In the field of education, the Educational Arcade project [26] aims to develop educational games like Caduceus, a series of casual games that aimed at teaching science to children, and Labyrinth, for teaching concepts of algebra.

There are also serious games that stand out for presenting current themes related to world events, called NewsGames, such as Darfur is Dying [27], launched in 2006, that portrayed the crisis in Darfur, Sudan, since 2003.

4 Experiential Learning and E-Learning

Learning is the process of acquiring new knowledge, values, skills, preferences and understandings. According to [28], learning is ubiquitous in human life, not just in the domain of a new skill, but also in the emotional, social and even personality development: One learns to fear, to love, to be polite and intimate. It is the process through which knowledge is created through the transformation of experience [29]. Learning is therefore an integrated process that leads to a qualitative change, altering the set of attitudes, and therefore the individual's behavior, contributing to his development.

The electronic learning, or e-learning, provides educational content via any electronic media [30]. Other authors in the literature support this meaning [31][32][33], adding that e-learning is an individual learning in nature, in which the student sets the pace of instruction, although it does not necessarily eliminate the need for a tutor. E-learning is the natural convergence of knowledge management and talent management and a way of dumping the gap between current and new techniques involved in a business development [30].

Experiential learning is "the process by which an individual builds knowledge, skills and values from direct experience" [34]. It occurs when carefully chosen experiments are supported by reflection, critical analysis and synthesis, being structured to require that the individual who undergoes the process of learning takes initiative, decisions and be held accountable for the results of those decisions, committing himself to submit questions, investigate, experience, solve problems, take responsibility and be creative. Thus, it is possible to combine experiential learning and e-learning, resulting in the process of building knowledge through direct experience obtained via electronic media.

According to [35], experiential learning emphasizes the nature of experience as being of fundamental importance concerning the education and training. However, the author notes that there are experiences that contribute positively and others that contribute negatively to education. Every experience is continuous, that is, every experience influences future experiments. Thus, it is the responsibility of the teacher to structure and organize experiences that positively influence student's potential future experiences [35], because good experiences serve as motivation, and encourage students in the learning process, while bad experiences can lead them to close themselves off to possible future experiments [36].

Due to its essentially interactive nature, games become appropriate tools for experiential learning, because they assume that the player will take actions that interfere with the game course. The player is necessarily proactive and a decision maker.

5 Negotiation Support System Module

This tool was created in order to allow users that do not have technical expertise in software programming to create, manage and publish Negotiation Games and was presented in a previous work [37]. The games explore different aspects of negotiation (from one or two aspects in a simpler game to several of them in a more complex game). The tool is a module integrated into a multilingual interface Negotiation Support System, ENEG [38], which includes, among other features, negotiation planning, risk management, meetings control, negotiation tips and other modules.

Figure 2 depicts the decision tree featured in this module. It represents the many possibilities of the negotiation. Starting from an initial common node, the player can chose one of several possible options, and each one of these options trigger a completely different flow in the tree, changing completely the game from that point on, by exploring different negotiation approaches, changing his options, the other party's and, eventually, the whole interaction. The game as it is displayed to the player is shown on Figure 3.

The dynamics of the game is simple: The counterpart of negotiation will begin the dialogue and the player selects one of the options available to respond to the argument of the counterpart. Each of these options has internal attributes that measure the value of assertiveness and cooperation of the answer, as well as an approach label. At the end of the game, these can be summed and a diagnostic regarding the player's

negotiation style begins to be drawn. Figure 4 shows how these values and approach labels are assigned to the arguments of the player in a game scene.

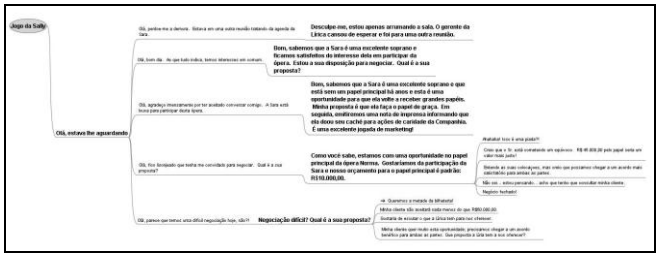

Figure 2. Decision tree of the negotiation.

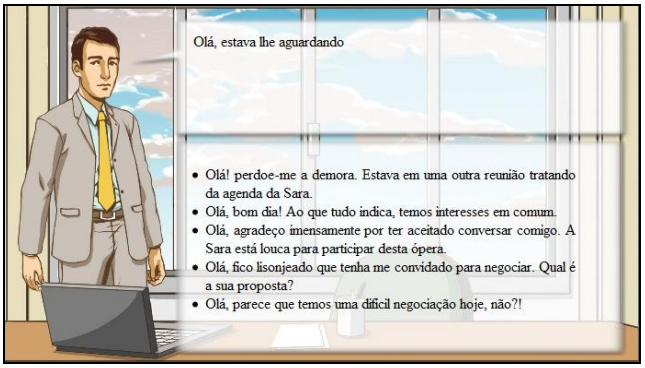

Figure 3. The game as it is displayed to the player.

COUNTERPART ARGUMENT:
The maximum value we can offer, due to budget restrictions, is $10,000. But your client will receive VIP treatment at the play.
PLAYER'S OPTIONS:
My client cannot accept less than $15,000. +1 ASSERTIVENESS -1 COOPERATION (COMPETITIVE)
I don't know... Maybe we need to talk more about it... -1 ASSERTIVENESS -1 COOPERATION (AVOIDING)
We have an agreement with a television network that is willing to cover the event. We can split the values of the transmission if the lyric house agrees to be responsible for providing the entire infrastructure. What do you think? +1 ASSERTIVENESS +1 COOPERATION (COLLABORATIVE)
It's a deal! Where do I sign? -1 ASSERTIVENESS +1 COOPERATION (ACCOMMODATING)

Figure 4. Assertiveness and Cooperation values and an approach label are assigned to the player's options in a game.

As the negotiator plays more games, the system is able to draw a more accurate history of his style, so that his profile can be traced with greater precision. Figure 5 shows a graph of the player's profile history. It must be clarified that a negotiator will not be necessarily 100% competitive or collaborative. To use different approaches over the dialogue may be a strategy, though the games developed to our tests reward the most collaborative approaches. Figure 6 depicts how the player's collaborative approach evolves as he plays more games. In addition, the diagnostic mode keeps track of all the options chosen by the player, like a replay of the games. When the player revisits his choices, the system shows how the negotiation could have ended with a better result. The goal of the system is to guide the player to more collaborative outcomes for the negotiations, encouraging creativity in generating solutions for the benefit of both parties involved in the negotiation. Figure 7 shows how the diagnostic mode works.

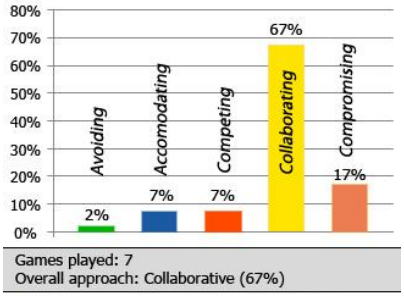

Figure 5. Player's profile history

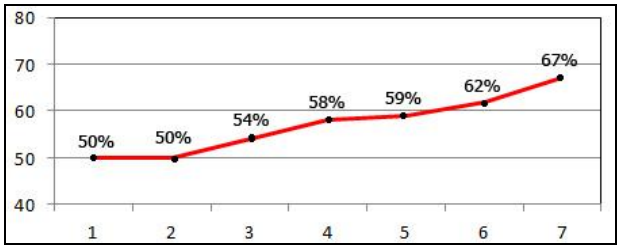

Figure 6. Player's Collaborative negotiation approach style X number of games played.

COUNTERPART ARGUMENT:
The maximum value we can offer, due to budget restrictions, is $10,000. But your client will receive VIP treatment at the play.
YOUR ARGUMENT:
It's a deal! Where do I sign?
IDEAL ARGUMENT:
We have an agreement with a television network that is willing to cover the event. We can split the values of the transmission if the lyric house agrees to be responsible for providing the entire infrastructure. What do you think?
This argument creates a mutually beneficial option for both parties. As described in the introduction, you had a previous $10000 agreement with a TV network to broadcast the event if you came to reach an agreement with the Lyric House. As the Lyric House already has the needed infrastructure to allow TV networks broadcasting events, splitting the value would mean getting $15000 to your client and cause the Lyric House to save $5000 of her payment.

Figure 7. Diagnostic mode, guiding the player into a more collaborative option in the game.

6 Results

The negotiation profile detection feature of this tool has been tested so far with 30 IT professionals. All the subjects played 7 games, all designed to offer the best outcomes when the player takes a collaborative approach in the negotiation, although the players were told only to earn as much as they

could in the negotiation, and the perception that the collaborative approach was the best one was left for them to make when playing, replaying or reviewing their results.

At the end of each game, all the subjects reviewed their games in the diagnostics mode and were offered a chance to replay the game before moving on to the next. However, only the results of the first time playing each game where considered for this report. Table 1 shows how the class history evolved from the first to the last game played. The overall collaborative approach grew 28 percentage points, from 24% to 52%, which means that it has more than doubled. The competitive approach decreased 11 percentage points, from 45% to 34%, and all other approaches have also decreased, with avoiding and accommodation decreasing to very low levels.

We can then conclude that the test subject class understood the proposal of more rewarding collaborative approaches in the negotiations simulated in the games. The results were considered very satisfactory.

Table 1 – Subjects Negotiation Profiles after Playing the Games

Profile	**Number of Games Played**						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Avoidance	9%	8%	8%	5%	4%	5%	3%
Accommodation	7%	5%	3%	4%	2%	3%	2%
Competition	45%	44%	40%	38%	38%	32%	34%
Collaboration	24%	27%	32%	37%	43%	49%	52%
Compromise	15%	16%	17%	16%	13%	11%	9%

7 Conclusions

This work discussed how a web tool developed to allow creation, maintenance and publication of Negotiation Games can be used to discover a negotiator's negotiation profile, and comprised a theoretical study on the areas of knowledge that related to the tool, such as Negotiation, Serious Games, E-Learning and Experiential Learning.

Although this profile discovery feature is still under development, the NSS which includes this tool is available on the web, allowing its use in several learning environments, including distance learning. The results obtained were considered very satisfactory, as it shown 28 percentage points of increase in the collaborative negotiation approach of the test subject class.

The fact that a bad negotiation in real life can ruin any possibilities of future negotiations or even the definitive end of a relationship is a major difficulty concerning negotiations. Simulation games can help beginners to learn concepts of negotiation without forcing them to adventure themselves on risky real-life negotiations.

A multiplayer mode for this computer tool is now under development. Students will be able to face each other anonymously on negotiations, preventing that any relationship between players interfere with the exercise. Besides that, new games are being designed in order to provide more results, and new tests will have other objectives than to develop collaborative skills.

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A Model for Office Document Processing and Collaboration in Cloud

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Abstract - *Office software suite is one of the most widely used and well developed applications. The suite includes word processor, spreadsheet, presentation, and so on. With recent developments of high-speed network and distributed computing technologies, some office applications such as document processing, have turned web-based (e.g., Microsoft Office WAC) and even cloud-based (e.g., Google Docs). The initial and obvious benefits of moving office applications into the cloud for small and medium sized businesses are cost savings in the purchase, maintenance and upgrades on both software and hardware. But the more significant advantage of doing so is to enable users of real-time collaborative editing on a shared cloud-based document. We believe moving office applications into cloud is an inevitable trend in the development of office applications. A novel, efficient cloud-based document processing model: DPC is proposed in this paper. Detailed description and functionality of this model are first introduced. We then instantiate the model using a document based on ISO 29500 [1]. Finally, we also discuss security, reliability and synchronization issues.*

Keywords: Office document processing, cloud, collaborative editing, logic structure, DPC.

1 Introduction

Office documents produced nowadays can be very sophisticated. Besides text, they may contain complex formulas, graphic illustrations, video clips, and control information. Therefore, modern office document processing software systems are large, complex and powerful. They have evolved from simple text processors to systems that deal with lots of objects and complex tasks.

The office document processor market is huge. To compete for or maintain the market share, software developers continue to upgrade their products with added features and capabilities. The Microsoft Office Suite is a prime example, which has undergone frequent upgrades in recent years. This phenomenon is not always beneficial to the end-users in terms of cost. The frequent upgrades with more functions that demand more storage space and faster CPU mean that users would have to continue to invest money on both software and hardware for the purchase, maintenance, and upgrade, just to support routine document production and processing. The rise of cloud computing technology provides an alternative approach that businesses may adopt to address this problem.

Cloud computing is a fairly new technology developed in distributed computing., The technology enables services and storage facilities to be provided over the Internet, thereby allowing users to access the services and storage facilities anywhere in the world, any time, wherever the internet access is available. A service provided through cloud computing may be an application, a computing environment, an IT infrastructure, or even a business process. Document processing is an obvious candidate service to be offered in the cloud, so that users can create, maintain, and share their documents without installing a complex software suite or needing a powerful computer to support the tasks. As such, users can expect to save thousands of dollars on both hardware and software. Furthermore, a cloud provider would have the business and economic incentives to maintain and improve efficiency of its computing facilities through proper and timely upgrades. Though payments for the service will partially offset the cost savings on hardware and software upgrades, the added benefits of using the cloud to support document processing in a business by shifting user focus from application and hardware upgrades to innovative use of the latest functionalities for their document productions should not be underestimated.

The trend that the IT industry has adopted a strategic position of moving their document processors into cloud is quite obvious. First was Google with its cloud-based Google Docs [3], and more recently Microsoft that offered its Microsoft Office 365 [4]. Both of these services claim to emphasize the support of collaboration of document editing among users. However, a closer look at these products led us to believe that the collaborative editing in Google Docs and the co-authoring in Office 365 both lack a proper granularity. For example, Google Docs's support of fine-grained collaboration that allows multiple users edit one sentence, even one word, concurrently, have been found to have led to confusion and disorder among editing users. In fact, many users have complained about this kind of confusion in the Google Docs help forum [5]. Therefore,

this level of granularity may not be suitable for collaborative document editing to some extent.

Aiming to enable users to process their office document collaboratively by a proper granularity in the cloud, we propose a Document Processing in Cloud (DPC) model in this paper. This paper is divided into four parts: background of DPC model, DPC model proposing, DPC model instantiating and discussion.

2 Background

Most office documents created nowadays are XML-based with embedded structure that describes the document content. The structure of an XML-based document defines a hierarchy, with pieces of document at the root below which are parts that make up the document. These parts are referred to as objects and each object has its own functions. Some objects can be further subdivided into smaller parts are referred to as composite objects, while others that represent smallest parts in the structure of a documents are called basic objects. For example, a sentence in an office document may be marked up as an object named as "run" (a basic object), and a paragraph may also be marked up as an object named as "P", which is a composite object and would be defined as the parent of a "run" object in the XML structure.

The hierarchical structure of an XML-based office document is the key requirement for our proposed DPC model. For most documents, the XML hierarchy consists of two categories of structures: geometric (layout) and logical [6]. A typical document is no doubt made up of pages, blocks, paragraphs, sentences, and so on that are defined as objects. When the subdivisions are based on the specific geometric layout of the document, such as page and block, the result is a geometric (layout) structure. When they are based on the human-perceptible meaning of the content, such as paragraph and section, the result is a logical structure. These two structures provide alternative but complementary views of the same document [7] and a mapping between these two structures may exist. Both structures are hierarchical in nature and can be represented by a tree as illustrated in Figure 1.

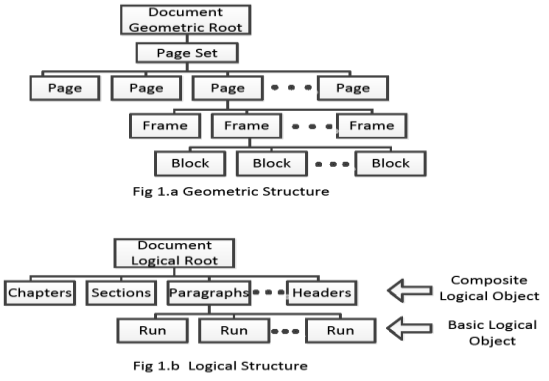

Figure 1. Two Structures.

Although both structures can represent a document comprehensively, we adopt the logical structure in developing our model for the following reasons: firstly, XML-based office documents normally use logical objects for markups; secondly, our proposed model is designed for the cloud. In a cloud, a task will be "divided" into several subtasks to be undertaken on different application servers. Then, each application server performs its assigned tasks using shared resources such as computing resources, data sources and application services. Finally, the results from all involved application servers will be collected and combined to produce the final solution of the given task [8]. For document processing, users tend to spend more time working on their documents based on the logical level, such as adding paragraph, than based on the geometric level. In light of these considerations we believe the logical structure of a document is the better choice for designing our model for document processing in a cloud environment.

In this paper, we use Microsoft Word to illustrate the development of our model. An overview of a logical structure of a Word document is shown in Figure 2.

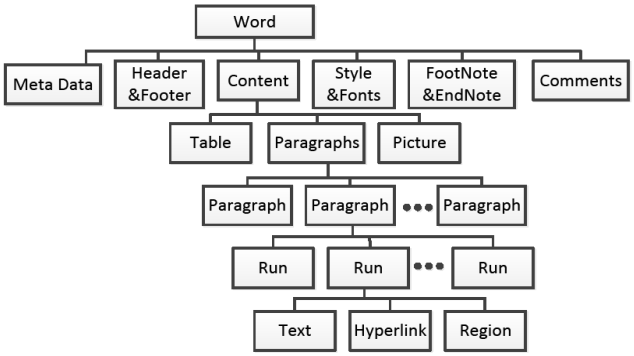

Figure 2. Logical structure tree overview of word document.

3 DPC Model

From the logical structure shown in Figure 2, we consider the non-leaf nodes in the tree as composite objects, and the leaf nodes as basic objects. More details of these two objects are discussed in the following paragraph. Our proposed DPC model is object-oriented based on these objects. It treats editable components in a document as distinct objects. DPC also gives users respective access to objects which are components of a whole document. As a result, multiple users working on one document can do collaborative editing at the same time. Our cloud-based model supports the distribution of individual objects to available processors in the cloud. Object-oriented DPC provides a more logical granularity for document processing collaboration. Instead of treating the content of a document as a string stream as Google Docs does, and which had been found to cause user confusion and disorder during concurrent editing among collaborators, we use

objects which can easily be distributed to different servers to be worked on by different users.

As an object-oriented model, our DPC model divides a document into objects. Each part of the document is assigned to a sub-task, and each subtask is a unit of work distribution to processors in the cloud. The sum of all edit tasks is the entire document. For example, if a user wants to edit a paragraph in a document, this paragraph object will be sent to a processor in the cloud and the editing subtask will be accomplished on that processor. The user performs the editing through remote access to the assigned processor. While this paragraph object is being edited by this particular user, other parts of the document are available and accessible to other users. Consequently, DPC enables multiple users to collaborate concurrently on the same document, and the collaboration is accomplished at the object level.

As discussed in Section I, collaboration in a cloud environment requires proper level of granularity. In our DPC model, the proper granularity lies on a proper design of objects in a document. DPC designs objects based on three criteria: 1) objects must reflect the logical structure; 2), the design of an object must take into consideration the editing frequency of each part in the logical structure; 3), the design needs to comply with the mainstream office document standards. Based on these considerations, our model defines thirteen objects for document processing in a cloud environment, as shown in Figure 3.

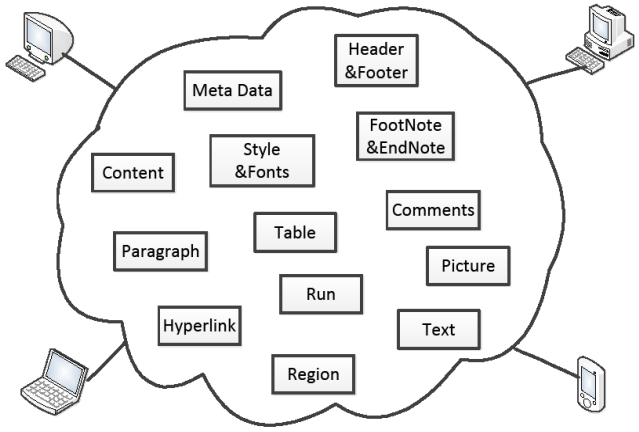

Figure 3. The proposed novel DPC model.

The thirteen objects in Figure 3 are also listed in Table 1. Nine of these objects are composite and four are basic. The composite objects are Content, Meta Data, Header&Footer, Style&Fonts, FootNote&EndNote, Comments, Paragraph, Table, and Run, and the basic objects are Hyperlink, Region, Text, and Picture. Since the objects are the basis of work assignment for editing subtasks, the definition of these objects determines the level of granularity of document processing in a cloud environment. Each object is atomic and cannot be edited by more than one user at any one time.

Table 1. DPC Objects description.

	Object Name	Object Description
Composite Objects	Content	Specifies document's properties.
	Meta Data	Specifies meta data.
	Header& Footer	Specifies headers and footers.
	Style& Fonts	Specifies styles and fonts setting.
	FootNote&End Note	Specifies foot note and end note.
	Comments	Specifies comments.
	Paragraph	Specifies paragraphs' properties.
	Table	Specifies tables.
	Run	Specifies runs' properties of content in the parent field.
Basic Objects	Hyperlink	Specifies hyperlinks.
	Region	Specifies regions.
	Text	Specifies literal text of runs which shall be displayed in the document.
	Picture	Specifies pictures.

Besides these thirteen objects, DPC also needs other components for a complete utilization in the cloud environment. We use the Z notation introduced by Spivey in [9] to define all eight components in our DPC model as follows:

DPC = {DOC, MIDDLEWARE, PROCESSORS《bag PROCESSOR》} (1)
DOC = {ROOT, ASSIST_INFO} (2)
PROCESSOR = { APPS《bag APP》} (3)
ROOT = {NONLEAF《bag COMPOSITE _OBJ》, LEAF《bag BASIC _OBJ》} (4)
COMPOSITE_OBJ = {OBJECT, DESCENDANT《bag ROOT》} (5)
BASIC_OBJ = {OBJECT} (6)
OBJECT = {NAME, ACCESS_PATH, ON_EDITING} (7)
ON_EDITING :: = Busy | Idle (8)

Formula 1 defines that DPC consists of three parts: DOC, MIDDLEWARE and PROCESSORS. Details of DOC and PROCESSORS will be discussed in the following paragraphs. MIDDLEWARE is the middleware [10] in the cloud, which is the software layer that "sits" between application servers (processors) and the resources (document and its pieces). MIDDLEWARE provides the link and passes data among resources and servers. In DPC, MIDDLEWARE is primarily responsible for reading/storing data from/to storage, generating objects from the division of the document, providing the link among objects processed by multiple distributed servers, and combing the results of sub-tasks to produce the final document.

Formula 2 specifies that DOC is the collection of all information contained in an office document. It is composed of two parts: ROOT and ASSIST_INFO. ROOT will be discussed in more detail below. ASSIST_INFO is the assistance information on the office document that is required for its processing, such as read-only sign.

Formula 3 defines the PROCESSORS component in the cloud. It typically comprised of multiple document processors, which are application servers available in the given cloud. These application servers can be substantially heterogeneous, thereby allowing servers with various specialized capabilities to be used in processing a single document. Since these servers are being shared among many cloud users, the effectiveness of document processing is improved without incurring high costs. For example, users who may wish to use handwriting pad to draw pictures in their Microsoft Office document cannot do so without buying add-in software that supports such functions. This translates to additional financial and time burden. However, a cloud created to serve a large and diverse population of document processing users would likely have a variety of add-on capabilities, including hand-drawing tools, so that a user may access them at little extra costs. This advantage may be especially obvious for large businesses, which normally have greater demands for sophisticated documents that contain embedded objects or links to external databases and require complex add-ins for their correct and effective processing.

Formula 4 defines ROOT, which is the aggregation of all objects in the DPC division. It has two components: NONLEAF and LEAF objects. NONLEAF is a collection of COMPOSITE_OBJ (composite objects). LEAF is a collection of BASIC_OBJ (basic objects).

Formula 5 defines COMPOSITE_OBJ, which is an object with descendants. As a result, one constituent part of COMPOSITE_OBJ is DESCENDANT. Because of the recursiveness attribute of the tree structure, DESCENDANT is a collection of ROOT, defined in Formula 4. COMPOSITE_OBJ also has another component, OBJECT, to identify itself. OBJECT will be defined in Formula 7.

Formula 6 defines BASIC_OBJ, for basic objects, which are leaf nodes in the tree structure. It only has OBJECT item to identify itself.

Formula 7 defines OBJECT, which is used to identify all objects including COMPOSITE_OBJ and BASIC_OBJ in DPC. It has three constituent items: NAME (name of the object), ACCESS_PATH (accessing path to the object) and ON_EDITING (the sign of whether it is on editing).

ACCESS_PATH is an accessing path which guides users to reach the target object in the given cloud. Because objects in DPC are derived from the nodes in a logical tree through divisions, every object corresponds to a node in the logical tree. Meanwhile, as described by XML, each node in the logical tree has its own unique XPath [11], so we adopted XPath to be identifiers of the nodes. By extension, some of these XPath become the identifier of objects in DPC because of the corresponding relationship mentioned above. The identifier of an object is the accessing path (ACCESS_PATH defined in Formula 7) that guides user to get in that object. As a document is being divided, the XPath of each node is recorded, and some of them become the ACCESS_PATH of the objects in DPC by division. Then the ACCESS_PATH will be sent with its corresponding object to a target processor. Users get the target object through its ACCESS_PATH. For example, the ACCESS_PATH of the object of "the texts of the first run in second paragraph in document" is: /document/body/paragraph [2]/run [1]/text. Once a processor is selected for the object's processing, the ACCESS_PATH will become the ID of that object on the processor and will be sent to the processor along with its corresponding object. At the other end of the processing, ACCESS_PATH also plays a key role in combining results from servers to produce the final document by giving each result of a subtask its location on the final document. In the above example, when the result of this subtask needs to be combined with results of other subtasks, the ACCESS_PATH will provide its location in the final document, which is the second paragraph's first sentence content. Due to the different ACCESS_PATH leading to different server, different user can access different parts of the same document, accomplishing collaborations at the logical object level among distributed processors in the cloud.

Finally Formula 8 defines ON_EDITING, which is a sign and works as a write lock. When it is busy, the object is locked to other users. When a user gets the link to a target object, this user will have the editing right as long as the ON_EDITING sign of that object is IDLE. The object will set its ON_EDITING sign as "Busy" when there is someone editing it. As the objects in DPC are isolated with each other, there is no inheritance relationship between any two objects. So do the ON_EDITING signs, which means even though object A is the ancestor of object B in DPC, there is no inheritance relationship of ON_EDITING sign between A and B, because A and B are sent to different processor, editing one of them on a processor won't affect the other on other processor. This state of ON_EDITING is crucial for collaboration in a cloud, because how often it is set to "Busy", and the duration of the "Busy" state impacts the collaborative editing in cloud deeply. In our DPC model, these two conditions depend on the granularity of document processing. As mentioned above, the granularity is decided by the design of objects in DPC. If the basic object is designed as phrase rather than text of a run in DPC, the collaboration will get finer granularity. A finer granularity is not always good for users, as it will bring confusion to when several users are editing one phrase. Besides, doing so will cost more time to divide the document and combine the results from individual servers.

4 Instantiate DPC

To help clarify how our DPC model works, we instantiate it using a real world example, the instance, which is an example office document and used to instantiate DPC, is based on ISO 29500. The logical

structure of ISO 29500 [12] and its mapping with DPC is shown in Table 2.

Table 2. ISO 29500 mapping with DPC.

ISO 29500 (Word Processing)	Objects in DPC
|------ XXX.docx	
|------ Metadata	Meta Data
|------ Document	Content
|------ P	Paragraph
|------ Run	Run
|------ Text	Text
|------ Hyperlink	Hyperlink
|------ Region	Region
|------ Drawing/VML	Picture
|------ Revision	Content
|------ Region	Region
|------ SectPr	Paragraph
|------ SectPrchange	Paragraph
|------ Revision	Content
|------ Region	Region
|------ Table	Table
|------ P	Paragraph
|------ SectPr	Content
|------ SectPrchange	Content
|------ DocumentRels	Content
|------ Settings	Content
|------ Styles	Style&Fonts
|------ FontProps	
|------ Endnotes	FootNote&EndNote
|------ EndnotesRels	
|------ Footnotes	
|------ FootnotesRels	
|------ Header	Header&Footer
------ HeaderRels	
|------ Footer	
|------ FooterRels	
|------ Comments	Comments
|------ CommentRels	

An example document, based on the instance standard, named as "the old man and sea" is used here to illustrate the mechanism of DPC. The display of this example document is shown as Figure 4.

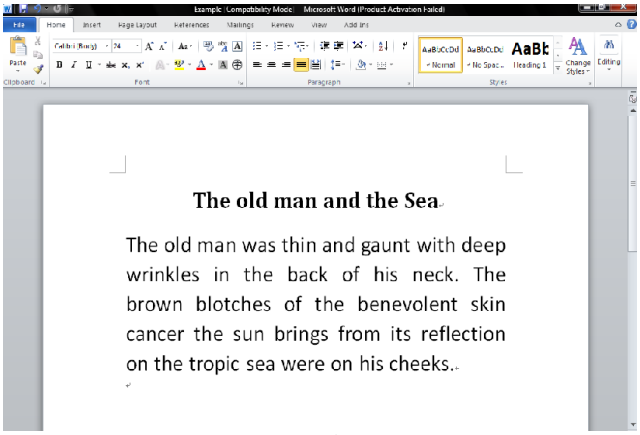

Figure 4. Display of example document.

We take the composite object "document" in this example as an example object, which is described in XML as:

```
<w:document
xmlns:w="http://schemas.openxmlformats.org/wordprocessingml/2006/main">
  <w:body>
    <w:p>
      <w:pPr>
        <w:pStyle w:val="a5"/>
      </w:pPr>
      <w:r>
        <w:t>The old man and the Sea</w:t>
      </w:r>
    </w:p>
    <w:p>
      <w:pPr>
        <w:spacing w:beforeLines="100"/>
        <w:rPr>
          <w:rFonts w:hint="east Asia"/>
        </w:rPr>
      </w:pPr>
      <w:r>
        <w:t> The old man was thin and gaunt with deep wrinkles in the back of his neck. The brown blotches of the benevolent skin cancer the sun brings from its reflection on the tropic sea were on his cheeks.
        </w:t>
      </w:r>
    </w:p>
  </w:body>
</w:document>
```

The composite object "document" contains five composite objects: content, two paragraphs and two runs, and two basic objects, which are two texts. Each composite object has the "w:pPr" attribute to represent the paragraph properties. Basic objects "w:r" represent the text of the paragraph. These five objects will be sent to five servers in a cloud with their own XPath as their accessing path shown in Table 3.

Table 3. XPath of object in instant.

Object	XPath
document	../w:document
First paragraph	../w:document/w:body/w:p[1]
First paragraph's properties	../w:document/w:body/w:p[1]/ w:pPr
First paragraph's text	../w:document/w:body/w:p[1]/w:r/w:t
Second paragraph	../w:document/w:body/w:p[2]
Second paragraph's properties	../w:document/w:body/w:p[2] / w:pPr
Second paragraph's text	../w:document/w:body/w:p[2] /w:r/w:t

In DPC, a paragraph is a composite object, and text is a basic object, and each of them has an ON_EDITING sign. As there is no inheritance relationship between paragraph and text, so their ON_EDITING signs do not have the inheritance relationship either. In this case, if a user edits the property of the first paragraph, the text of this paragraph is still available to other users, while the ON_EDITING sign of the first paragraph is BUSY. An overview of this example document processed in cloud based on DPC is shown as Figure 5.

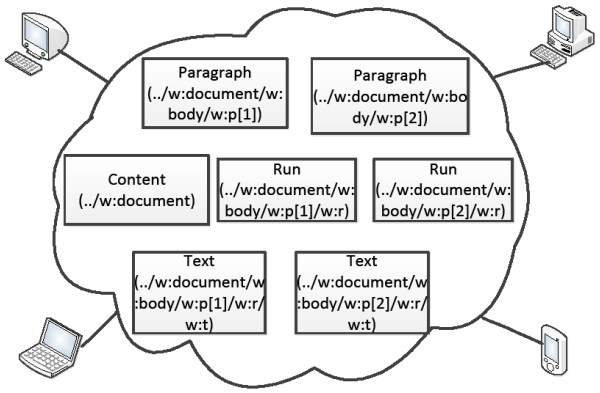

Figure 5. Overview of example document in cloud based on DPC.

Accessing path is used to lead user to get the sub-part of the office document, which is the key concept of collaboration editing in cloud. Through accessing path, multiple users can get access to the part they want to edit separately. For example, if user wants to edit the text of the first paragraph, the middleware in cloud will lead user to the processor which marked this object's accessing path as "../w:document/w:body/w:p[1]/w:r/w:t", and then user will accomplish their editing on that processor.

5 Discussion

The first problem of moving office document processing into the cloud environment using DPC is the security problem. As DPC divides a document into smaller pieces and sends them to servers that may be geographically disperse, how to ensure the security of the document would be a legitimate question. The best solution so far is to send pieces of the document to authorized servers with secure channels. The limitation of this method is that it will narrow the range of application servers in a cloud for document processing.

As different parts of a document are being processed in different processors separately, a second problem of concern is reliability. If one of the servers crashes while processing, the final document cannot be integrated and produced, because the crashed processor will not return the result of its part. A solution for this problem is to back up the document before it is divided in storage. If server crash does occur, the backup copy of those pieces on crashed server will be used to constitute the final document. Synchronization is a common problem encountered in all distributed computing, including cloud computing. For DPC, the user who opens a document first in a cloud is regarded as the owner of the document; other users collaborate on this document in two steps: (a), obtain the permission from the owner; (b), save their work before the owner closes the document, otherwise their work will not be saved. Meanwhile, for DPC, synchronization is on the logical object level which is a proper granularity for document processing.

6 Conclusion

As people realize that cloud computing will reshape the IT industry, some even predict that one day it will become the 5th utility after water, electricity, gas and telephone [13]. Moving document processing into the cloud is a logical and strategically wise choice. This movement is not only based on cost-saving considerations, but also on the merits that include easier and more effective collaboration in document processing. Aiming to accomplish this goal completely, we have proposed a DPC model to enable users process their office document collaboratively in a cloud environment at a proper level of granularity so that concurrent editing tasks are more effectively isolated, thereby eliminate any confusion that may occur as a result of collaboration at a finer granularity.

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Computer-aided Resource Consumption Costing for a Fiberboard Producer – an Implementation Report

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Abstract *The article presents a costing system for a fiberboard producer. Resource consumption costing was chosen as the underlying cost accounting methodology. Technological links between the consumption of resources and final cost objects have been reflected in designing the costing system. Allocation bases derived from the features of the production flow for allocating resources costs to cost objects have been proposed. Dedicated tools for collecting and processing cost and quantity data have been invented. Integration of non-integrated functional modules and spreadsheet computations for the purpose of the costing model was the IT challenge in the researched company. Attention was given to the cost flow of multi-phase production and the complexity of finished products.*

Keywords: Resource costing, resource consumption, phase production

1 Introduction

Cost analysis and cost management are key functions for the majority of producers that seek excellence, or at least improvements, in their information-based management practices. Proper, unbiased and true information on costs of products (and other cost objects) plays an important role in both strategic and operational management. Reliable, analytical information in both ex ante and ex post modes helps in sound planning and running of the business.

Costing systems of nowadays are subject to constant changes due to a rapid development of computerized tools for accounting, budgeting, performance management and other management functions. Traditional full costing methods, which are required for valuation and disclosure purposes imposed either by national accounting laws or international standards, are not a satisfying solution for many companies operating in volatile reality. Thus, modern, tailor-made, computer-aided and integrated costing and performance management systems are highly valued by practitioners.

The rise of the activity-based costing [6], developed next into activity-based budgeting/management (ABB/ABM), and recently transformed into Time-driven ABC [7], has been fertilizing the imagination of cost accountants, cost managers and costing systems designers worldwide. Moreover, even non-financial managers have become aware of new perspectives emerging from recent developments in the domain that was perceived as stagnated.

The development of costing methods has been very rapid for the last 20-25 years. Nowadays there is a wide choice of costing procedures including:

- traditional full costing, simple volume-driven or with complex multi drivers, with variations between industries and branches,
- traditional variable costing, for various purposes,
- contribution accounting based on marginal costing with multi-level contribution margins,
- combined contribution accounting with activity-based costing,
- modern activity-based costing of different genres at different stages of development, from single-step ex post systems, through the classic resources-activities-objects solutions, enriched with the ex ante perspective,
- time-driven ABC systems, where the consumption of activities of human and material resources are measured with standard time.

Recently the idea of resources consumption accounting (RCA) for production has been emphasized [1], [2]. Some authors consider RCA the first step in the process of ABC systems implementation [9]. Generally, the underlying assumption of RCA is first to identify the company's resources and assign costs to them, and second to allocate costs of resources either to activities (when ABC is applied) or directly to cost objects (if traditional costing is concerned). For example, with reference to production if "machine X" is considered an element of resources, then the "work of machine X" is an activity. This straightforward logic results in the allocation of machine costs directly to final cost object, i.e. the final product, manufactured thanks to the activity of the resource element.

All the above-mentioned solutions require computer aid. On one hand there are sophisticated costing solutions performed by means of advanced integrated software, but on the other hand, stand-alone, tailor-made, spreadsheet-

based, unique applications are used in many companies [3].

The aim of the paper is to present the practical implementation of the idea of a tailor-made stand-alone resource costing (accounting) system based upon production resources of a manufacturing company in the fiberboard industry.

2 Characteristics of the Company

The company is a medium-sized player on the market of wet-processed fiberboard. During the implementation period the company total sales revenue reached an average of PLN 50 m a year, one fourth being an export stake. The efficiency of the wet-processed hardboard business in Poland, that has usually been oscillating around 2%, is not a promising incentive for heavy capital investments. Hence the search for better profitability and performance management.

Wet processing requires rigorous standards for the protection of the environment. A large amount of poisonous pollution has to be biologically neutralized and recycled in the course of environment-sheltering actions. The company operates facilities of biological and natural sedimentation. Moreover, specialized service units have been organized, i.e. sewerage, waste and dust departments.

Production technology of the company is a typical example of multi-phase processing along with final customization with the use of machine work centers (MWC). The variety of finished products is derived from the same basic raw material input which are pre-processed wood scraps and, to some extent, stack wood (phases 1 and 2). Enriched with chemical direct materials (adhesives, glues, hardeners, catalysts, inhibitors, aggregators) and technological water (phase 3), it is further developed into standard pulp lace cast upon lines of dedicated outcome. At the end of each of three casting lines standard or non-standard products come out (phase 4A, 4B and 4C). The standard ones are then subject to grinding and cutting and are moved to inventories in the final commercial sizes. However, the non-standard ones are subject to various technological operations that give final customized features to them (phases 6, 7 and 8). Hence, the abundance of potential end products of the company is huge due to possible different settings of the CNC machines. Thus, the well established wood processing technology itself, accompanied by the choice of customizing machines allows the producer to compete in the demanding market conditions. A general view of the processes is depicted on Figure 1.

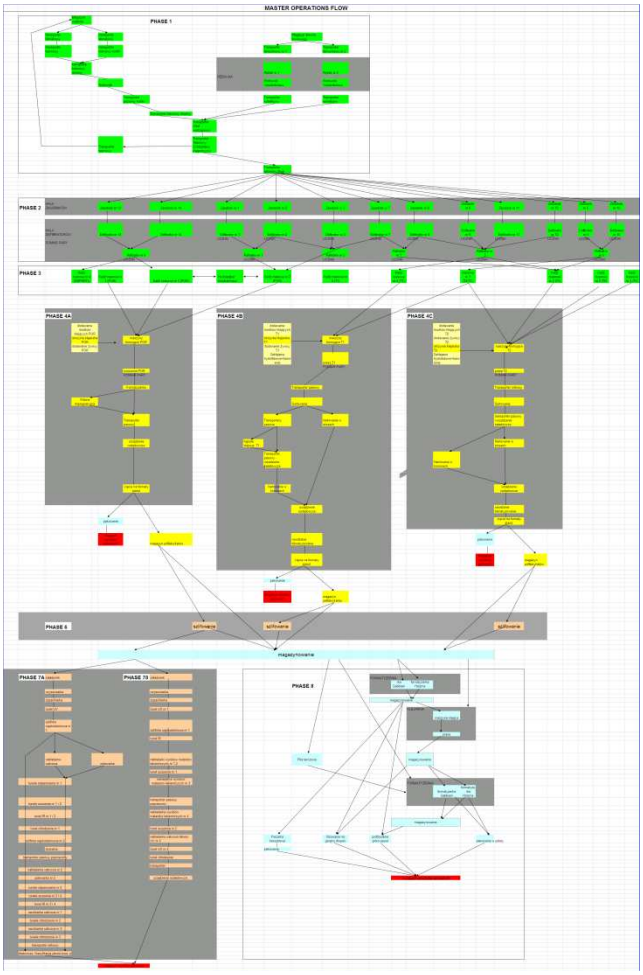


Figure 1. General Flow of Technological Processes

From the commercial point of view, the final products of the company range from regular dimension and thickness/density plain hardboard, lacquered wood-based decor hardboard, regular size oil-hardened boards and extra-hard bituminous-based boards, as well as roof, floor and wall insulating boards (so called porous or low-density fibreboards), and insulation boards for sound absorbing chambers. The company's products are in high demand from the furniture, construction, automotive, railway, tramway and shipbuilding industries. The company is a supplier for European as well as some African clients.

The final cost object unit embraces all sorts of end products which are the commercial offer of the company. They have been first split into the following master groups:

1) Strategic products (STR),

2) Special products (SPE),

3) Regular products (REG),

4) Other products (OTH).

Then each product group has been explored in detail as far as types of final products from the commercial viewpoint are concerned. As a result, the full

commercial offer of the company has been itemized into the total of 109 final following cost object:

1) STR – 21 types,

2) SPE – 27 types,

3) REG – 32 types,

4) OTH – 29 types.

Every final product received a cost object account in General Ledger.

3 Application of Resource Consumption Costing to Production Processes

Every model of a costing system built upon the activity-based costing notion should consist of three modules:

- resources unit,
- activities unit,
- cost objects unit.

ABC maintains that cost objects consume activities and activities consume resources. Hence, resources costs are assigned to activities based on their use of those resources and then activity costs are reassigned to cost objects (outputs) based on the cost objects' proportional use of those activities.

Allocating costs to final cost objects in a two-step procedure necessitates defining relationships between both resources and activities, and activities and cost objects. In consequence, clearly measured allocation drivers should be identified, i.e. the resources drivers and activities drivers.

The structure of the resource consumption costing model consists of two modules:

- resources unit,
- cost objects unit.

The underlying idea of resource-based single-step allocation procedure explores direct connections between a single resource engaged with a cost object charged with a share of cost of the resource. There is no intermediate level of double-step allocation: firstly: costs of resources to activities performed by those resources and secondly: cost of activities to cost objects which consumed those activities.

The solution presented in this paper belongs to the family of full costing methods. The conviction of usability of resource consumption costing system stems from the authors' practical and theoretical experience gained in the course of implementing different models of performance control applications into the operations of Polish manufacturing companies. The full costing procedure presented in the paper belongs to dedicated solutions with necessary modifications with reference to:

- detailed identification of production resources in line with the "resources usage – cost drivers – cost object" logic,
- differentiation of end-products from both the technical and commercial viewpoints,
- development of newly-designed costing paths in accordance with the resources consumption by final products,
- full awareness of the functional capabilities of existing computer-aided modules of management information system operated by the company,
- capital restraints concerning the acquisition and implementation of expensive and extensive IT packages.

As can be expected from a full costing system, the company can easily identify raw materials and direct material costs. Raw materials are wood extracted from forests managed by The National Forest Holding in Poland. Direct chemical materials can be directly traced to production lots and result from chemical prescription. In addition, a vast amount of technical water from the neighbouring river is used for preparing the production input.

As far as indirect costs are concerned, prior to the implementation the described company had identified only four main production departments:

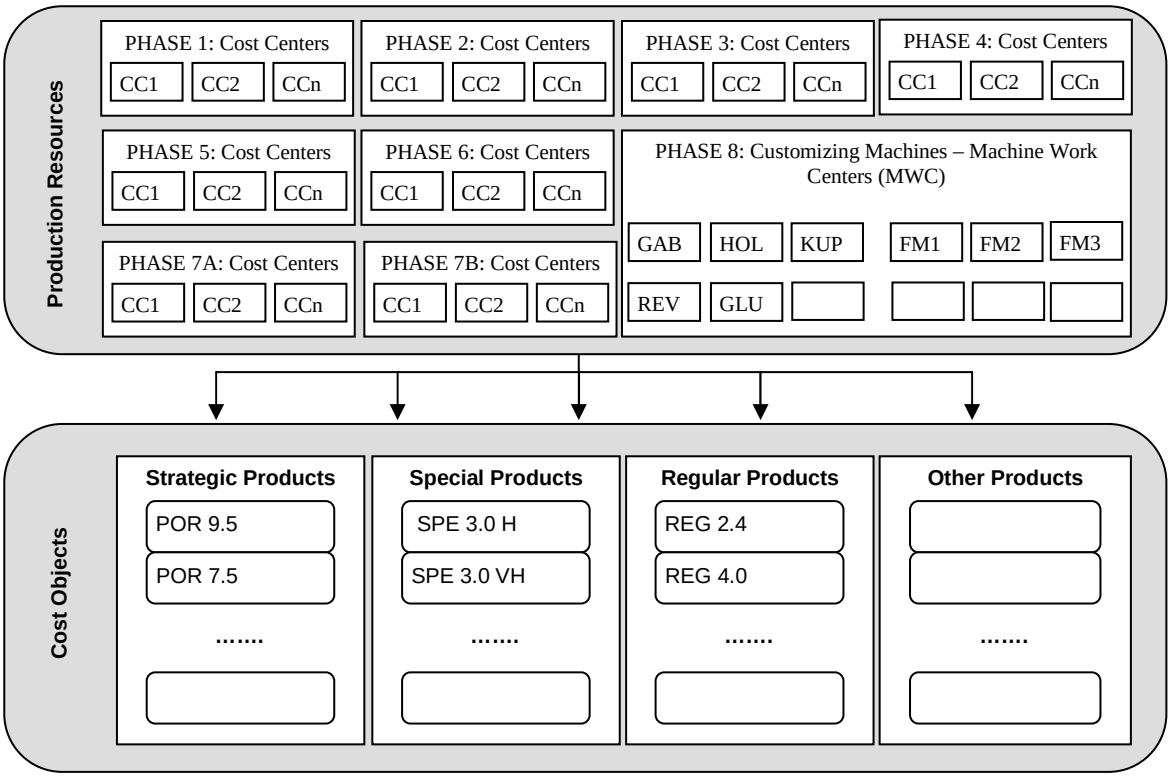
- raw wood store and pulp pre-processing,
- pulp casting lines,
- board veneer lines,
- customising machines.

The issue is that the company operates various production resources that are technologically organised into clearly distinguished production phases. To make it more transparent, there are technologically justified inter-operational warehouses located between the phase of pulp casting lines and the veneering, lacquering, cutting, formatting and customising lines and machine work centers. Moreover, in the early phase of wood pulp casting the consecutive processes are normally set on obtaining half-products in the form of fibreboards of required thickness, density and hardness. Thus, not only very soft and soft boards can be obtained, but also hard, very hard and toughened ones. And this definitely brings about significant alterations in the manufacturing cost of

the half products and final products. Hard and very hard boards are obviously more cost-consuming than the soft and porous ones and hence the differentiation of costing procedures between them is necessary.

Bearing in mind the abundance of possible finished products from the commercial perspective and their diversity according to customers' needs, the costing procedure in such conditions should reflect the complexity of technological processes of each phase as well as regular and customization processes in the final steps of production. The general idea of resource consumption costing is depicted on Figure 2.

Figure 2: General model of single-step allocation in resource consumption costing



From the purely technological point of view the production processes in the company have been structured into the following production phases:

1) Raw wood scraps and wood logs chopping,
2) Pulp pre-processing,
3) Chemicals pre-processing,
4) Pulp casting (three separate production lines),
5) Kindling (by-products line),
6) Grinding,
7) Painting and lacquering (two product-oriented dedicated production lines),
8) Customizing.

The operations in the phase of customizing are performed by specialized machines that are located in a separate production department. They are nested into machine work centers (MWC) and are CNC lathes, millings, moulders, drillings, panel saws, revolving millings, and others.

4 Reasons for Resource Costing

The idea of and necessity for resource costing system arose from the need of the company to amend costing procedures for the reason of a fast changing variety of products. In the early 2000s the company experienced a rising demand for non-standard products which would be specially processed to meet the clients' needs. Hence, it turned out to be necessary to equip the production plan with special purpose customizing machines. At that time the final phases of the technological processes were terminated by final cutting to standard dimensions and stacking the hardboard in the finished goods warehouse. However, with the increasing demand for fine finishing, pattern painting, lacquering, and non-standard cutting, the management has decided to invest in special equipment. Since then additional phases of the technological processes have been added to the production flows. Other problems emerged with the

shortness of the special order production lots. The newly-bought equipment has never been engaged to its full capacity thus creating problems with productivity and performance.

The implementation works were perceived as an introductory step towards an activity-based costing system to be applied in the future. At that time the role of consultants was to identify the production resources engaged in all of the production stages of the company. Thus, the aim of the project was not to develop an elaborate and expensive costing system but rather to prepare grounds for further developments.

Designing the above described system necessitated the reorientation of the approach towards cost recording and accounting. In order to achieve the aims, it was necessary to:

- establish 214 GL accounts for costs by nature (instead of previous 66),
- define phase-oriented cost centers (in place of 4 production departments),
- differentiate between cost sub-centers accordingly to production phases (previously non-existent and not reflected in the GL recording system),
- introduce 109 final cost objects (replacing previous 9 groups of products),
- elaborate a spreadsheet costing module,
- define the rules for data transfers form stand-alone modules and GL to the spreadsheet module,
- define the rules of recording the results of the costing procedure back to GL accounts.

However, many existing solutions and information flow channels have been adapted to the new concept, the main being:

- description of the technology and all chemical formulas,
- mass allocation bases for production phases 1-3 and dimension allocation bases for production phase 4,
- tools available for collecting detailed data, for example: timesheets for labor hours, sheets for recording the mass of production, machine registers, goods flows registers,
- entire existing software for production planning, general ledger and subledgers, payroll, staff management, sales and invoicing, material handling, asset management and CRS.

The following key expectations with respect to the new costing system were formulated by the client:

- use of existing accounting software,
- use of existing material handling and dispatching software,
- integrating all computations into a spreadsheet,
- itemized identification of expenses with connection to personal cost control and cost responsibility,
- detailed analysis of profitability of final products based upon selected criteria,
- relative simplicity of operating and understanding the new system for non-economists,
- low cost of the system application.

5 Costing Procedure

The adopted costing procedure has been built upon the following general assumptions.

Natural costs are traced to particular cost objects and cost centers. Cost centers are the prime resources to which natural costs are originally recorded, whereas natural cost themselves are treated as simple costs of running and maintaining those resources.

Costs of maintenance departments (mechanical, electrical, transportation, environment and others) are allocated to cost centers for different production phases upon a cost base that is proper for each maintenance department. Next, costs of the so-called supporting departments, i.e. technical steam department and technical water department, are allocated to cost centers of production phases. The allocation bases are: GJ for heat and tonnes of overheated steam for the first, and tonnes of technologically enriched water for the latter. Further, costs of Phase 1 (Wood Processing) and Phase 2 (Pulp Pre-processing) are allocated to the output. Here allocation bases are the mass of ready-to-process wood and the mass of ready-to-cast pulp in tonnes of respective substances. Costs of the supporting phase of chemicals pre-processing (phase 3) are allocated on the base of the mass of the substance.

Then the costing procedures move to pulp casting lines where predefined technical parameters are to be obtained in order to ensure the desired quality of final products. From the technological perspective each of three casting lines serves to manufacture a specific range of products. For example, the porous output can only be obtained from the Phase 4A. Phases 4A, 4B, and 4C have thus their own allocation bases which are the cubic meters of the products (end or half) obtained from those phases.

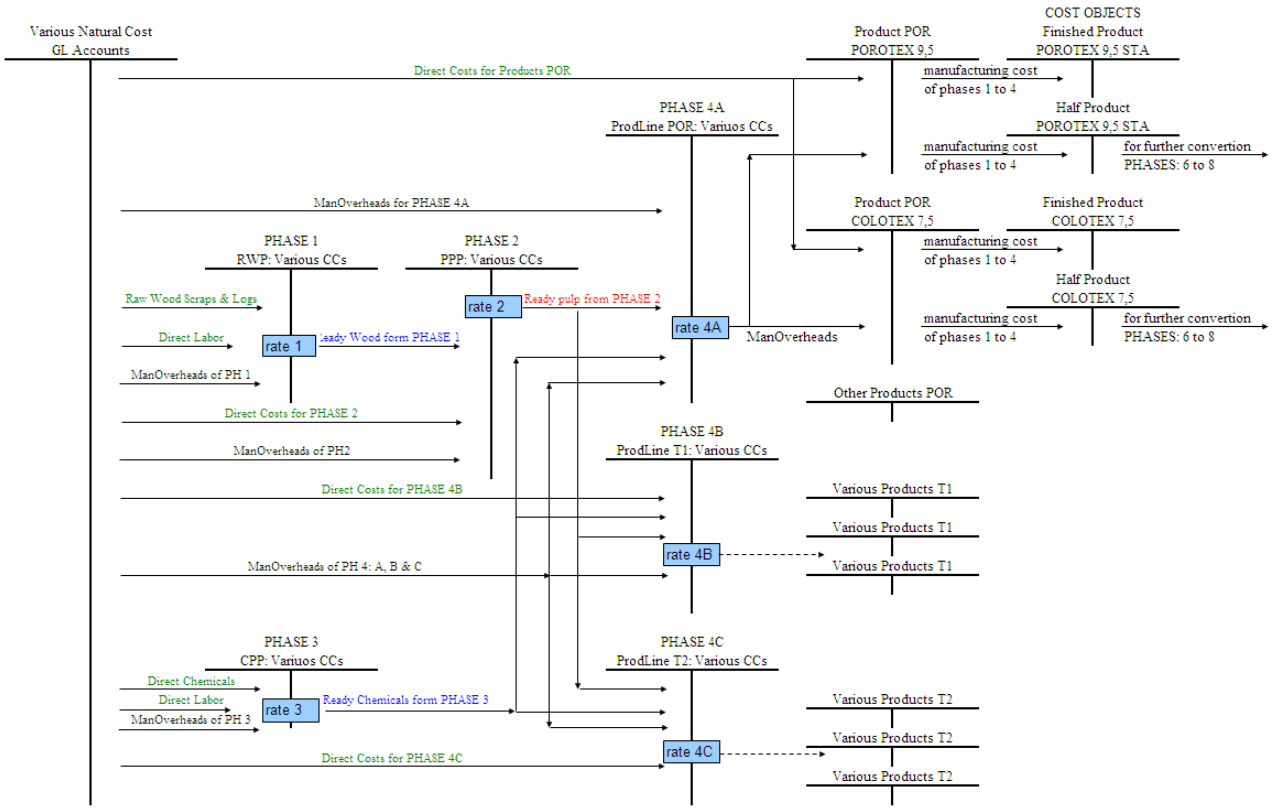
For the non-lacquered regular finished products the procedure stops here. But in the case of the lacquered regular ones costs of phase 6, 7A or 7B should next be taken into account. Different costs of which the painting

operations are composed are allocated upon different bases. For example, direct materials used in these phases are primarily recorded to each batch separately, whereas direct labor is allocated based on labor hours, and indirect manufacturing costs are allocated upon the number of machine hours spent on each batch.

Finally comes phase 8 which is made up of customizing operations. Each of 12 specialized machine work centers (MWC) is treated here as a separate resource with dedicated allocation bases. Labor hours is the allocation base for direct labor costs of workers who process batches of products. The total costs of running and maintaining the machines divided by the number of machine hours gives the cost rate per machine hour. Any costs of direct materials necessary for customized production are registered to respective batches. Setup costs are included in the rate per labor hours.

Figure 3 depicts a section from the description charts of the cost flow in the company.

Figure 3: Section of General Ledger Scheme of Cost Flow



6 Further Developments

From the user's viewpoint, development of the described resource consumption costing system should aim at achieving several future goals:

- amending the process of recording source documents to GL resource accounts,
- strengthening the role of the responsible engineer in the process of classifying natural costs to proper resources,
- speeding up the process of collecting and inputting necessary information for the purposes of the costing procedures,
- abandoning pendrive-based data transfer in favor of an intranet data input and transfer,
- costing intra-operation warehousing of half-products; currently the cost of this activity is a part of the cost of general inventory stocking and is charged to warehousing expenses,
- reorganizing the data transfers form stand-alone dedicated modules (payroll, materials handling, asset management, maintenance management, general ledger natural cost accounts) to the spreadsheet-based costing procedures, which are now the main IT tool for the entire concept,
- integrating budgeted vs. actual data variance analysis into the spreadsheet costing procedure,
- introducing the concept of activity-based costing to customizing, packaging, warehouse logistic and dispatching operations.

Identification of resources, along with analysis of activities and differentiation of cost objects, are usually the main step towards an implementation of activity-based costing. Hence, elaboration of business concept of the entity for the purposes of an integrated MRP or ERP system application can be a further perspective for the analyzed company.

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Design specifications for a generic Intelligent Tutoring System

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Abstract - *Intelligent Tutoring System (ITS) is no more a young research area as it has already revolutionized e-Learning, curriculum instructions and workplace training. For the last few decades, the field has seen approach towards many possible directions and as a result, numerous ITSs have been developed to date. However, they are mostly being studied in research environment and only a few have claimed to be successful in real classrooms for large number of students. This is mainly because human learning phenomena are very complex and itself is an ongoing research activity right through the history of mankind. This paper attempts to identify some key learning/instructional aspects that must be addressed while designing a successful tutoring system. In this regard, we have reviewed some of the well-known ITSs and report an analysis of their success in modeling these instructional ingredients.*

Keywords: Intelligent Tutoring System, Student Modelling, Domain Knowledge, Instructional ingredients, Affective factors, Feedback.

1 Introduction

Given a rich intellectual history of decades, Intelligent Tutoring Systems have already attracted attention, funding, and research largely from three different disciplines such as computer science (AI), psychology (cognition) and education and training. Starting from the early days of Computer Aided Instruction (CAI), the field has come across a great success and the recent tutoring systems have claimed to achieve some degree of success in real world applications. However, their success is still limited mainly because it takes a lot of development time (generally 200 hours of development time for one hour of teaching/instructions) and many researchers even describe the ITS development as notoriously costly.

Any software having some degree of intelligent behavior and used for the purpose of learning/instruction is referred to as Intelligent Tutoring system or Intelligent computer Aided Instructions (ICAI). However, human learning is a very complex phenomenon and is being investigated through the lenses of psychologists, psychiatrists, educationist, cognitive scientist and various others. Thus, the success of a tutoring system depends heavily on our ability to understand and model these factors through the four basic ITS modules like domain, pedagogy, student and interface. An ITS may be very much domain rich but adopts a poor policy of providing feedback while another may be good at feedback but pays a little attention towards student's affective states as well as to well deserved individualized instructions. An ideal tutoring system should be developed keeping in mind all the aspects and thus ITS research must be interdisciplinary in nature. However, most of the existing tutoring systems lack one or more of these aspects. In the next section, we try to enlist the major requirements of a full-fledged ITS, as identified by various experts. We have studied some of the existing tutoring systems and reported which aspects of learning are being addressed by each of them.

2 Learning Processes

In a real classroom, an expert human teacher who is rich in domain knowledge explains the concepts to the students using various tools and evaluations (mostly through final exam) are conducted to test the mastery of the student over the subject. During these interactions, the teacher tries to model/assess individual student behavior and accordingly decides the pedagogical strategy. A tutoring system should attempt to mimic the best of the collectively human teachers while putting major effort on individualized attention, because this is where teacher fails or falls short to deliver due to time and other constraints.

2.1 Domain knowledge representation

Domain model contains a representation of the information to be taught, provides input into the expert module, and ultimately is used to produce detailed feedback, guide problem selection/generation, and as a

basis for the student model [22]. The domain model may take many forms, depending on the knowledge representation used, the domain it represents, and the level of granularity. A major chunk of ITS development time is supposedly consumed in accomplishing such ingredients. We need to have a standard generic template based domain module which can simply be filled each time by a subject expert and get a quickly developed ITS ready to use. In Cognitive tutors, the domain model consists of low-level production rules that completely describe the expected student behaviour down to atomic thought components while Constraint-based systems describe the possible valid states that an answer may occupy.

2.2 Initial student modeling

Student module plays a very important role in Intelligent Tutoring Systems and stores information about each individual student such as his current state of the domain knowledge, history, and emotional aspects. The content of student models varies widely [27]. Some of these are built for recognizing student plans or solution paths [8], and many others are built for evaluating student performance or problem solving skills [14]; while mostly others are created for describing constraints that the student has violated. We should be clear about what aspects of the student to model while working on a specific tutoring system. Model tracing [15] is the most popular student modeling approach currently. It tracks student's progress by generating solutions step-by-step, and is suitable for well-defined tasks. But, developing model-tracing tutors for ill-structured tasks is much harder, as it is difficult to come up with problem solvers for such tasks [20]. However, constraint based tutors do not suffer from such difficulties [19].

2.3 Evaluation and Feedback

Simply solving problems through ITS without any feedback may not improve skills or deeper understanding of the subject. Learning occurs best when the learner receives feedback from the system as it improves the learning process on the basis of a continuous assessment of results, the analysis of their quality and performance and feedback for necessary corrections. Feedback encourages desired learning behavior and discourages undesired one, allows understanding how successfully the learner acts, whether he/she applies relevant knowledge and provides opportunities to correct misconceptions. Cognitive tutors try to check if the student's current solution is on track and, if not, assess what has gone wrong while constraint-based systems evaluates the student solution against the constraints to determine what concepts have been misunderstood.

2.3.1 Simply Hint or Detailed Feedback?

It might be useful to provide a detailed feedback after a session is complete or when a module is finished in order to provide an effective learning experience [4]. Learner would get confidence on the ITS through this as it would lead to a more humanly touch in the learning process. On the other hand, ITS can simply provide hints when error is being made during problem solving. However, the insufficient amount of information in a hint can cause frustration and desire to request the subsequent hints without attempts to solve a problem by the learner.

2.3.2 Immediate vs. Delayed Feedback.

An ITS called E-tutor [21] was evaluated to check the benefit of 'scaffolding', 'hint-on-demand' and 'delayed feedback'. E-tutor with dialog led to better learning and represents a more interactive tutor than the "hints on demand" control condition. Also, it was observed that honours students do the best in the delayed feedback condition and regular students do the best in the scaffolding + hints condition. Students who come in with less knowledge benefit more from the scaffolding + hints than students who come in with more knowledge. Students, who come in with more knowledge, benefit from the delayed feedback more than the other groups.
With the LISP tutor, Corbett and Anderson [9] showed that immediate feedback leads to three times reductions in the learning time compared to delayed feedback condition. In addition to cognitive benefits, there are also motivational benefits of timely feedback. Students know right away that they are making progress and having success at a challenging task. Further, because the system does not make a big deal out of errors, students do not feel the social stigma associated with making an error in class or on homework.

2.4 Affective factors

Curiosity is considered as an indicator of motivation level and learners with more intrinsic interest display greater levels of pleasure, active involvement, task persistence and lower levels of boredom, anxiety and anger. The role of affective states in learning was investigated from the perspective of a constructivist learning framework through an ITS called AutoTutor [11-13], which teaches introductory computer literacy using natural language based tutorial dialogue. It tracked the learners' emotions during interactions and these emotions were then correlated with learning outcome measures as shown in table 1. Six different affective states observed are: frustration, boredom, flow, confusion, eureka and neutral [10].

Table 1. Affective states and student behaviour during that state [10]

Affective states	Learning outcome /Measuring criteria
Frustration	Angry or agitated
Boredom	Uninterested in the activity or respond slowly to the system
Flow	Shows interest, pays attention and respond quickly
Confusion	Puzzled, not sure how to continue or struggling to understand the material

Eureka	Transition from a state of confusion to a state of intense interest, like typing in answers very quickly after a period of inactivity.
Neutral	Void of emotion and no facial features or emotions could be determined

3 Existing ITSs and their limitations

In this section, we have studied some of the existing well-known tutoring systems and the pedagogical methodologies used in them. This can be useful for new researchers of the field to get a deep understanding of the related pros and cons.

3.1 MetaTutor

MetaTutor [23] is an intelligent tutoring system to teach students how to generate smaller subgoals of a problem while learning science topics and to generate necessary feedback. It is a complex system and consists of nine major logical components: pre-planning, planning, student model, multi-modal interface, feedback, scaffolding, assessment, authoring, and system manager. The major advantage of this architecture is the openness which means new module can be easily accommodated or major changes can be made to existing modules without redesigning the system from scratch. Another feature of the current architecture is its separation of processing from data and this allows domain independence. Domain expert only need to edit the knowledge base stored in external files and the system can be applied for a different domain. It works on the cognitive models of self-regulated learning, which says that the student should regulate key cognitive and metacognitive processes in order to learn about complex and challenging science topics. The system tries to classify three different student mental models (low, medium and high) by combining his prior knowledge activation data with various supervised machine learning algorithms. MetaTutor does not have any feedback mechanism yet though the system is still in its various implementation phase.

3.2 AnimalWatch

AnimalWatch [5, 7], an ITS designed for students mastering basic computation and fractions skills. It uses problem solving errors to estimate the student's skill with each math topic, and selects problems that the student should be able to solve by using the integrated help resources. When the student can solve challenging problems in one topic successfully, the system will move on to a new math topic. One encouraging approach in this study is the pre and post test based evaluation methodology. This can be implemented in future ITS systems where students can be asked to go through a pre-test for each topic and the result can be used by the student module to decide the teaching strategy for this student. Recently, the system has got immense use by the online users and the webpage claims that more than 350,000 AnimalWatch word problems have been completed since August 2010.

3.3 SQL Tutor / SQLT-Web

Mitrovic et al. [16, 17] developed SQL Tutor, an ITS for SQL database language. It contains no domain module and uses Constraint-Based Modeling to model knowledge of students. At the beginning of a session, SQL-Tutor selects a problem for the student to work on. When the student enters a solution, the pedagogical module sends it to the student modeller, which analyzes the solution, identifies mistakes (if there are any) and updates the student model appropriately. On the basis of the student model, the pedagogical module generates an appropriate pedagogical action (i.e. feedback).

SQLT-Web [18] is a Web-enabled version of the SQL-Tutor and was developed reusing the components of the standalone system. SQLT-Web maintains a centralized repository of student models and supports multiple simultaneous students, thus giving students freedom to access the system at any time and from any place. The session manager records all student actions and the corresponding feedback in a log. It also requires the student modeller to retrieve the model for the student, if there is one, or to create a new model for a student who interacts with the system for the first time.

3.4 ELM-ART tutor

ELM-ART [6, 25] is an intelligent interactive educational system to support learning programming in LISP. It provides all learning material online in the form of an adaptive interactive textbook. Using a combination of an overlay model and an episodic student model, ELM-ART provides adaptive navigation support, course sequencing, individualized diagnosis of student solutions, and example-based problem-solving support. ELM-ART is based on ELM-PE [26], an Intelligent Learning Environment that support example-based programming, intelligent analysis of problem solutions, and advanced testing and debugging facilities. The negative side of this method is that there is a higher risk for the student to get lost in this complex hyperspace.

3.5 Andes Physics Tutoring System

Andes [24] is an intelligent tutoring system that helps university students to learn physics. It concentrates on web-based homework (WBH) and gives immediate feedback. Andes provides three kinds of help during learning:

- Andes pops up an error messages whenever the error is probably due to lack of attention rather than lack of knowledge. For example, leaving a blank entry in a dialogue box, using an undefined variable in an equation, or leaving off the units of a dimensional number.
- Students can request help through a help button to ask "what's wrong with that?".

- If students are not sure what to do next, they can click on a button that will give them a hint. This is called Next Step Help.

Multiple evaluations have reported Andes to be significantly more effective than doing pencil and paper homework.

3.6 PAT

PUMP Algebra Tutor (PAT) [15] was developed by the Pittsburgh Urban Mathematics Project (PUMP) where students engage in investigations of real world problem situations and use modern algebraic tools to solve problems and to communicate results. It is based on ACT theory [3] and cognitive tutoring technology [1, 2]. The cognitive model is written as a system of if-then production rules that are capable of generating the multitude of solution steps and mis-steps typical of students. During student's interaction with the PAT, the tutor monitors their activities, and provides feedback on what they are doing. For the most part, the tutor is silently tracing student actions in the background. When a student makes an error, it is "flagged" without comment, which appears to reduce students' negative feelings associated with making errors in math class. But if the student's error is a commonly occurring slip or misconception that has been codified in a buggy production rule, a message is provided that indicates what is wrong with the answer or suggests a better alternative.

4 Analysis

LISP tutor [9] shows that immediate feedback is more beneficial compared to delayed feedback. AutoTutor [10] concludes that emotional states like confusion and flow are positively correlated to learning while boredom is negatively related. The correlations between learning and states like eureka and frustration is low and least significant. E-tutor [21] tells that students having less domain knowledge benefit more from the scaffolding + hints than students with more knowledge and students who having more knowledge benefit from the delayed feedback more than the other groups. The success of MetaTutor [23] raises hopes of achieving domain independence as its architecture separated the domain module from the rest of the parts. AnimalWatch [5, 7] employs the pre and post test based evaluation method for initial student modeling and its update.

Table 2 summarizes a comparative view of the six ITSs we studies in section 3. Our evaluation here is based on major parameters like: domain they cover, feedback policy being employed, pedagogical agent (if any) and the student modelling methodology being followed.

5 Conclusion

Throughout the paper, we have tried to describe the important design specifications for a generic intelligent tutoring system through our experience of evaluating some of the prominent ITSs and their results. Various learning/instructional ingredients are being identified and their effectiveness is explained. For example, the benefit of immediate vs. delayed feedback, small hints vs. detailed help etc. are compared. ITS development is a costly affair in terms of cost and complexity. We need to develop standardized reusable components which can be used to develop any domain specific tutor in a short span of time and in a cost effective manner. In future works, we plan to model a general purpose tutoring architecture emphasizing the role of emotional factors during a learner's interaction with the ITS.

Table 2: ITS and characteristics

Properties ⇨ / Tutors ⇩	*Domain Covered*	*Feedback*	*Use of Animated Agent*	*Student model*	*Other notable features*
Meta Tutor	Human body	verbal	Yes	Adaptive Hypermedia	Self regulated learning
Animal Watch	Math Teaching	immediate	Yes	Hidden Markov Models	
SQL Tutor	Learning SQL Query	5 levels of feedback	No	CBM for short-term and Overlay for long-term modelling	
ELM ART	LISP programming	Immediate	No	Episodic/Collaborative (open, editable)	Display material as adaptive interactive book
ANDES	Physics	Immediate	No (instruction through videos)	Bayesian Network	
PAT	School level Algebra learning	Immediate (timely)	No	model tracing and knowledge tracing (ACT theory)	

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Multicampaign Assignment Reflecting Group-based Response Suppression

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Abstract − *Companies have made their best efforts to sustain ongoing relations with their customers and thus generate as much revenue and profits as possible through CRM (Customer Relationship Management). One of the key marketing tools of CRM is target marketing. Target marketing is a marketing strategy that analyzes certain goods and services preferred by existing customers, develops new goods and services that fit with the customers' preferences, and targets those goods and services. As many companies carry out personalized target marketing, most customers may encounter several similar marketing campaigns simultaneously, thereby making the campaigns less effective and efficient than specifically-personalized campaigns. Furthermore, when a customer is offered several marketing campaigns, his or her response is highly dependent on the total number of campaigns recommended to him or her. With this being said, this research shall suggest a strategy to deliver more effective and efficient multicampaigns and hence maximize customer satisfaction by applying different response suppression functions into various customer groups.*

Keywords: personalized marketing, one-to-one marketing, target marketing, multicampaign, response suppression

1 Introduction

A dramatic increase in Internet users and an advancement of IT (Information Technology) have brought us new theories and concepts in many academic fields. We have been stressing the significance of word-of-mouth marketing since the days of old school commerce. Word of mouth refers to oral communication and the passing of key information about certain goods such as price, quality and reliability from satisfied customers to potential customers. This traditional marketing strategy has been coupled with dramatic advancements in the Internet and IT and has created a new marketing terminology, CRM (Customer Relationship Management)[1]. There has been a wide spectrum of studies and research on enhancement of relational marketing using the CRM system. A customer's purchasing traits and patterns cannot be recorded and kept in case of general commerce; however, those customer purchase data can be stored in a database in the case of an e-commerce. As e-commerce becomes more and more important, it is essential for companies to utilize the customer information accumulated in e-commerce and efficiently manage its customers through CRM (Customer Relationship Management). To maximize their profits and customer satisfaction, most companies have been implementing one-to-one marketing or target marketing in order to provide personalized services tailored to their customers. There has been much research on prediction of user preference via such one-to-one or target marketing[2,3,4]. To promote their goods and services, companies establish and deliver many marketing campaigns. As a result, most customers are living in a flood of similar promotion/campaign e-mails. These simultaneous campaigns are called an *overlapped recommendation problem*. The greater the number of recommended campaigns, the less efficient they are. According to research by Cannon and Riodan on repeated exposure to ads and commercials, once the same ads and commercials are repeated beyond a certain decent level, the effects of the ads and commercials shall be adversely impacted, and most customers will become bored and irritated[5].

Applying the findings that simultaneous recommendation of several marketing campaigns to one customer adversely influences the customer's response (overlapped recommendation problem), Kim and Moon suggested a multicampaign assignment problems that is associated with how to optimize marketing recommendation of multicampaign to multiple customer groups[9,10]. In addition, they formulated a mathematical model for the problem and used various heuristic algorithms to solve it. In this way, they came up with the best assignment method that applies the heuristic algorithms and improves the existing methods[8,11].

As there has recently been soaring interest in multi-campaigning, we have seen diverse research in many directions. This research includes optimization of multi-campaigning using a swarm intelligence[12], optimization of efficiency in the overlapped recommendation problem[13], optimal assignment of multicampaigns using the activities of honey bees[14], and so forth.

In the assignment of multicampaigns with the overlapped recommendation problem in consideration[10], customer preference, from the customer's perspective, diminishes when there are too many overlapped campaigns. In the existing research, response suppression functions as per declining user preference are simply assumed to be equal for every customer. This research assumes that each customer group should have its own response suppression function and calculated different

response suppression functions per customer group. Customers were classified in groups by the values derived from the *k*-means clustering algorithm[6,7]. With an assumption that a customer group in the same cluster has the same response suppression function value, there will be *k* response suppression functions for *k* clusters. Customers in the same group have the same response suppression function. Through these tests, better results could be attained than in the case where there is only one response suppression function.

The remainder of this research is comprised of the following: Section 2 shall touch on the incentives to use multiple response suppression functions in the assignment of multicampaigns and their application methods in detail. Section 3: Algorithms used to resolve the problem; Section 4: Methods used to compute multiple response suppression functions; Section 5: Results from actual data, and finally Section 6: Conclusion.

2 Multiple Response Suppression Functions for Assignment of Multicampaigns

This section shall discuss the effectiveness of using multiple response suppression functions in assigning multicampaigns and eventually realizing more accurate multi-campaigning.

2.1 Effectiveness of the Multiple Response Suppression Function

If we assume a company recommends three campaigns to customers and assign each campaign to one customer, we shall come up with results shown in Tables 1 through 3. Table 1 depicts the customer preference. User 1 belongs to Cluster B with response suppression function B in Table 3, while User 2 belongs to the cluster with response suppression function A in Table 3. With these factored in, Table 2 shows the relevant values if there is only one response suppression function, 'A', in Table 3. Only one response suppression function in Table 3 means that users have the same response, while response suppression functions A and B mean different responses per user. If there is only one response suppression function, 'A', in Table 3, two campaigns are recommended for User 1 whereas one campaign is recommended for User 2. In this case, the application of preference and response suppression values results in 100*0.9 + 95*0.9 + 92*1.0 = 267.5, but this value should be regarded as a biased value.

Table 1. Customer's Campaign Preference

	# of Campaign=1	# of Campaign=2	# of Campaign=3
User 1	100	60	95
User 2	66	92	55

Table 2. Examples of Multicampaigns Assignment

	Campaign 1	Campaign 2	Campaign 3
User 1	1	0	1
User 2	0	1	0

Table 3. Customer's Response Suppression Function Values

	Campaign 1	Campaign 2	Campaign 3
Response A	1.0	0.9	0.8
Response B	1.0	0.2	0.0

If we discover that there are two response suppressions, we then apply the response suppression function values in Table 3 and recompute the formula. The result is 100*0.2 + 95*0.2 + 92*1.0 = 131.0. This value is the accurate value divided by the two clusters.

2.2 Problem Formalization

From this section going forward, this research shall prescribe more accurate and detailed multicampaign assignment problems as per each problem. Forms used by Kim and Moon[10] will be adopted. Let us assume N to be the number of customers, $B = \{1,2,..., N\}$ to be a set of customer groups, $C = \{1,2,..., K\}$ to be a set of cluster numbers, and M to be the number of campaigns. Inputs, outputs, constraint conditions and evaluation functions shall be explained in detail.

<Input>

Each customer shall be given with his or her preference for each campaign and relevant weighting. The response suppression function associated with overlapped recommendation for customers in Cluster C is denoted as R_C.

- $f_1, f_2,..., f_M : B \rightarrow [0,\infty)$: Each campaign's preference function (actually vector). This research shall take into consideration only the preferences denoted in positive real numbers. Preference toward a campaign can be obtained through on existing preference estimation method such as CF. $f_j(i)$ refers to an estimated preference value of Customer *i* on Campaign *j*.
- $C : N \rightarrow [K]$: Cluster number *C(i)* means a cluster number with Customer *i*.
- $R_{C(i)} : N \rightarrow [0,1]$: Response suppression function related to the number of recommendations. Function value $R_{C(i)}(t)$ is defined as a preference diminishing factor when Customer *i* is exposed to *t* recommendations. If H_i is equivalent to the number of recommendations for Customer *i*, then actual estimation of preference of Customer *i* on Campaign *j* is equal to $R_{C(i)}(H_i) \cdot f_j(i)$.
- $w_1, w_2,..., w_M$: Each campaign's weighting. (Weighting of Campaign *j* is a positive value denoted by w_j .) Each campaign *j* has its own weighting w_j. The importance of a campaign depends on this weighting. In formalized multicampaign assignment problems, the preference of Customer *i* for Campaign *j* becomes $w_j \cdot R_{C(i)}(H_i) \cdot f_j(i)$.

<Constraint Conditions>

Constraint conditions and the problem should include the minimum and the maximum values of the number of recommendations for each campaign. The number of

recommendations for Campaign *j* should lie between P_j and P^j. Here, P_j and P^j are the minimum and the maximum recommendations for Campaign *j*, respectively. The difference between these two values, $P^j - P_j$, can be either high or low.

<Output>

Outputs can be denoted by $A = (a_{ij})$, binary campaign assignment matrix. Here, a_{ij} refers to the assignment of Campaign *j* into Customer *i*. If Campaign *j* is assigned to Customer *i*, then $a_{ij} = 1$.

<Evaluation>

The sum of preferences in Campaign *j* is defined as actual estimation of the recommended customers' preferences in Campaign *j*. Optimal level *F* of campaign assignment matrix *A* becomes the sum of weighted preferences in all the campaigns as follows:

$$F(A) = \sum_{j=1}^{M} \left(w_j \cdot \sum_{i \in B; a_{ij}=1} \left(R_{C(i)}(H_i) \cdot f_j(i) \right) \right)$$

The purpose of the problem is to find matrix *A* that maximizes *F*.

3 Algorithms Employed

3.1 Heuristic Algorithm

This research shall apply the heuristic algorithm used by Kim and Moon[10]. This algorithm begins with a no-recommendation condition and continues to assign multiple campaigns to customers in a greedy way. It is called a CAA (Constructive Assignment Algorithm). Cluster *C*, Customer *i*, and Campaign *j* are used to define *g(i,j)* as the quantity of gains optimized through the assignment of Campaign *j* to Customer *i* included in Cluster *C*. Initially, gain *g(i,j)* is equal to $w_j f_j(i)$, a multiplication of campaign weighting and the preference of Customer *i* for Campaign *j*. Generally, gain values are expressed as follows:

$$g(i, j) = R_{C(i)}(H_i + 1) \cdot (\sigma_i + w_j f_j(i)) - R_{C(i)}(H_i) \cdot \sigma_i,$$

where σ_i refers to the sum of weighted preferences for the recommended campaigns by Customer *i*. This value is usually a real number, and this research shall use AVL tree[2] for efficient control on gain values.

3.2 *k*-means Clustering Algorithm

This research applied a simple *k*-means clustering algorithm in order to group the customers with similar characteristics. Since each customer has his/her own preference value for *M* campaigns, he/she can be regarded as a dot in *M*-dimensional space. Therefore, there are *N* dots spread in *M*-dimensional space because the number of customers is *N*. Clustering these customers into *k* groups means classifying *N* dots into *k* groups. The algorithm is used in this research in the following way: *k* centers are randomly chosen in *M*-dimensional space. Choose a center with the closest distance out of the *k* centers. In this way, every customer shall be grouped in at least one of the *k* centers. Let us say that a customer group which selects a center *p* is C_p. Average out the dots in C_p per dimension and move the center *p* into the location of the averaged dots. Repeat the computation for every *p* from 1 through *K* and move each center *p* into the location of the computed dots. Then, choose the closest center and repeat the procedures. At this time, we should terminate the algorithm if the location of the centers do not change. Using this method, we can cluster the customers into *K* groups which share similar characteristics.

4 Application of Multiple Response Suppression Functions to Multicampaigns

4.1 Test Method

We determine the number of customer clusters. If there are *N* customers with *M* campaigns, then the number of response suppression functions for the campaigns with *K* clusters shall be equal to *K*.

Filed data obtained from e-mail marketing were used as test data. Estimated preference values obtained through collaborative filtering of those field data with 48,559 customers and 33 campaigns were utilized [15,16]. Data sets used in this research were provided by Optus Inc. Personal data are comprised of many independent variables and their subordinate variables that indicate customer response to corresponding e-mails. These customers were grouped into two, three, six, and 10 clusters and tested using the *k*-means clustering algorithm. Clustering into 2 groups results in the two clusters with 33 campaign center values. Likewise, clustering into three, six and 10 groups shall generate three, six, and 10 clusters, respectively, with 33 campaign center values. If we sum and average out all these values, we can see the different results. Different average values mean that clustering is successfully accomplished. Table 4 summarizes the average values of each clustering.

Table 4. Average Values of Each Clustering

# of Clustering	Average Value
2	0.389, 0.080
3	0.456, 0.240, 0.039
6	0.019, 0.224, 0.326, 0.141, 0.164, 0.462
10	0.134, 0.019, 0.448, 0.225, 0.501, 0.365, 0.144, 0.295, 0.199 0.467

4.2 Multiple Response Suppression Functions

Analysis of real data via clustering showed different responses per cluster. Cluster center values were used to compute the response suppression functions per each cluster. This research sorted 33 center values for each cluster in descending order, set the first campaign as 1.0, multiplied the first value appearing in the descending order by 1.0 and defined the result as the second response value. The

Table 5. First Response

# Campaigns	1	2	3	4	5	6	7	8	9	10
C1 Center Value	0.675 (1)	0.642 (3)	0.623 (5)	0.603 (7)	0.555 (9)	0.548 (11)	0.495 (13)	0.488 (15)	0.478 (17)	0.469 (19)
Response Computation	1.0	(1)*(2) = (4)	(3)*(4) = (6)	(5)*(6) = (8)	(7)*(8) = (10)	(9)*(10) = (12)	(11)*(12) = (14)	(13)*(14) = (16)	(15)*(16) = (18)	(17)*(18) = (20)
Response Suppression Function Value	1.0 (2)	0.675 (4)	0.433 (6)	0.270 (8)	0.163 (10)	0.090 (12)	0.049 (14)	0.025 (16)	0.012 (18)	0.006 (20)

Table 6. Second Response

# Campaigns	1	2	3	4	5	6	7	8	9	10
C2 Center Value	0.137 (1)	0.121 (3)	0.120 (5)	0.119 (7)	0.118 (9)	0.110 (11)	0.103 (13)	0.100 (15)	0.100 (17)	0.094
Response Computation	1.0	(1)*(2) = (4)	(3)*(4) = (6)	(5)*(6) = (8)	(7)*(8) = (10)	(9)*(10) = (12)	(11)*(12) = (14)	(13)*(14) = (16)	(15)*(16) = (18)	(17)*(18) = (20)
Response Suppression Function Value	1.0 (2)	0.137 (4)	0.016 (6)	0.002 (8)	0.000 (10)	(12)	(14)	(16)	(18)	(20)

preference computation method shown in the table below first set the default value as 1.0 and computed the second response value as (1)*(2)=(4). (3)*(4)=(6) was calculated for the response value in case of three campaigns. This computation was repeated until the response suppression function value reached a value greater than 0.001. How to compute the response suppression function values are well described in Tables 5 and 6. In this way, the response suppression functions for 3, 6 and 10 clusters could be calculated: 1) the number of response suppression functions for 3 clusters = 3; 2) the number of response suppression functions for 6 clusters = 6; and 3) the number of response suppression functions for 10 clusters = 10. Table 5 indicates the first response suppression function value in 2 clusters while Table 6 shows the second response suppression function value.

5 Experiment Results

<Experiment 1: 2 Clusters>

This experiment grouped 48,559 customers into two clusters. In this case, there will be two response suppression functions formed. However, the experiment assumed that there was only one response suppression function R1 and came up with 30761.62 by using a multi-assignment table and computing for a preference multiplication response suppression value. This value is a biased value as explained in Section 2.1. R2 value 30209.76 in Table 7 was computed on the assumption that there was only one response suppression function R1 and is therefore also a biased value. This is the value derived from the following procedures: 1) we believe there is only one response suppression function R1, 2) a multicampaigns assignment table is then prepared based on our belief, 3) we come to realize that there are two response suppression functions, and 4) we finally apply the two response suppression functions in the previously-prepared table. This derived value is also a biased value, but a bit more accurate than the value derived from the assumption that there is only one response suppression function. The multicampaigns assignment table was prepared on the assumption that there are two response suppression functions with 48,559 customers in two clusters. Then, 30534.56 resulted from by multiplying the preference function value by the response suppression function value as shown in Table 8. This value is a more precise value and is greater than 29768.19 that was computed on the assumption that there were two responses up by 766.37. Each customer group classified via the k-means clustering algorithm as per customer characteristics has its own response suppression function. Therefore, more efficient campaigning can be achieved if different response suppression functions are applied.

Table 7. Biased Results for 2 Clusters

Response	'Only One Response Suppression Function' Assumption	'2 Response Suppression Functions' Assumption
R1	30761.62	29326.62
R2	30209.76	30209.76
Average	Biased Value	29768.19

Table 8. Precise Results for 2 Clusters

	Response Suppression Functions Used	Preference * Response
Cluster 1, 2	R1, R2	30534.56

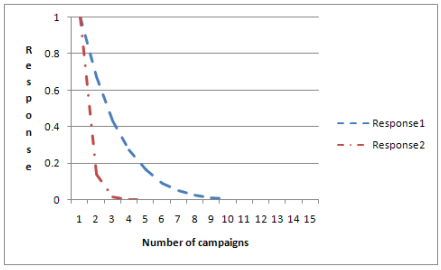

Figure 1. Response suppression function for 2 clusters

Figure 1 shows a graph of a response suppression function for two-clusters case. As shown in the figure, the Response 1 Graph has a gentler slope than that of the Response 2 Graph. This implies that a customer group in 1 cluster(see Response 1) is better fit for multicampaigns assignment than is that in 2 cluster(see Response 2).

Experiment results shown below represent the results with 3, 6 and 10 clusters.

<Experiment 2: 3 Clusters>

This experiment grouped 48,559 customers into three clusters. In this case, there will be three response suppression functions formed. However, the experiment assumed that there was only one response function R1 and came up with 31407.85 by using a multi-assignment table and computing for a preference multiplication response value. This value is a biased value as explained in Section 2.1. R2 value 30222.08 in Table 9 was computed on the assumption that there was only one response suppression function R1 and is therefore also a biased value. This is the value derived from the following procedures: 1) we believe there is only one response suppression function R1, 2) a multicampaigns assignment table is then prepared based on our belief, 3) we come to realize that there are three response suppression functions, and 4) we finally apply the three response suppression functions in the previously-prepared table. This derived value is also a biased value, but a bit more accurate than the value derived from an assumption that there is only one response suppression function. The multicampaigns assignment table was prepared on the assumption that there are three response suppression functions with 48,559 customers in three clusters. Then, 30765.31 resulted from multiplying the preference function value by the response suppression function value as shown in Table 10.

Table 9. Biased results for 3 clusters

Response	'Only One Response Suppression Function' Assumption	'3 Response Suppression Functions' Assumption
R1	31407.85	29138.67
R2	30222.08	30221.80
R3	30209.76	30209.76
Average	Biased Value	29856.74

Table 10. Precise results for 3 clusters

	Response Suppression Functions Used	Preference * Response
Cluster 1, 2, 3	R1, R2, R3	30765.31

This value is a more precise value and is greater than 29856.74 that was computed on the assumption that there were three responses up by 908.57. Each customer group classified via the *k*-means clustering algorithm as per customer characteristics has its own response suppression function. Therefore, more efficient campaigning can be achieved if different response suppression functions are applied.

Figure 2 shows a graph of a response suppression function for three-clusters case. As shown in the figure, the Response 1 Graph has a gentler slope than that of the Response 2 Graph and 3 Graph. This implies that a customer group in 1 cluster(see Response 1) is better fit for multicampaigns assignment than is that in 2(see Response 2) and 3 cluster(see Response 3).

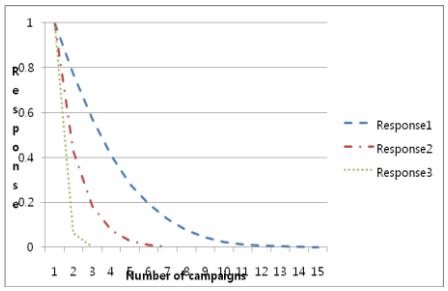

Figure 2. Response suppression function for 3 clusters

<Experiment 3: 6 Clusters>

This experiment grouped 48,559 customers into six clusters. In this case, there will be six response suppression functions formed. However, the experiment assumed that there was only one response suppression function R1 and came up with 30209.76 by using a multi-assignment table and computing for a preference multiplication response value. This value is a biased value as explained in Section 2.1. R2 value 30229.16 in Table 11 was computed on the assumption that there was only one response suppression function R1 and is therefore aslo a biased value. This is the value derived from the following procedures; 1) we believe there is only one response suppression function R1, 2) a multicampaigns assignment table is then prepared based on our belief, 3) we come to realize that there are six response suppression functions, and 4) we finally apply the six response suppression functions in the previously-prepared table. This derived value is also a biased value, but a bit more accurate than the value derived from then assumption that there is only one response suppression function. The multicampaigns assignment table was prepared on the assumption that there are six response suppression functions with 48,559 customers in 6 clusters. Then, 30809.54 resulted from multiplying the preference function value by the response suppression function value as shown in Table 1. This value is a more precise value and is greater than 30126.02 that was computed on the assumption that there were six responses up by 683.52. Each customer group classified via *k*-means clustering algorithm as per customer characteristics has its own response suppression function. Therefore, more efficient campaigning can be achieved if different response suppression functions are applied.

Table 11: Biased results for 6 clusters

Response	'Only One Response Suppression Function' Assumption	'6 Response Suppression Functions' Assumption
R1	30209.76	30209.76
R2	30229.16	30228.88
R3	30317.89	30130.23
R4	30228.12	30227.94
R5	30218.66	30218.60
R6	31569.21	29740.71
Average	Biased Value	30126.02

Table 12: Precise results for 6 clusters

	Response Suppression Functions Used	Preference * Response
Cluster 1, 2, 3, 4, 5, 6	R1, R2, R3, R4, R5, R6	30809.54

Figure 3 shows 2 graphs of a response suppression function for 6-clusters case. As shown in the figure, the Response 1 and 4 Graph have a gentler slope than that of the Response 2, 3, 5, and 6 Graph. This implies that a customer groups in 1(see Response 1) and 5 cluster(see Response 5) are better fit for multicampaigns assignment than are those other clusters.

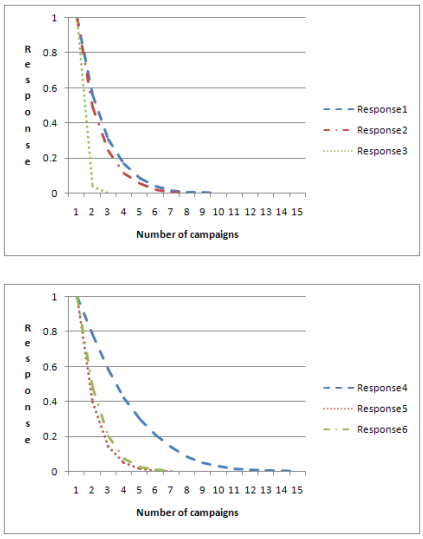

Figure 3. Response suppression function for 6 clusters

<Experiment 4: 10 Clusters>

This experiment grouped 48,559 customers into 10 clusters. In this case, there will be 10 response suppression functions formed. However, the experiment assumed that there was only one response suppression function R1 and came up with 30228.11 by using a multi-assignment table and computing for a preference multiplication response value. This value is a biased value as explained in Section 2.1. R2 value 30209.76 in Table 13 was computed on the assumption that there was only one response suppression function R1 and is therefore also a biased value. Moreover, R3, R4, R5, R6, R7, R8, R9 and R10 values are all biased values. This is the value derived from the following procedures: 1) we believe there is only one response suppression function R1, 2) a multicampaigns assignment table is then prepared based on our belief, 3) we come to realize that there are 10 response suppression functions, and 4) we finally apply the ten response suppression functions in the previously-prepared table. This derived value is also a biased value, but a bit more accurate than the value derived from the assumption that there is only one response suppression function. The multicampaigns assignment table was prepared on the assumption that there are 10 response suppression functions with 48,559 customers in 10 clusters.

Table 13: Biased results for 10 clusters

Response	'Only One Response Suppression Function' Assumption	'10 Response Suppression Functions' Assumption
R1	30228.11	30227.94
R2	30209.76	30209.76
R3	31234.82	30142.20
R4	30229.32	30228.71
R5	33549.00	29183.81
R6	30882.97	30200.46
R7	30222.07	30221.86
R8	30379.41	30178.63
R9	30542.00	30110.10
R10	31126.32	30163.37
Average	Biased Value	30086.68

Table 14: Precise results for 10 clusters

	Response Suppression Functions Used	Preference * Response
Cluster 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	R1, R2, R3, R4, R5, R6, R7, R8, R9, R10	31430.92

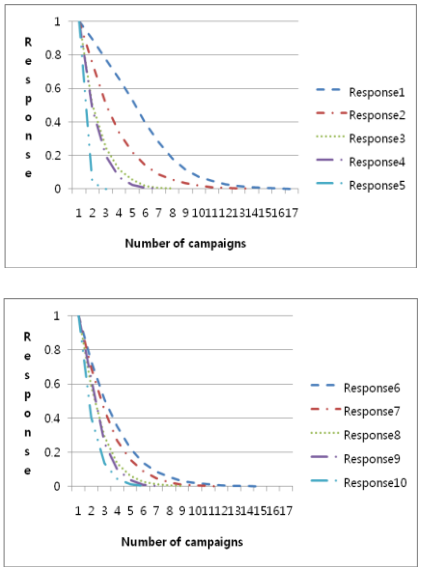

Figure 4. Response suppression function for 10 clusters

Then, 31430.92 resulted from multiplying the preference function value by the response suppression function value as shown in Table 14. This value is a more precise value and is

greater than 30086.68 that was computed on the assumption that there were 10 responses up by 1344.24. Each customer group classified via k-means clustering algorithm as per customer characteristics has its own response suppression function. Therefore, more efficient campaigning can be achieved if different response suppression functions are applied.

Figure 4 shows 2 graphs of the response suppression functions for ten-clusters case. As shown in the figure, the Response 1 and 6 Graphs have gentler slopes than those of the Response 2, 3, 4, 5, 7, 8, 9 and 10 Graphs. This implies that customer groups in 1(see Response 1) and 6 cluster(see Response 6) are better fit for multicampaigns assignment than are those in other clusters.

6 Conclusion

Based on the fact that repeated ads and commercials may provoke customer boredom and adversely impact their effectiveness[5], this research used the *k*-means clustering algorithm in order to cluster customers into certain groups with similar characteristics (i.e., response, preference, etc), to apply the clustered customer's own response suppression function and to carry out multicampaigns. Corresponding results indicated that grouping into 2, 3, 6 and 10 clusters had 2.57%, 3.04%, 2.26% and 4.46%, respectively, higher preference * response value than using a single response suppression function. This implies that better results can be attained if different response suppression functions are used for each customers.

Since it is clear that repeated ads and commercials in one-to-one target marketing adversely influence the effectiveness and efficiency of the marketing recommendation, there should be more in-depth research on customer response in the multicampaigns assignment that utilizes a campaign-recommending company's preference and reliability.

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Arabic language learning assistance based on automatic speech recognition system

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Abstract - *In this work we present the results of a research phase that have been conducted to establish a new system providing Arabic speech recognition with satisfactory performance and independence of the speaker. This system will be integrated into a Computer Assisted Language Learning (CALL) platform. This work describes the development of the above announced system that will acquire as part of the signal emitted by the speaker and assess learner perspective pronunciation and to propose remedies to teach him the correct pronunciation. This work is based on a new speaker independent automatic recognition of Arabic speech by deploying SPHINX open source tools from Carnegie Mellon University (CMU) [1].*

Keywords: Computer Assisted Language Learning (CALL): The Arabic case, computer assisted instruction (CAI): Arabic case, automatic Arabic speech recognition, Arabic Corpus, acoustic model, pronunciation dictionary.

1 Introduction

The system presented here is essentially a method of automatic Arabic speech speaker independent recognition. This method is specially designed to help for oral language training; in this case the Arabic language and can automatically report to the learner's mistakes in pronunciation in previously listed words of a lexicon constituting a "lesson ". Tests on a large representative corpus of phonetic difficulties and tonic accent of Arabic show the qualities and limitations of the method.

2 Problematic

One of the contributions of modern linguistics is highlighting the importance of the oral aspect of any language. However, the acquisition of correct pronunciation and a good accent and mastery of oral expression is often difficult in a foreign language. The introduction of vocal techniques in language teaching has been an attempt in this direction. The computer also can assist and we have seen, over the past ten years, multiply the projects interested by the Computer-Assisted Learning: the case of oral, mostly in U.S. but also in Japan and Europe.

Among those who are addressed to the languages students of include, we mention:

- The PLATO (Programmed Logic for Automated Operations Teaching), developed at the Illinois University (USA) for French, Spanish, German, Russian, Hebrew, Latin and even Esperanto [2].
- KANDA in Tokyo for English, German, French, Spanish and Chinese (quoted by JC Simon [3]).
- The OPE Project, at the Paris VII university, for English language [4].
- The Nelles R. and Sennekamp M. works [5] at the Freiburg University (Germany), on the French language.
- MIRTO, developed at the "LIDILEM" laboratory in Grenoble, MIRTO allows the creation of educational activities almost immediately, by exploiting the possibilities of NLP tools procedures. MIRTO can generate activities for learners to learn several languages [6].

These achievements are certainly an important educational value, but limited by the fact that they applied only to the written part of languages. It seemed interesting to bring to the Computer Assisted Learning the assistance of automatic speech recognition, giving the student control of his oral expression.

To our knowledge, little research has been done in this direction, we note the Nord-mann B.Jwork's [7] at Illinois University, who proposed a project limited to the screen simulation for pronunciation differences between teacher and student, and that to try to approximate as possible the pronunciation of the learner to the proposed model.

On their side, DW Kalikow and Swets IA [8] present a system of phonetic correction developed in "Bolt Beranek and Newman Inc., Cambridge (USA) for learning a foreign language. There was only one automatic pronunciation instructor using the capabilities of data storage. Note also the API system (Automated Pronunciation Instruction) developed under the ARPA project, initially for learning French by the Spanish, then in its second version, for the therapy of hearing impaired children. TT System (Teaching Training) designed in Japan [9] is also a unit of computer-assisted voice therapy.

In France, recent research has been undertaken by CNET Lebras J. [10] who had implemented an algorithm reflecting some pronunciation errors with an English native speaker learning French (especially aspiration errors of the Deaf plosive consonants and faults on diphthongization).In the Arab world, there have been several initial attempts to address this problem. They began by applications to learn Holy Quran correct recitation to the Arabic speakers and I must say that this task is almost similar to learning a foreign oral language (in this case Arabic language) where there is a wide variety of pronunciations that can be accepted by the speakers, or the holy Quran should be recited in the same way that mean in the classical Arabic dialect.

Among the few studies that are interested in Arabic, we can cite the following works to be able to find out later that our system differs from other systems in several ways:

- El-Kasasy [11] developed a system for holy Koran recitation learning. This system is based on the syllabic signal unit's segmentation. Each segment of the test syllable is compared to the reference, then the system accepts or rejects the segment and syllabic he does not give detailed comments on the error. Each segment of the test syllable is compared to the reference, then the system accepts or rejects the segment and syllabic but the system here does not give detailed comments on the error.
- Omar proposed in [12] a learner pronunciation identification system based on hidden Markov model (HMM). He grouped, in this work, the different kind of acceptable Arabic phonemes pronunciation and then compares them with the speaker pronunciation to decide whether they can be accepted or not. This system has two steps: First, the pronunciation of entry is segmented into phonemes. However, in this stage, errors of substitution, insertion and deletion between the phonemes of the word searched are detected. Secondly, these units are examined by HMM.

This hierarchical system has increased complexity and its performance was proved to be more severe than purely statistical approaches such as systems based on HMM.

To our knowledge, it seemed interesting to bring robust automatic speech recognition to the Computer Assisted foreign languages learning. In this paper we present a system resulted from several years research efforts and we hope to use it to teach Arabic pronunciation for non Arabic native speakers. We show how our system can be used for the task of spoken foreign language learning, in this case Arabic language. We will also show how he can evaluate the learner level and how he can return feedback messages to help learner to locate the mispronounced phonemes and this is will be based on a new robust system for automatic Arabic speech recognition.

3 Automatic Arabic speech recognition

Although the Arab world has an estimated number of 250 million speakers, there has been little research on Arabic speech recognition when compared to other similar importance languages. Due to the lack of speech corpora and pronunciation dictionary, the majority of automatic Arabic speech recognition work was focused on adapting recognition systems designed for other languages like English i.e. let the system identifies the Arabic word as English ones, these systems are based on rules for converting English phonemes for Arabic graphemes.

In this section we present our Arabic speech recognition system based on Sphinx [1] and propose an automatic toolkit that is able to be applied for educational oral language learning applications. Three corpora are fully developed in this work, namely the training corpus about 7 hours, the test corpus about 1.5 hours and the third corpus is containing the learners records about 3 hours. The method adopted for the corpora development is inspired from [13] and [14]. By deploying the three mentioned above corpora and by using our automatic transcription tools and our Arabic phonetiser, our dictionary pronunciation corresponding to about 23578 words SPHINX decoder is trained to develop three acoustic models, one for each corpus. The training is based on Hidden Markov Model HMM. We consider the corpus used in our system is quite important to validate our approach. The Sphinx has never been used before in this way for the automatic recognition of Arabic speech independent speakers.

3.1 State of the art

Developing Arabic speech recognition system is a multi-disciplinary effort, requiring the integration of phonetics of the Arabic language, speech processing techniques and Arabic natural language processing.

Automatic Arabic speech recognition has recently been approached by a number of researchers. Satori. and al. [15] used tools Sphinx speech recognition for Arabic. They have managed to build a system for recognition of isolated digits from Arabic (1, 2. 9). These data were recorded from 6 speakers. They reach a recognition accuracy of 86.66% of isolated digits.

Hiyassat, 2007 [16] in his thesis developed a tool to generate the dictionary of Arabic pronunciation. Dictionaries are generated based on a small MSA speech corpus consisting of numbers and small vocabulary. Kirchhoff et al. [17] worked on the recognition of spoken Arabic and study the differences between colloquial and formal Arabic in speech recognition

3.2 Recognition steps

From a speech signal, the first treatment is to extract the characteristic parameters. These parameters are input module

acoustic or acoustic-phonetic decoding. This acoustic-phonetic decoding in turn can produce one or more phonetic assumptions usually associated with a probability for each segment (a window or a frame) of speech signals.

This hypothesis generator is often modeled by local statistical models of elementary units of speech, such as a phoneme. To train acoustic models, we learn models of acoustic units of our tagged corpus [my work].

The hypothesis generator interacts with a lexical module to force the acoustic-phonetic to recognize only the words represented in the lexical module. The models are represented by a phonetic pronunciation dictionary (phonetic dictionary) or probabilistic automata that are able to associate a probability to each possible pronunciation of a word.

To recognize what is being said, we begin by looking through the models of acoustic units, the unit that is supposed to have been produced, and then construct, from the lattice of acoustic units and a statistical model of language following the most likely words. Before presenting these modules separately, we give the Bayesian equation applied to the problem of automatic speech recognition. The input values of an ASR system correspond to a sampled audio signal and are analyzed to extract a sequence of acoustic observation "X". As part of a statistical modeling of speech decoding, the search for the W series of spoken words is based on a criterion MAP (maximum a posteriori):

$$\widetilde{W} = arg\,max_w\, P(W|X) \quad (1)$$

By applying Bayes theory, the equation becomes:

$$\widetilde{W} = arg\,max_w \frac{P(X|W)P(W)}{P(X)} \quad (2)$$

However, P (X) does not depend on a particular value of W and can be "released" from the calculation of the argmax:

$$\widetilde{W} = arg\,max_w\, P(X|W)\ P(W) \quad (3)$$

Where the term P (W) is estimated using the language model and P (X | W) is the probability given by the acoustic models. This type of approach allows integrating in the same decision process, the acoustic and linguistic information (Figure 1).

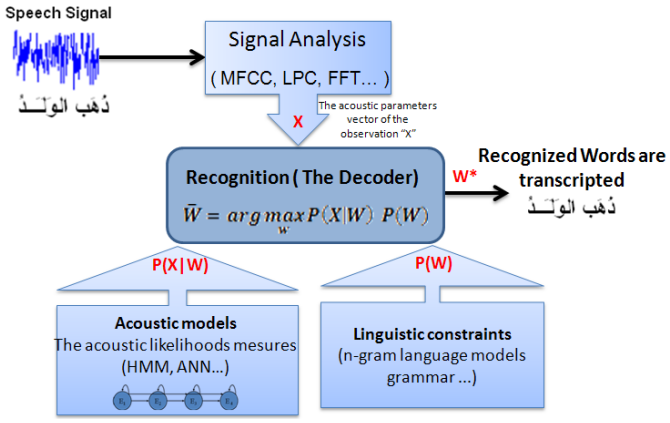

Fig.1. General principle of our system of automatic speech recognition Multi-dialect corpus

3.3 Overview

For our automatic Arabic speech recognition system, we have made the choice to built our own corpus using several classes of dialects and also to add orthographic transcriptions that are needed for the forced alignment module. This corpus consists of all data used in the evaluation campaign and exclusion of textual data. This corpus was developed within the project Oreillodule [18]. Three types of resources are provided in the corpus. On the one hand, the resources used in conventional automatic speech recognition, acoustic (corpus of spoken text) and text (newspapers or transcripts of official proceedings approximate). On the other hand, an original resource of untranscribed speech is proposed. This corpus of speech, without associated transcript but in large quantity, intended to explore the possibility of unsupervised learning. This corpus is composed of radio data (different radio): Radio International Tunisia, Algeria Radio International and TV channels: Aljazeera TV [19] and many other Arab channels [15].

Table 1. Statistics of our Corpus: Learning and Test.

Corpus	Dialect	Duration	Male	Female
Learning	9	7 Hours	235	235
Test	9	1.5 Hours	45	45
Total	9	8.5 Hours	280	280

3.4 Pronunciation Dictionaries

The pronunciation dictionary provides the link between the sequences of acoustic units and the words represented in the language model. While the corpus of text and speech can be collected, the dictionary pronunciation is usually not directly available. Although a manually created pronunciation dictionary gives a good performance, the task is very cumbersome to achieve and requires extensive knowledge of the language. The literature suggests approaches that can automatically generate the pronunciation dictionary. The

approach, simple and fully automatic, using phonemes as the unit of modeling has been well validated in many works. However, for the Arabic language, we used a new approach to automatically generate our dictionary pronunciation. The first step is based on the phoneme and each phoneme is representing Arabic as a modeling unit. The second step is to try to build manually a small dictionary as shown in the following table, and finally, in the third step, build automatically an Arabic phonetiser based on our pronunciation dictionary which was done manually and an Arabic model language.

Table 2. Sample from the pronunciation dictionary.

Arabic word	Phonetic
أمس	S M AE E
الدائرة	H AE R IH E AE: D EL
الجنائية	H AE Y IH E AE : N IH J EL
الرابعة	H AE AI IH B AE: R EL
بالمحكمة	H AE M AE K AE M EL IH B
الابتدائية	H AE Y IH E AE : D IH T B IH E EL
بتونس	S IH N UW T IH B
النظر	AE R AE DH2 AE N EL

3.5 Evaluation of automated tools

In analyzing large-scale variations related to dialect speakers and automatic recognition of Arabic speech, we evaluate the contribution of automatic tools acoustic-phonetic decoding and forced alignment tool based on the Sphinx.

3.6 Acoustic-phonetic decoding

This step is the exact transcript generated from the speech signal that is the transcript that the speaker supposed tosay.

From a speech signal, the first treatment is to extract vectors of parameters. These parameters are input module acoustic or acoustic-phonetic decoding. This acoustic-phonetic decoding in turn can produce one or more phonetic assumptions usually associated with a probability for each segment (a window or a frame) of speech signals.

3.7 Principle of forced alignment

The second treatment is to achieve for each sentence in the corpus forced alignment between the sentence and the corresponding speech signal. The eventual aim is to compare the results of our acoustic-phonetic decoding results of the forced alignment to extract phonetic confusions. Before starting the forced alignment, it needs our dictionary pronunciation. This task is to align the speech signals of each class with its corresponding orthographic transcription in our corpus to obtain segmentation into phonemes in the corpus, compelled by the transcript. The purpose of this experiment is to compare the forced alignment with the output of acoustic-phonetic decoding. Following the forced alignment procedure, we get a body segmented into phonemes with the timestamps. Each line of transcription result contains the start time and end time, the position of phoneme in the phoneme frame number expected.

3.8 Experiments

We use SphinxTrain [1] to train the acoustic models (HMM). Models context independent (CI) and context dependent (CD with 1000 states) based on graphemes and phonemes are constructed from the speech corpus described in section I.3. We obtain four acoustic models, namely Grapheme_CI, Grapheme_CD, Phoneme_CI and Phoneme_CD.

Experiments are conducted with Sphinx3 [13]. The topology model is a HMM with 3 states with 8 Gaussians per state. The parameter vector contains 13 MFCC, their first and second derivatives. The body of text is first segmented into words and the 20k most frequent words are extracted for use as vocabulary test. This vocabulary of words and the corpus of learning language models are then segmented into 8800 syllables and 3500 clusters of characters respectively. The transcript of the speech training corpus is also used to learn the language model. The language models used in our experiments is obtained by linear interpolation between the models created from the web data and those of the transcription of speech corpora. Development data are used to optimize the interpolation parameters.

3.9 Results and Discussion

Phonemes grouping

Using the DAP (acoustic-phonetic decoding), we get a phonetic transcription of the corpus from a speech signal without using the orthographic transcription (without any knowledge of the lexicon, and no language model). From the phonetic transcription, we performed statistics on the percentage of phonemes in our corpus [20].

The fact is that analysis of phonemes first class is simpler for analysis as distinct phonemes. Secondly because there are not many errors in the DAP. We classified all the phonemes generated by the DAP in two classes: consonant and vowel, and each class is divided into subclasses. We have compiled the sounds into six classes of phonemes: long vowel / short vowel gemination, words containing unfamiliar sounds, sounds that exist in other languages, Hamza middle and final emphatic Letters, Sounds unproblematic. These groups maintain production methods and do not include places of articulation of sounds.

Table 3. Arabic phonemes grouping.

LSVG	WUS ح ع	SEOL ذ هـ ث خ ر	MFH	EL ق ص ض ط ظ	US
تكلّم	شارع	ماذا	جزائري	طالب	سكن
تفّاح	جامعة	هل	لقاء	صفّ	اسبانيا
ستّة	عربي	ذهب	سؤال	طلب	لبنان
أمّي	مرحبًا	أهلاً	سأل	برتقال	في

We explain here the abbreviation used in this table (Table 3)

LSVG : Long or short vowel germination
WUS: Words with unfamiliar sounds
SEOL: Sounds that exist in other languages
MFH : Middle and final "hamza"
EL: Emphatic Letters
US : Unproblematic Sounds

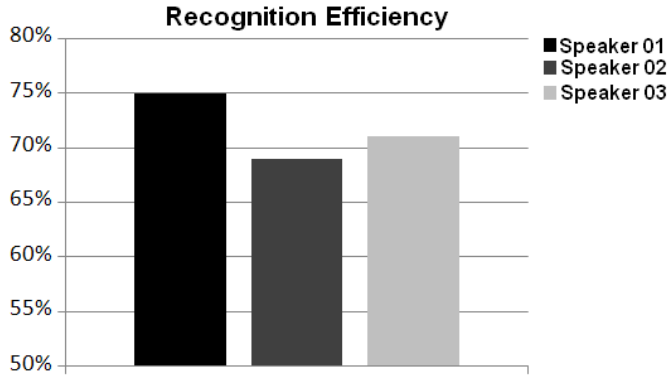

Fig. 2. Rates of automatic recognition of Arabic speech: isolated words

The previous figure shows the efficiency of our recognition system tested on three Arabic speakers. The results of our system are very satisfactory, as over 97% recognition rate of isolated words from Arabic. This result is the best compared to all the work that has made in this area.

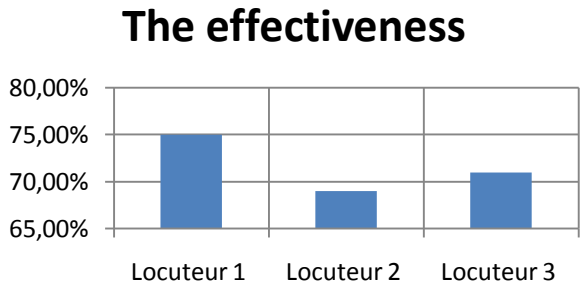

Fig. 3. Rate of automatic recognition of Arabic speech: large vocabularies

Recognition problems of large vocabulary may appear depending on the conditions under which the test signal is recorded. If the word is pronounced more or less close to the microphone therefore recognition rates can vary widely, despite the normalization of the signal to prevent this phenomenon.

However if the user pronounces the word always the same distance and with the same intensity, the recognition rates are very satisfactory , and this allow the system to reach a new rate of automatic speech recognition for large Arabic vocabulary never reached before.

4 CALL Applications

The computer-assisted learning has attracted considerable attention in recent years. Many research efforts have been made to improve such systems particularly in the field of foreign language teaching.

In the second part of this article, we describe our system and these results for learning of spoken Arabic language computer-assisted. This work was developed to teach pronunciation of Arabic people speaking a foreign language: French ... This application uses our system for speech recognition to detect errors in pronunciation user.

4.1 Design and testing of our system

This system consists of a mosaic of sub-program managed by a main program that allows users to interact firstly with the teacher in the design phase of programmed instruction, and secondly with student during the lesson itself. The dialogue-machine operator (teacher or student) is typically provided via a keyboard, screen and microphone.

The teacher's role: the teacher should call the lesson and then:

- Select the words to study based on problems of pronunciation adapted to grade level: Level 1 (A1) Level 2 (A2) or level 3 (B1).
- The teacher makes sure that the system recognize it well the words that were chosen by him for learners.

The role of the learner: the learner works as follows:

- The student pronounces the words chosen by the teacher.

The role of the system: the system can output the results as follows:

- If the pronunciation was incorrect, therefore the system returns the word after underlining the place of faulty pronunciation. For example the word شارع if the learner gave SAE: RIHAI instead SHAE: R AI IH

- If the spoken word is too far removed from the model proposed by the teacher, especially if not provided this fault so there will be only the error message.
- In the latter case it may be asked:

  * To go directly to the hearing of the next word and further work.

  * Either to repeat the word immediately (W_n times) if the teacher wants.

All these rules are designed to make our system a very simple application that allows a genuine dialogue with the student, even in the absence of the teacher.

4.2 The process of ALO: Testing and Results

This part corresponds to the test process of our system. This application was tested for quantitative information on its validity and, in particular, its ability to provide statistics on a learner or the class (level). Systematic tests on a large corpus in Arabic (of the order of 352 words selected by a linguist and Arabic Language is communication in everyday life (introducing oneself, family, food, clothing , orientation in space and time ...).

- Sounds unproblematic: 52 words.
- Letters emphatic (ق ص ض ط ظ) : 60 words.
- Hamza and final median: 60 words.
- Sounds existing in other languages : (ذ ه ث خ ر) : 60words.
- Words with unfamiliar sounds (ع ح) : 60words
- Long vowel or short vowel and gemination: 60 words.

This system was tested by 13 French students from the University Stendhal Grenoble, France after the training Learning foreign languages: the case of Arabic. The following figures show the statistics of the level of each student for classes in Arabic phonemes: long vowel or short vowel and gemination, emphatic letters, unfamiliar sounds.

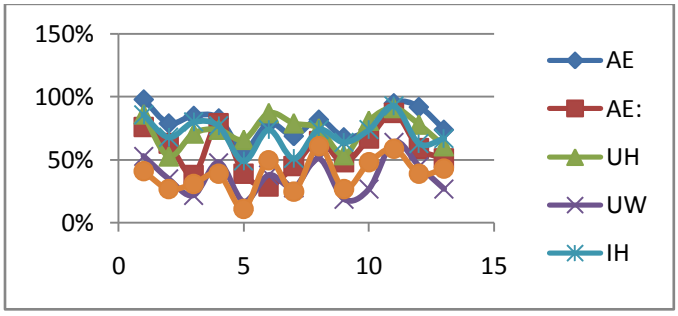

Fig. 4. Result of the system for each student on the class of the phoneme: the long vowel or short vowel gemination and Arabic.

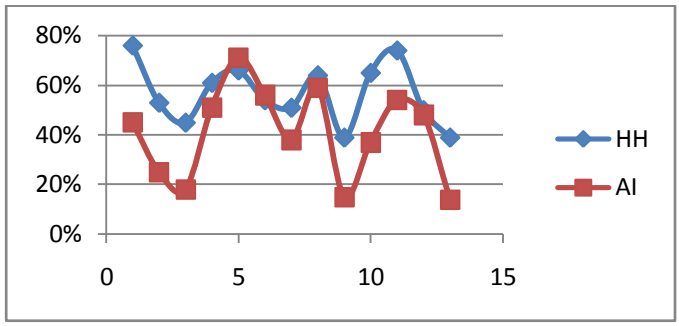

Fig. 5. Result of the system for each student on the class of the phoneme: the unknown sounds of Arabic.

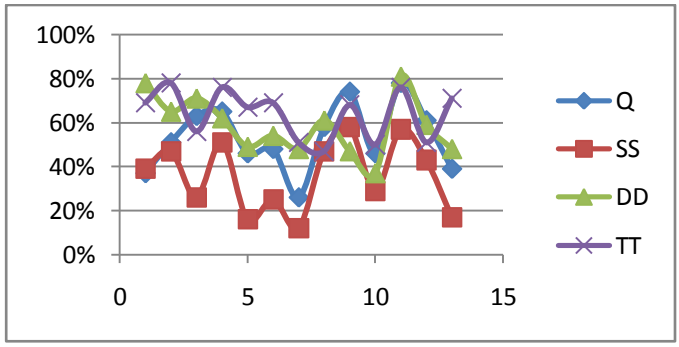

Fig. 6. Result of the system for each student on the class of the phoneme: Letters from the Arabic emphatic.

The results and statistics of our system: Learning foreign spoken languages: the case of Arabic, are very satisfactory. The previous figures show very good levels of each learner in relation to its difficulties in pronunciation of each class of phonemes. These statistics are very helpful for the teacher to automatically detect errors in the pronunciation of each learner.

5 Conclusion and Outlook

In this paper, we presented our system, a platform for learning foreign spoken languages: The case of Arabic based on the formalism of standard Arabic automatic speech recognition.

Our system differs from the few other work being done on standard Arabic and use the foreign language learning: the case of spoken Arabic Computer Assisted on several aspects: it incorporates an acoustic model of speech-based Arabic-Based Approach to Hidden Markov Model (HMM) giving results in the form of phonetic structures, while other systems are lacking and assume that the input signal is already phonetically labeled and organized (the case of El-Kasasy [11]).

Our system includes also a language model to validate the acoustic analysis obtained. Several opportunities are offered to our work, we can cite, among others:

In terms of modeling: a multitude of modeling that can be undertaken to expand the coverage of linguistic phenomena treated (enlarge our training corpus, our language model, dictionary pronunciation ... etc.).

In terms of implementation, we propose the implementation of other modules of the platform (Learning Voice of Arabic sentences, diversity of exercises for the learner, expand our platform for learning other languages ... etc...).

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Empowering the political systems using technologies

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Abstract: *This paper discusses the societal-framework that would enable technologies of the present and the future to bring about the universal justice, prosperity and security as yet unattained, but for ever dreamed of. It proposes the integration of all the scientific approaches to achieve an ever increasing rate of productivities and the resulting higher standards of living by reducing the burden on the education methodology but relying on a permanent infra-structure of knowledge that can transcend the chronological time. It outlines the architecture for an omniscient culture that would balance the opposing forces in real-societal-time to deliver the results mentioned above for all the members of a futuristic humanity. It brings out the limitations of the present day political processes and advances an approach to prevent the loss of early childhood potentials. On an optimistic note it promises for everyone what has been attainable only for a very precious few.*

Keywords: empowerment, political-systems, societal-time, child-education, social-justice, economic-freedom

1 Introduction

Human society has evolved from a few people to a very large number with a diversity very few people can imagine or comprehend. If that is the case, we have to wonder how we can manage all these complexities in such a way that we do not sacrifice the human values we are here to practice, individually and collectively. It seems the management art and science can greatly help us in this regard.

While educating ourselves individually is necessary for our individual growth and development, the society needs to accumulate all of its knowledge, experience and augment its potential for improving the societal wellbeing. The rate change of knowledge as well as the people makes it imperative that the management of both of those, one bio-logical and the other, perhaps non-biological; be well synchronized using time-scales and time-clocks that are in-tune with each other. This is an unexplored vista that can lead to greater prosperity and less strife, if developed and implemented.

Justice and human values are central to all cultures. The question is how can we practice them to our mutual benefits?

2 Political Awareness

It used to be that the politics is the art of the possible. Then, there is this new definition that politics might be the art of the impossible. Political management of the political affairs[1] of any society is to meet the needs of its citizens, whatever they may be, beginning with the basic needs of food, shelter and emotional security; to be able to help others as well as to better themselves; and to meet all of their obligations to their families, friends, communities and many such global relationships of their own or anyone else's making. If there are barriers[2] to achieving these ends, they are best managed using technologies[3]; since humans, as a biological phenomenon, on their own, are unable to achieve complete integrity[4] consistently, throughout all of their relationships. There are just too many variables that can and do go wrong in any system of relationships, which are difficult to realign. Even after education, repentance[5] or whatever else is

[1] See the latest news of political violence: Paul Krugman

[2] Few of which were discussed in, "Empowerment of people and societies using technologies", a paper presented at the 98th Indian Science Congress held from Jan 3rd – 7th, 2011 at the SRM University Campus in Chennai, India.

[3] Technology is defined very broadly as everything humanity does, including languages, arts, money to name three.

[4] Integrity is that quality/property of completeness that enables a system to be worthy and fully functional

[5] Restorative Justice(RJ): The damage done

sought and used to mitigate the problem. A system of justice based on the physical identities of people is not a system of justice at all; till after we are able to understand what the humans are composed of (biologically and non-biologically)and how humans react to any stimuli. Even after that question is answered and standardized across the globe, there are psychological and philosophical questions that never could be resolved to help humanity achieve their true potentials, using imprisonment of human bodies and using physical punishments to achieve behavior change and societal civility. There is no evidence as yet of any correlation between the body and the mind. Still, the societal justice systems[6] are based on these disproven methods even today at the beginning of this 21st century.

3 Education

The present systems of education of the citizenry through schools, colleges and universities might help to make them want to live, dream and perhaps even innovate, but do they not perish[7] when those educated and informed die?; and do they not take away with them all of the knowledge and the learning?; leaving the new born to enter the life system, as it were, to get started from the beginning?

4 Societal Roles and Needs

Societally, such educational systems of endeavor is not productive in terms of achieving the higher outputs for a given amount of input and to assure an ever increasing levels of the standards-of-living for the entire global citizenry, even at a far distant future, because of our failure to distinguish the time-scales of the processes involved. Is there an alternative to this vicious circle? Is it possible to build a new permanent infrastructure of knowledge that transcends the generations?

5 Effective Management

The difference between building a permanent infrastructure of knowledge (ex: a CNC machine with an operator) and information, against the present concepts of education (a fully trained operator)- which have outlived their usefulness - calls for more robust technologies that can prevent the slippery slope of the often noted vicious cycles.

The time has come to embark on a new path where humans are not challenged beyond what is their rightful place in the universe which is, to only govern them-selves with the necessary prudence and that too with only the aide of the technologies. When they fail to achieve that goal, the permanent infrastructure of knowledge and wisdom shall govern the processes of failures to correct that failure by objective criteria and not by any one or another method of judicial leanings which itself is based on the false premise of body & mind relationships. Such an infrastructure, as suggested, is not only essential for the survival of humanity but for the entire universe of beings and non-beings, alike.

6 Precious Childhood

Let us start the young ones from their earliest days to observe and tell/write about what is wrong, unjust and unfair among us and how they feel they can improve all that they have noticed to be incorrect. Let them ask questions on their own, about why the things are the way they are; and in that process learn the methods, tools and subjects they would need to focus on to come up with their own curriculum solution. Let us give them the challenges at the beginning of their growing-up and not after their senses have been dulled by the reading of many a outdated textbooks, irrelevant lectures presented in bygone eras that might have become obsolete on the day they were written or spoken; that are without any identified use or purpose for their application for the present day student; taught and retained only to regurgitate so as to get a grade or obtain a diploma/degree. Let us not reward our teachers based on the meaningless grades that may not measure what the students as well as the society cares about.

How will we decide what problems should we give to the children to solve to gain access to the knowledge they would care to learn and use? Good question. That is why we need a permanent infrastructure of what we have learnt and accomplished with all the unexplored questions[8] we seek answers for. This permanent structure of knowledge as it would exist at any given moment would allow humanity to visualize the contents as the state-of that art, in all of the fields of endeavors. The contents and its containers need transform as they assimilate new knowledge from new generations of humanity that would want to take those fields of endeavor further than they have been up to that point. We would need to improve the

[6] Justice or anarchy? : http://www.google.com/hostednews/afp/article/ALeqM5jrpXFCyCEwRrQEIVFca67OqKwRWg?docId=CNG.19d12e5647311a6750cb654cad6306f8.761

[7] Naturally or not, http://news.in.msn.com/national/article.aspx?cp-documentid=5015358&page=4

[8] Such as the one reported in this news item : http://news.in.msn.com/national/article.aspx?cp-documentid=5015358&page=4

present day concepts of jobs, careers, career counseling and head hunters etc., in favor of this approach to work, life, meaning and contribution to the permanent well-being. These present day concepts may have applicability and usefulness in the right contexts and circumstances, even after the permanent structure of knowledge had been created and applied.

7 Governance

The political systems and processes need methodologies that are rigorously tested and proven to be efficient and effective. As of now, such methodologies are not existent; or if they exist they are neither transparent nor universal and hence subject to large variations in their outcome. Political systems are only as good as they are able to show consistent outcomes/results. Any systematization in these processes will greatly enhance the stability of the organizational efforts.

Humanity and the divinity are goals that could be achieved only by institutionalizing the human/divine behaviors as ends in themselves, through the means instilled in the permanent infrastructures of knowledge. Present infrastructures of knowledge are books, internet and many such media. The proposed infrastructure needs to be a real-social-time capable, and not mere solar clock versions of the geo-chronometer measured; with the intention of bringing wisdom to the decision making and its implementation processes, which are thought of to be either divinely inspired or of mere chance. Political systems considered here are not limited to the geo-political variety but of a very comprehensive kind that is an individualized solution that penetrates all the regional, national, communal, cultural, religious, secular, family, and the commercial circumstances capable of ensuring the desired outcomes without any human intervention. Such a sophisticated communication & delivery mechanism once conceived needs to be made operational and then maintained without any failure for an infinite duration. Its construction and upkeep could take decades (comparable to the space exploration vision of the 60's) of human ingenuity but likely to be well worth the effort when measured against its benefits[9] and the likely capacity to raise the standards-of-living of the entire humanity both in quality and quantity, approaching one hundred percent of the global inhabitants.

An advanced country is the one that is omniscient and mindful/respectful of its citizenry be it a fetus, yet unborn or an elderly that is ready to choose euthanasia over facing the prospect of loss of dignity, since no one wants to take care of that person or wants to pay for the health care of that citizen till the natural end. It is that country, that worships the ground that citizen trod on; respectful of its citizenry's time, emotions, feelings and sufferings; it is that country that honors the opinions, wishes and needs of its citizenry over and above any other considerations such as some laws, regulations, procedures or edicts; it is that country that prioritizes its citizen's decisions both individually and not just collectively alone. It is that country that risks all it has to protect the life and memory of any single individual, at any given time and forever. While it's true that civilization requires laws and its obedience by all, and no one is above the laws, humanity and the respect of its citizenry involves wisdom above and beyond what is enshrined in the laws, the customs; and the judicious application of that wisdom to meet both of these criteria (Law - collective & Justice-individual), concurrently; not ever one or the other alone.

The processes of the empowerment of the political systems involve more of the results experienced by each and every citizen. If the result is undesirable either to an individual or to the collective, then the management of the political-systems-technologies needs better attenuation till the right quality of the result is achieved. For example, while we may have a monetary system that is capable of printing money and distributing that money to the citizenry as earnings for their discretionary spending; if those processes that provide such income are not timely enough due to either the business recessions or due to the vagaries of the cyclical causes of all human endeavors; there needs to be an alternate mechanism for distributing goods and services in a timely manner, irrespective of the lack of income at a certain point of that systemic shortcomings, beyond even the extended unemployment benefits etc., which could apply only to the once employed. An empowered political-technology system, perhaps based on a credit/debit-card that will enable any-one to get what they need when they need it; irrespective of their ability or lack there-of, for what-ever reason, at a given societal-time frame of that country's history. Wisdom and political rigor requires such common-sense outcome, and failure to achieve that result is more of a management issue and not a moral/ethical or even as it were, an economic issue. We know,

[9] To avoid mishaps of the scale reported in here: http://news.in.msn.com/national/article.aspx?cp-documentid=5015358&page=4

given enough societal-time[10], scarcity does not exist; abundance and surplus are the norm, both in nature and in human endeavors. It's imperative that this universal truth and knowledge be incorporated in all of the empowerment sciences. Given this realistic scenario of problem resolution, tasks such as the environmental protection; energy production, distribution and use; balancing an individual, city, state, organizational, national and international budgets; education of everyone; health-care for all; and many others like these are not anything one needs to fret about, argue over or even fought through the political regimes. These are mere "management gone- awry" happenstances that need immediate rectification by appropriate algorithms, using –if necessary – increasingly powerful computational powers of sophisticated and iterative sequences of societal-time engineering solutions with transcapes[11] of possible outcomes. Our present-day print media illustrations of reality - in a magazine format, news broadcast, as an editorial or a descriptive article - are but a form of transcapes, albeit of a primitive kind.

8 Empowerment Technologies

Empowering political systems using technologies is further advanced than even the serendipitous relevance[12] measurements involved in the very human social networking sites and related technologies. Monetization of the human labors and the human acts of virtue[13] are different from the monetization of the clicks on the cyberspace from the page view rates that benefit the sponsors/advertisers. Other more significant relevance criteria for the humanity are the occupations and the societal roles. Both of these criteria can lead to the creation and the maintenance of the permanent infrastructures of knowledge; easily furbished as virtual workbenches, all updated in societal-time scales appropriate for their intended functions. Access to the workbenches of the permanent infrastructure of knowledge might or perhaps, ought to be universal and ought to become a fundamental right of being human. These workbenches and the virtual offices should be equipped with simulation tools to enable learning through hypothesizing and finding out the consequences without having to experiment in their real-lives. Education to reach and use these established workbenches may not be based on gainful employment but guaranteed during the life of all. Data about the physical and societal atmospheres[14] should be freely available and shared since all the data is a public good- in the non-biological economics studies. Ability to monetize all of the efforts made at these benches, auto-reflexively, could lead to a sophisticated economy that would concurrently be both entrepreneurial and socialistic, combining the values of all philosophies secular, religious[15], ethical and perhaps, even be based on mere moral reasoning as well. Similarly, concurrency of the several seemingly opposing notions could and would co-exist with the permanent infrastructure of knowledge, know-how, know-why, know-what etc., to provide the resiliency and the strength needed for the human societies to reach the next level of progress and attain the humanity postulated by the human sciences[16] and prescribed for human existence; if not the divinity[17] dreamed of for mankind. If, euphemistically at least, a smarter-planet[18] is what is aspired for, then, these are the

[10] Societal-time is a unit of measure that adjusts the capacities of different societal roles and their value contribution among other things to maintain an equitable exchange for all members of the societal non-biological economic system.

[11] Transcapes, like the landscapes or the moonscapes of a three dimensional planet, depict the relationships of any number of variables in a context to help visualize the scope, the nature and the significance of that complexity in that societal confluence presented as an unique or a representative perspective.

[12] See link: http://techcrunch.com/2011/03/03/the-age-of-relevance/ that maps and explains its meaning.

[13] Such as the presence of love in a family that transcends to make the monetization of a house spouse's labor unnecessary.

[14] Societal atmosphere, similar to the natural atmosphere needs to be predictable in forecasts to help understand the immediate weather as well as the long-term climate from the societal changes.

[15] Such as the Vatican's past and present roles in tying the sciences to faith: http://being.publicradio.org/programs/2011/asteroids/

[16] As presently conceived and written about: http://en.wikipedia.org/wiki/Human_science

[17] As postulated and written about: http://en.wikipedia.org/wiki/Divine

[18] This is a reference to the sector level Information Technology (IT) ad campaign to encourage investment in that sector.

essential stepping stones to achieve those euphemistic aspirations.

9 Conclusions

Our knowledge of the natural world has provided us with progress and benefits at a cost to human value according to many. The concepts proposed and discussed endeavor to show that the natural world and the humanism enshrined in the biological body of the societal members are both dependent on one another for their mutual presence; and by distinguishing the biological from the non-biological it will be possible to govern both an individual and the society. The rates of changes of the various phenomena are a critical measure with which governance has to contend with. By proper devices these processes can be effectively managed. It is through effective management that the monetization of the work and the non-work can take place to meet the non-biological societal economics and to ensure the human survival at the same time.

References

[1] See the latest news of political violence: Paul Krugman

[2]Few of which were discussed in, "Empowerment of people and societies using technologies", a paper presented at the 98th Indian Science Congress held from Jan 3rd – 7th, 2011 at the SRM University Campus in Chennai, India.

[3]Technology is defined very broadly as everything humanity does, including languages, arts, money to name three.

[4]Integrity is that quality/property of completeness that enables a system to be worthy and fully functional

[5]Restorative Justice(RJ): The damage done

[6] Justice or anarchy? : http://www.google.com/hostednews/afp/article/ALeqM5jrpXFCyCEwRrQEIVFca67OqKwRWg?docId=CNG.19d12e5647311a6750cb654cad6306f8.761

[7] Naturally or not, http://news.in.msn.com/national/article.aspx?cp-documentid=5015358&page=4

[8] Such as the one reported in this news item : http://news.in.msn.com/national/article.aspx?cp-documentid=5015358&page=4

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[18] A reference to the sector level Information Technology (IT) ad campaign to encourage investment in that sector.

The UBL Standard and its Potential in the Exchange of Industrial Data

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Abstract - *The purpose of UBL (Universal Business Language) is mainly that of filling the gap of the missing standardization in the formatting of data to be exchanged. The focus of this document is an introduction and description of UBL as an XML based document formatting language and an evaluation of the factors that may directly influence its success and adoption on the market. After fast introduction, we explain what is UBL. In section 3 we present a panoramic UBL applications and conclude with a description of the critical use of UBL. After taking all the mentioned aspects into consideration it can be said that UBL has a huge potential and will definitively influence a certain amount of business data exchange in the European Community. There is on the other side need of more time o formulate a more precise and coherent answer on the success of UBL as a standard.*

Keywords: *EDI, Standardization, B2B, UBL*

1 Introduction

The exchange of information is not only a need of human beings but also a vital need of companies making business together and interacting with public admnistrations. If verbal contracts are considered as valid in European countries (among which Italy and Switzerland), it is good and common practice in economy to avoid them and formalize contracts and commercial documents by putting them in writings (EU contract law Art. 13).

The exchange of written business documents has normally involved sending and transferring paper documents from one company to the other. With the development of new technologies, paper documents have been gradually digitalized and either sent via telephone lines (fax) or stored as copies of the original paper documents (in electronic formats like jpeg, pdf or pcx). Quite widespread in year 2010 is the habit of receiving paper documents, scanning them directly at receipt and storing them in a document database. Software solutions like EMC Documentum or Parametric Technology Corporation (PLM Software) have been on the market since the '80ies and are still well known for electronic document management. If the treatment of paper document in digital form is quite common inside the boundaries of single

Figure 1 – e-Data Transfer

enterprises, much less widespread is the practice of exchanging business documents in pure digital form. Among the many difficulties and obstacles of the data exchange we can mention the cost of the required technological investments, lack of political will in both companies and the public administrations, absence of adapt products and the lack of data formatting standards.

The purpose of UBL (Universal Business Language) is mainly that of filling the gap of the missing standardization in the formatting of data to be exchanged. The focus of this

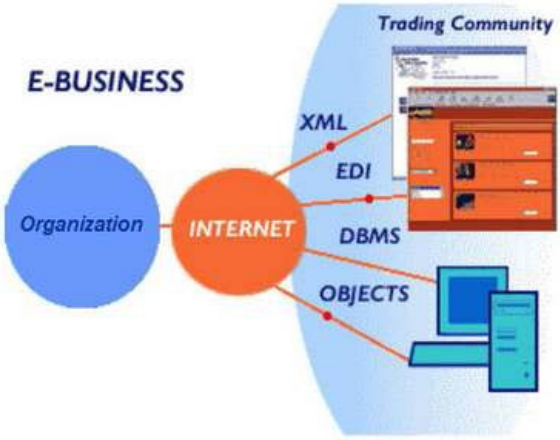

Figure 2 – Business Data Exchange through Internet

document is an introduction and description of UBL as an XML based document formatting language and an evaluation of the factors that maydirectly influence its success and adoption on the market. After introducing the problem at the base of this effort , in ch. 2 we'll take a quick look at UBL in

particular. Chapters 3 and 4 are dedicated to the analysis of potential factors influencing the development, success and adoption of UBL. Chapter 5 summarizes this paper and the need of doing additional research.

Problem Definition

The traditional form of electronic data exchange at the end of the last century has mainly involved the use of proprietary technologies, communication lines, proprietary formats and data exchange protocols. This way even today "the adoption of advanced integration technologies that enable private and public organizations to seamlessly execute their business transactions electronically is still relatively low, especially among governmental bodies and Small and Medium-sized Enterprises" (Janner et al., 2008). With the turn of the century the larger diffusion of the Internet and the adoption of open standards have led to an extremely large utilisation of Markup languages, SGL/HTML first and XML probably second for popularity.

The practical utilization of the XML markup language is in 2010 absolutely widespread to the point that this language has been adopted also for a vast and varied list of different purposes. Among the many possible utilization of XML in the market and industry we may quote Microsoft utilization of "Office Open XML" (OOXML) to store and exchange Office documents, Oracle's Berkeley DB XML, a fully fledged relational database using XML for the data storage and the XQuery, XML based query language for database, just to mention some.

Despite this remarkable popularity, many issues still lay on the way toward an easy and low cost exchange of business electronic data. OASIS itself, a no profit organization active in the promotion of open standards for information, is quoting the following problems or disadvantages (UBL TC, 2010):

1. Developing and maintaining multiple versions of common business documents like purchase orders and invoices is a major duplication of effort. Janner et al. (2008) mention indeed the huge variety of business document formats.

2. Creating and maintaining multiple adapters to enable trading relationships across domain boundaries is an even greater effort.

3. The existence of multiple XML formats makes it much harder to integrate XML business messages with back-office systems.

4. The need to support an arbitrary number of XML formats makes tools more expensive and trained workers harder to find

In addition to these evident and important elements we may also quote the following open issues mentioned in literature:

5. The requirements of different sectors of the market are specific and peculiar, this way difficult to be addressed by a general purpose standardisation. Brun and Nielsen (2003) focus on e-Government, mentioning for example naming conventions and design rules.

6. The adaptation of UBL documents to the specific requirements of SMEs in Enlarged Europe is mentioned by Guglielmina et al. (2006)

7. The need of strong data typing is quoted by Brun and Nielsen (2003).

8. Organisational and procedural interoperability is quoted by van Overeem et al. (2007) as a major challenge, especially as a consequence of the subsequent extensions of the border of the EU, including new and very differently organised governments.

9. Bureaucracy and simplification programmes are mentioned by van Overeem et al. (2007).

10. Discovery and interpretation of the required or implied metadata to be added to the raw transactional data. (Van Overeem et al., 2007)

11. Lack of internationally valid standards with enough support and acceptance of member states. (Van Overeem et al., 2007)

12. Impact of the local language on the organisation and coding of data and of related metadata. (Van Overeem et al., 2007)

13. Support for negotiation and collaboration among enterprises has to be guaranteed (Guglielmina et al., 2006)

14. Adaptation possibilities for the predefined document formats. Guglielmina et al. (2006) remarks the importance of this requirement in the special case of SMEs.

15. Support for traceability of transactions is mentioned by Iachini (2008).

We'll now take a look at the UBL initiative, keeping in mind at least some of these factors in our analysis.

2 What is UBL ?

UBL (Universal Business Language) is a language (not simply a collection of documents) directly based on XML and strongly related to the ebXML project, of which it may be

considered an extension and specialised evolution. One goal of the UBL project is to formalize the XML definition of preformatted business documents that can directly be used in business software, implicitly enabling the data transfer between companies using the same formatting. The group of documents altogether form a library which has been extended already twice since its creation. From the 8 documents contained in R. 1.0 of 2004, the number of documents has increased to 31 of R. 2.0 in 2006. This is also the result of a much more complex modeling of the business process. R. 2.1 is still in discussion in January, 2011 and will presumably add additional 29 documents, mainly aimed to support a more complete e-procurement process. After 9 years of progressive development, collecting inputs from national and international projects, in 2011 UBL is confirmed to be the most widely adopted language for data transfer used by the Public Administration (PA) in Europe (www.UBL-Italia.org). Its adoption in the industry is still not extremely widespread, because many proprietary EDI solutions are still in place. The need for standard and open solutions is anyway giving a contribution toward the adoption of UBL and similar competitor initiatives (like Rosetta Net).

2.1 Architecture

UBL R. 1.0 has been specified on the base of a quite simple model of the business process. Fig. 3 gives a clear idea of the commercial process used. Since only 3 actors were involved, 8 simple documents were predefined by the

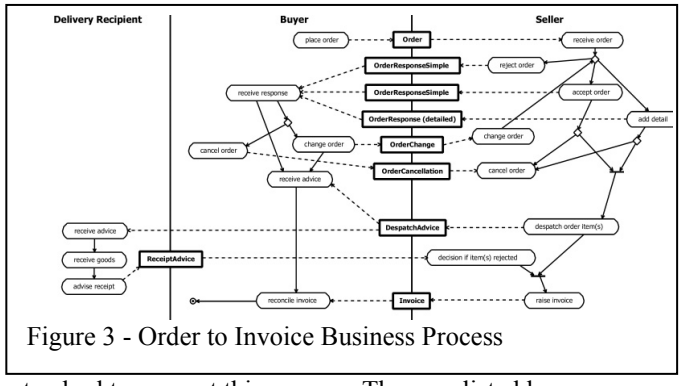

Figure 3 - Order to Invoice Business Process

standard to support this process. They are listed here:

Order	Order/Delivery
1. Order	5. Order Cancellation
2. Order Response Simple	6. Despatch Advice
3. Order Response (detailed)	7. Receipt Advice
4. Order Change	8. Invoice

Table 1 – UBL 1.0 Business Documents

UBL R. 2.0 has been a big step forward toward mapping a much more complex business process, which is for sure more typical of our modern times. The number of documents and actions covered by the model is much bigger now. Here the documents added by the R. 2.0:

Sourcing	Fulfillment	Billing	Payment
1. Catalogue	8. BillOfLading	14. CreditNote	
2. Catalogue Deletion	9. CertificateOfOrigin	15. DebitNote	20. Remittance Advice
3. CatalogueItem SpecificationUpdate	10. Forwarding Instructions	16. FreightInvoice	21. Statement
4. Catalogue PricingUpdate	11. PackingList	17. Reminder	
5. Catalogue Request	12. Transportation Status	18. SelfBilled CreditNote	**Document Types**
6. Quotation	13. Waybill	19. SelfBilled Invoice	22. Application Response
7. RequestFor Quotation			23. Attached Document

Table 2 – UBL 2.0 Additional Business Documents Categorised

Even at first sight it is evident that the new extended group of documents covers the need of many more operations of the typical business process. The underlying business model is of course much more general and detailed. Despite the much higher level of complexity of R. 2.0, the most recent extension called UBL R. 2.1 still adds 29 documents, mainly to cover also the 'tendering' process between buyer and potential suppliers. As of January 2011 the R. 2.1 is still in draft phase and open for comments and modification. New processes will now be supported by means of the additional document available. Here is the list:

- eTendering
- CPFR (collaborative planning, forecasting, and replenishment)
- VMI (Vendor Managed Inventory)
- Intermodal Freight Management
- (Multi)utility billing

Table 3 is an overview of the new documents, grouped by category.

e-Tendering	Collaborative planning	Vendor Managed Inventory	Intermodal Freight Management
1. Awarded Notification	11. Exception Criteria	18. InstructionFor Returns	24. Transport ExecutionPlan
2. CallFor Tenders	12. Exception Notification	19. Inventory Report	25. Transport ExecutionStatus
3. Contract AwardNotice	13. Forecast	20. Performance History	26. Transport OperationStatus
4. Contract Notice	14. Forecast Revision	21. ProductActivity	
5. Guarantee Certificate	15. Item InformationRequest	22. RetailEvent	
6. Tender	16. PriorInformation Notice	23. Stock AvailabilityReport	
7. TenderReceipt	17. TradeItem LocationProfile		
8. Tenderer Qualification		**Utility Billing**	**Supplementary Document Types**
9. Tenderer Qualification Response		27. Utility Statement	28. Document Status
10. Unawarded Notification			29. Document Status Request

Table 3 – UBL 2.1 Additional Business Documents in Draft Phase

2.2 Components and Metadata

Each document is represented and formalised by the standard in a predefined XSD Schema. These are "the only normative representations of the UBL 2.0 document types and

library components" (UBL 2.0). Documents are built using business information, which in turn can be simple BBIEs (Basic Business Information Entities) or be grouped in ABIEs (Aggregate Business Information Entities). The schemas are taken from the CCTS (Core Component Type Schemas) definition managed by UN/CEFACT at European level. This choice is an additional contribution to the standardisation of the solution at international level.

2.2.1 Schemas

Schemas are explicitly provided in order to make validation of the documents possible. Actually, according to the UBL 2.0 standard, each and every instance document of the library must validate to a corresponding schema.

2.2.2 Core Component Parameters

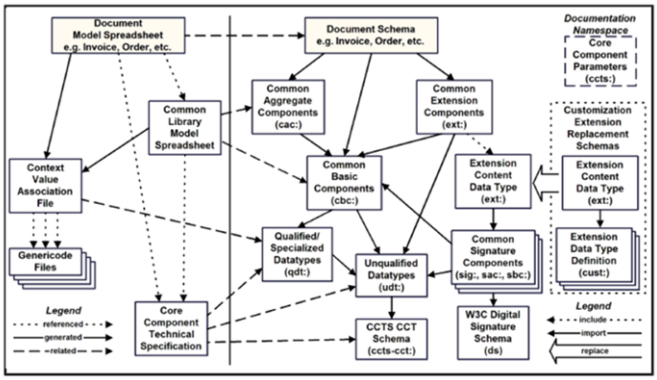

Figure 4 - Organization of UBL Schemas

Core Component Parameters is a special schema that formalizes the structure of the annotation/documentation sections which may appear in all the other schemas. The idea is to provide a consistent format for metadata such as semantic descriptions, classification and similar information, in order to encourage consistency of customized extensions.

3 Example of utilization of UBL

The adoption of a standard can also be measured by its utilization in real life project, following the initial phases of definition and promotion. A quick look with search engines in Internet gives a rough idea of the still low level of adoption of the UBL standard. Among the publicly available documentation, one commercial, one no profit open source project will now be mentioned as Italian case studies together with two additional projects promoted by European Public Administrations.

3.1 Case study UBL in private industry in Italy

The Italian group of companies Salmoiraghi-Viganò has adopted UBL as the internal data format for the codification of the invoicing documents. The main dataflow happens between the central production and the about 300 distributed sales points. Typical products include glasses and related accessories. The amount of orders exchanged everyday is of the order of magnitude of 300'000. Company website: http://www.salmoiraghievigano.it/portale/out/homePage.aspx

3.2 Project TYL – Business Objects Programming

Tyl is an Open Source project with the goal of developing a collection of Business Objects written in the Java language and reusable in the context of Java SE and EE projects. The idea is that of providing pre-programmed classes to generate objects like Persons, Products, Organisations, Roles, Relationships, Orders and Invoices only by means of open source tools and platforms. The utilisation of the Apache and JBoss platforms allows the use both desktop (Swing) and web interfaces (JSF, Wicket or AJAX). The main functionalities provided by this project can also be used and accessed by means of Web Services, which also allows the integration in a SOA project. To enhance the compatibility of the Data Model, most of the components are just a copy of the data model defined in UBL.

3.3 Project NES (Northern European Subset) UBL

This cooperation among countries of north Europe (Denmark, Sweden, Norway, Finland, UK and Iceland) has the target of reducing the amount of documents defined in the UBL 2.0/2.1 standard and create subsets to be used not in general, but only for some specific business processes. Subsets are defined by means of "profiles" applicable to specific business situations and the NESUBL subset has been published in 2007. Among others, public institutions can profit from this initiative, especially in the case that they want to adopt UBL only for some sectors and move on step by step. In a second step, each of the involved counties has developed specific guidelines for the domestic business practices which have influenced eProcurement initiatives of the member states. For example Brun and Nielsen (2003) remark that Danish name and design rules differ from those typical of UBL.

3.4 Project PEPPOL

One of the further developments of the NES project has formed the basis of the PEPPOL project. According to the information available on its public website, PEPPOL (Pan-European Public Procurement Online) "aims to implement common standards enabling EU-wide public eProcurement. Existing national systems of electronic public procurement will be linked so that all participants can enjoy the full benefits of a single European market. PEPPOL is operated under the European Commission's Competitiveness and Innovation Framework Programme's ICT Policy Support Programme.

The main drivers of the project are the common platform for EU-wide communication and the immediately consequent cost savings for each following project requiring business e-data exchange in the EU community. Procurement processes, for example, will directly and immediately benefit from this approach. Among the many business cases and scenarios examined and scheduled for test, the constitution of the e-Procurement services for the city of Bremen (Germany) and the standardisation and improvement of the e-Procurement (also named "tendering) services for the city hospital of Bordeaux (France) can be mentioned (PEPPOL, 2010).

4 Possible success factors for UBL

UBL 2.1 takes all the advantages of the big effort of the technical groups and committees of the OASIS organisation and of the adoption as UN/CEFACT standard. In addition the second (although minor) update to R. 2.1 extends the model to cover important aspects of e-Procurement.

4.1 Positive factors

Nurmilaasko (2006) analyzed 12 frameworks in his work and identifies some important factors for an objective evaluation. UBL is quite well placed in practically each of these factors. In fact in comparison with the parallel initiative Rosetta Net, it's not linked to specific industries and it is promoted by vendors instead of users. Additional positive aspects that can also be mentioned here are the increasing adoption in standard industrial business and EDI software, the lack of fees and royalties and the support from local comities (like for example UBL-Italia in Italy).

Figure 5 – UBL compared to other solutions (from Nurmilaasko, 2006)

4.2 Factors that could be enhanced

Sven and Brunner (2003) remark quite directly that "it is impossible to agree on strong data types that are relevant to all parties in cross border exchanges." It is absolutely true that really many parties are involved in the various phases of business data exchange and they have peculiar needs. The acceptance of UBL in the private market even today is quite low. On the side of the Public Administration the same authors admit that "in E-Government there is a substantial benefit to be gained at a national level by expressing all elements with strong data types."

As mentioned by Guglielmina et al. (2006) "the analysis of research about enterprise interoperability led to the identification of the two main research priorities: adaptation of UBL documents to the requirements of SMEs in Enlarged Europe … reconciliation and integration of state-of-the-art languages and standards for Business Process Management". As a matter of fact, in its effort to cover additional business cases, UBL is getting more and more complex, this way also complicate to use and difficult to be introduced in SMEs. Examples of simplification like the NES Project confirm both the lack of simplicity and the remarks of Guglielmina's work. Bechini et al. (2008) is well aware that "generic ontologies (as UBL) are not directly usable in the traceability domain, because they do not contain domain specific concept definitions." This is of course a pitfall of the UBL solution and although traceability ontologies require a lot of efforts to be built, this activity may be included in a further extension and release of UBL.

4.3 Comparison with the requirements mentioned in literature

N.	Description of the requirement	Relevance 1-10*	Grade 1-10*	Subtotal
1	Developing and maintaining multiple versions of common business documents.	10	10	100
2	Creating and maintaining multiple adapters.	7	10	70
3	Existence of multiple XML formats makes it much harder to integrate XML business messages.	6	10	60
4	The need to support an arbitrary number of XML formats.	6	10	60
5	The requirements of different sectors of the market are specific and peculiar.	10	6	60
6	The adaptation of UBL documents to the specific requirements of SMEs	8	6	48
7	The need of strong data typing.	8	10	80
8	Organisational and procedural interoperability.	10	NA	--
9	Bureaucracy and simplification programmes.	10	NA	--
10	Discovery and interpretation of the required or implied metadata.	10	6	60
11	Lack of internationally valid standards with enough support and acceptance of member states.	10	4	40
12	Impact of the local language on the organisation and coding of data and of related metadata.	10	8	80
13	Support for negotiation and collaboration among enterprises.	10	5	50
14	Adaptation possibilities for the predefined document formats.	9	8	72
15	Support for traceability of transactions.	9	6	54
			Total	834/1300

Table 5 – Evaluation of the Potential of UBL against the Requirements

* In both cases "1" is the worst grade, "10" is the best

The overall score of a UBL-only based solution is good but not extremely high. Some requirements (1, 2, 3, 4 and 7) would be completely matched in case of a direct utilization of UBL in practice, among all business partners involved. Other requirements, which are also extremely critical for the implementation of electronic exchange of business data (e.g. 8 till 13), are only partially addressed by the UBL initiative. The implementation of the ebXML standards would complement UBL perfectly and enhance the fulfillment of some factors. As a whole, the UBL language is still lacking of the necessary acceptance at national and EU level, this way the grade of the requirement n. 11 is still very low.

5 Summary and Additional Research

Starting with the UBL Rel. 1.0 dating 2004 and quite basic in its formulation, the group of documents has been progressively extended to involve additional and more detailed phases of the business process, focusing mainly on delivery and e-Procurement/Tendering activities. After the draft and future release of the minor version 2.1, an agreement has been reached between OASIS and UN/CEFACT for the common promotion of this standard. UBL remains formally an own initiative of the OASIS group, but it's been licensed without restrictions to the UN/CEFACT, which is now taking the initiative to promote and develop it further in the EU and worldwide.

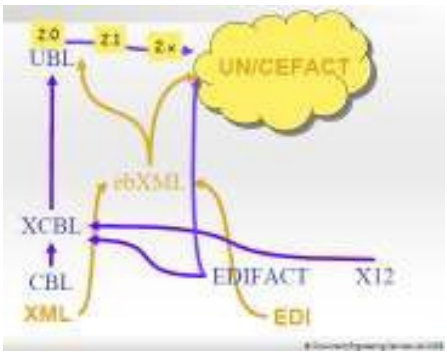

Figure 6 – Evolution of UBL

Maintenance of UBL 2 remains with OASIS with the expectation that UN/CEFACT will produce its own integrated set of XML schemas within short time. OASIS will produce no further major versions of UBL after UBL 2. As Brun and Nielsen (2003) remarked, "UBL is the first standard designed to work within an ebXML framework". In between it now profits from many years of theoretical and practical experience. As clearly displayed in Fig. 7 future releases and development of UBL will take advantage of the ebXML initiative (which has already been a collaboration between OASIS and CEFACT) and will be published under the name and as an official standard of the UN/CEFACT, opening de facto the way to a larger acceptance of this "language".

This paper has investigated the history, development and evolution of the UBL language originally promoted by OASIS. Starting with the beginning of the project in 2001 and the first release of UBL in 2004, the UBL language has progressively reached a higher level of complexity after undergoing two different extensions. The goal of becoming a real "language" spoken by systems during the more and more necessary exchanges data between companies and with the public administration is noble and it tries to satisfy a general need for compatibility. Taking the general acceptance of this standard into consideration, it must be recognised that UBL is still having some problems in both the industry and the public administration. The specific needs of SMEs are also not especially considered by the model. The step of licensing UBL to the UN/CEFACT is a very positive move toward better acceptance.

Requirements coming from both research papers and some industrial aspects have been evaluated in this paper reaching an overall score of 834 points out of the 1'300 available in the evaluation. After taking all the mentioned aspects into consideration it can be said that UBL has a huge potential and will definitively influence a certain amount of business data exchange in the European Community. There is on the other side need of more time o formulate a more precise and coherent answer on the success of UBL as a standard. The newest release is still in its draft phase and a EN/CEFACT release is expected to appear soon as standard. In addition, some factors deserve a deeper analysis which because of the time hasn't been possible during the preparation of this paper. For example it is critical to know if the main producers of ERP for large enterprises and specifically for SMEs are going to adopt the UBL standard and offer out of the box UBL compatible solutions. If this is going to happen soon, then the UBL standard will receive an important push toward widespread adoption. The technical choices of the main and larger PAs in the EU community will also be extremely important for the future adoption and diffusion of UBL. If this format (or "language") will soon be established in the PA, then also private companies dealing with PAs will have an additional good reason for the adoption of UBL compliant solutions.

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The New Fields of Public Policy Engineering, Political Engineering, Computational Public Policy, and Computational Politics

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Abstract: *This research paper defines four new fields called public policy engineering, computational public policy, political engineering, and computational politics. Public policy engineering is the application of engineering, computer science, mathematics, or natural science to solving problems in public policy. Computational public policy is the application of computer science or mathematics to solving problems in public policy. Political engineering is the application of engineering, computer science, mathematics, or natural science to solving problems in politics. Computational politics is the application of computer science or mathematics to solving problems in politics. Public policy engineering and computational public policy include, but are not limited to, principles and methods for public policy formulation, decision making, analysis, modeling, optimization, forecasting, and simulation. Political engineering and computational politics include, but are not limited to, principles and methods for political decision making, analysis, modeling, optimization, forecasting, simulation, and expression. The definition of these four new fields will greatly increase the pace of research and development in these important fields.*

Keywords: public policy, politics, engineering, computer science, mathematics, natural science

1 Introduction

In this research paper, the author, Ashu M. G. Solo, defines four new closely related fields that he is initiating called *public policy engineering*, *computational public policy*, *political engineering*, and *computational politics*. Basic and advanced methods in engineering, computer science, mathematics, or natural science can be used for public policy formulation, decision making, analysis, modeling, optimization, forecasting, and simulation as well as for political decision making, analysis, modeling, optimization, forecasting, simulation, and expression. This will lead to greatly improved public policy and political decision making.

For example, legislators usually determine spending priorities and budget allocations based on passions of the moment, special interest lobbying, parochial interests, ignorant public opinion, or their own ideological biases rather than on a rigorous mathematical and computational analysis of how spending priorities and budget allocations can be made for the greatest public benefit. Politicians often determine how to spend limited campaign funds on advertising in certain geographic areas based on their best guesses rather than on a rigorous mathematical and computational analysis of how funds should be allocated for the greatest benefit to their campaigns. There needs to be more technocracy in democracy.

2 Public Policy Engineering and Computational Public Policy

Public policy engineering is the application of engineering, computer science, mathematics, or natural science to solving problems in public policy. Computational public policy is the application of computer science or mathematics to solving problems in public policy. Therefore, computational public policy is a subset of public policy engineering. Public policy engineering and computational public policy include, but are not limited to, principles and methods for public policy formulation, public policy decision making, public policy analysis, public policy modeling, public policy optimization, public policy forecasting, and public policy simulation. Public policy engineering and computational public policy are more technically, computationally, mathematically, and scientifically rigorous approaches to the field of public policy.

The term *e-government* [1, 2] refers to the use of information and communication technologies in government operations, access to government data, interactions between government agencies, interactions between government and citizens, and interactions between government and external organizations. Therefore, an e-government activity only constitutes public policy engineering when principles or methods in engineering, computer science, mathematics, or natural science are used in public policy formulation, decision making, analysis, modeling, optimization, forecasting, or simulation. An e-government activity only

constitutes computational public policy when principles or methods in computer science or mathematics are used in public policy formulation, decision making, analysis, modeling, optimization, forecasting, or simulation.

The formulation of criminal sentencing policy does not constitute public policy engineering or computational public policy. However, the formulation of criminal sentencing policy involving the use of computational intelligence methods for determination of criminal sentences would constitute public policy engineering and computational public policy.

3 Political Engineering and Computational Politics

The term *political engineering* [3] has been previously used to refer to designing political institutions. This is a poor usage of the term and an abuse of the word *engineering.*

Engineering consists of theoretical engineering and applied engineering. Theoretical engineering is the creative development of mathematics, natural science, technical principles, or technical methods for usage in the development, analysis, characterization, modeling, control, automation, optimization, forecasting, simulation, or visualization of devices, algorithms, components, systems, machines, apparatuses, structures, processes, operations, or materials. Applied engineering is the creative application of mathematics, natural science, technical principles, or technical methods for the development, analysis, characterization, modeling, control, automation, optimization, forecasting, simulation, or visualization of devices, algorithms, components, systems, machines, apparatuses, structures, processes, operations, or materials. These definitions of engineering, theoretical engineering, and applied engineering are by the author of this research paper.

As it has been previously used, the term *political engineering* does not require the creative application or development of mathematics, natural science, technical principles, or technical methods for the development, analysis, characterization, modeling, control, automation, optimization, forecasting, simulation, or visualization of devices, algorithms, components, systems, machines, apparatuses, structures, processes, operations, or materials. Therefore, the author of this research paper is giving a new and more appropriate definition to the term *political engineering.* Just like many terms in the dictionary have multiple meanings, the term *political engineering* can have multiple meanings.

As defined by the author of this research paper, political engineering is the application of engineering, computer science, mathematics, or natural science to solving problems in politics. Computational politics is the application of computer science or mathematics to solving problems in politics. Therefore, computational politics is a subset of political engineering. Political engineering and computational politics include, but are not limited to, principles and methods for political decision making, political analysis, political modeling, political optimization, political forecasting, political simulation, and political expression. Political engineering and computational politics are more technically, computationally, mathematically, and scientifically rigorous approaches to the field of political science.

The term *e-politics* [4] refers to politics and the Internet. Some aspects of the field of e-politics, such as e-voting, are part of political engineering. An e-politics activity only constitutes political engineering when principles or methods in engineering, computer science, mathematics, or natural science are used in political decision making, analysis, modeling, optimization, forecasting, simulation, or expression. An e-politics activity only constitutes computational politics when principles or methods in computer science or mathematics are used in political decision making, analysis, modeling, optimization, forecasting, simulation, or expression.

Political expression on a blog doesn't constitute political engineering or computational politics. However, political expression involving the use of software methods for automatically generating political blog entries based on the latest polling data or government data would constitute political engineering and computational politics.

4 Scope of Public Policy Engineering and Computational Public Policy Research and Development

4.1 Scope of Public Policy Engineering Research and Development

The scope of research and development in the field of public policy engineering includes, but is not limited to, the following:

Public Policy Formulation, Decision Making, Analysis, Modeling, Optimization, Forecasting, and Simulation

- public policy decision making under uncertainty
- new technologies in public policy
- application of engineering to public policy
- application of computer science to public policy
- application of mathematics to public policy
- application of natural science to public policy
- application of operations research to public policy
- application of optimization methods to public policy
- application of computational intelligence methods to public policy
- uncertainty management in public policy decision making

- application of machine learning methods to public policy
- application of pattern recognition to public policy
- application of data mining to public policy
- application of decision theory to public policy
- application of game theory to public policy
- data fusion for public policy decision making
- public policy forecasting
- public policy modeling
- public policy simulation
- public policy visualization
- public policy software tools
- case studies

4.2 Scope of Computational Public Policy Research and Development

Computational public policy focuses on the application of computer science or mathematics to the research and development issues listed in section 4.1.

5 Scope of Political Engineering Research and Development

5.1 Scope of Political Engineering Research and Development

The scope of research and development in the field of political engineering includes, but is not limited to, the following:

Political Decision Making, Analysis, Modeling, Optimization, Forecasting, Simulation, and Expression

- political decision making under uncertainty
- new technologies in politics
- application of engineering to politics
- application of computer science to politics
- application of mathematics to politics
- application of natural science to politics
- application of operations research to politics
- application of optimization methods to politics
- application of computational intelligence methods to politics
- uncertainty management in political decision making
- application of machine learning methods to politics
- application of pattern recognition to politics
- application of data mining to politics
- application of decision theory to politics
- application of game theory to politics
- data fusion for political decision making
- political forecasting
- political modeling
- political simulation
- political visualization
- political software tools
- political campaign software tools
- case studies

5.2 Scope of Computational Politics Research and Development

Computational politics focuses on the application of computer science or mathematics to the research and development issues listed in section 5.1.

6 Conclusion

The definition of the new fields of public policy engineering, computational public policy, political engineering, and computational politics will greatly increase the pace of research and development in these extremely important fields. These fields are critical for the future success of politics and public policy.

In the future, after more research and development is done in these fields, graduate or undergraduate university degrees can even be offered in political and public policy engineering as well as computational politics and public policy. Political and public policy engineering should be combined into one curriculum for engineering students because politics and public policy necessarily go together. Similarly, computational politics and public policy should be combined into one curriculum for science students because politics and public policy necessarily go together.

A political and public policy engineering curriculum could include courses in mathematics, physics, chemistry, biology, software engineering, electronics, intelligent systems, machine learning, pattern recognition, data mining, communication networks, power systems, operations research, domestic policy, foreign policy, history, law, economics, finance, accounting, organization theory and design, technical writing, etc. A computational politics and public policy curriculum could include courses in mathematics, software design, artificial intelligence, machine learning, pattern recognition, data mining, communication networks, operations research, domestic policy, foreign policy, history, law, economics, finance, accounting, organization theory and design, technical writing, etc.

Graduates of these programs would be skilled in doing research and development to apply methods in engineering, computer science, mathematics, or natural science to solving problems in public policy and politics as government executives, government legislators, government bureaucrats, government staff, and political campaign staff. Political and public policy engineers as well as computational political and public policy scientists would also be able to work in closely related areas like e-government, e-politics, and e-voting.

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IT Projects Assisted To Negotiation Support Systems

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Abstract – *Managing IT projects requires a great amount of effort and ability due to the variables and risks that are involved. Many conflicts occur during the duration of the project due to contract terms, since when generating an initial poor agreement, the tendency is to occur conflicts throughout the duration of the project. One of the possible ways of avoiding this is to negotiate better the terms of the contract and extenuate expectations from the moment of the sell or prospection of the project. On the IT area, it is common to have technical professionals that act as sellers. Although this may bring a more trustful view to the client, the quality of the agreement is not always guaranteed if the IT professional is not properly prepared for the negotiation. On this context, supporting tools for decision making can aid the knowledge management of the negotiation, powering opportunities and evidencing project risks. This work will present how negotiation support systems can help IT professional during negotiations. Initial experiments and results are also mentioned in this article.*

Keywords: Negotiation Support System, Decision-making Process, Information Technology Environment

1 Introduction

Despite of the fact people see IT development as a commodity, decision-making processes in IT projects usually require great effort in solving regular conflicts. One aspect to handle these conflicts is to use negotiation.

Some authors regarding negotiations say that people should focus on the definition of a social conflict that takes place between two (or more) parties [2]. In this case, conflict is defined as "the opposition between individuals and groups on the basis of competing interests, different identities, and/or different attitudes".

Even in IT context, once getting in a conflict situation, people most often become negotiators because everyone seeks for the conflict resolution [3]. The best choice in this scenario is to take a joint decision-making process through which negotiating parties accommodate their conflicting interests into a mutually acceptable settlement [5].

Experienced IT negotiators assert that the preparation stage is vital to lead successful deals, even though one of the main issues faced by IT professionals is to know when they are technically prepared for the negotiation table. Under these circumstances, negotiation support systems may help IT professionals to manage their negotiations, specially the preparation stage.

This article aims at presenting how negotiation support systems may assist IT professionals during their settlements. The work also presents a proposal negotiation knowledge management system which may support specifically IT project negotiations. In addition, some studies and results are presented.

2 Background Review

This section aims at explaining some literature description of negotiation methods, negotiation support systems and knowledge management are introduced. This article uses these concepts during the proposal environment development.

2.1 Negotiation

What does a child when asking a permission to do something that was restricted by his parents? What does a student when he disagrees with the professor`s point of view and tries to call in question his mark? What does a businessman on the meeting with his counterpart when? The answer is one – negotiate. Throughout life at any age people

face negotiations. Be it minor ones that occur in everyday life, or more sophisticated ones that need mediators and involve whole countries, negotiations are confronted so often that professionals do not always identify them consciously [9].

Negotiation is an activity that requires training, practice, coaching, strategy, and preparation and allows the execution of agreements that are mutually acceptable for counterparts, even though different conflicts may occur and external help may be needed [7].

Negotiations can be divided into phases [8], so that it is possible so find a process, such as preparation step, value creation step, value division step and execution step. [6]

Preparation is the most important stage once it provides enough information to facilitate agreements, defines the issue to be resolved and situates counterparts' interests [1]. Value Creation is crucial to explore counterpart's interests and to create alternatives of mutual gains [10]. The Value Division is a step to propose brainstorms on contingent options and to project future deals [6]. In this case, neutrality is critical to discuss standards and criteria for distributing the generated value [10]. Finally, the Execution must establish arrangements to keep track or check adopted decisions and facilitate the commitments maintenance. [6][8].

Great negotiators have already claimed that the Preparation step is the key to success in negotiations [11][12] because it prevents the consolidation of counterparts' inflexible positions and focuses on the main interests of the involved parties. Amongst beginners, preparation is almost a challenge once these disregards frequently result in gaps of negotiation information and, in each round, the volume of information to be understood becomes a dilemma.

It has known that the most difficult task for negotiators is to know which information is important; thus, negotiation support systems may play a huge role to prioritize information and make decisions fast. Therefore, in the scope of this work, an e-negotiation approach is presented to structure the preparation stage.

2.2 IT Project Negotiations

Even in IT project negotiations, the competitive globalization has led negotiations to conflict situations, where counterparties are competing in a zero-sum game. Competition among suppliers may help to reduce cost due to negotiators` tendency to make concessions that may change the product value. On the other hand, the IT professionals are often neglecting the risks of such actions.

From the client's point of view, software development outsourcing is motivated by the possibility of transferring the technological risk. Besides, these factors often cause a breach of the budget, problems with deadlines and features that do not satisfy the customer needs.

A common characteristic in IT context is the fact that the sale of software is done by professionals who are not from the IT area, which raise difficulties to anticipate risks in the project's execution phase.

Indeed, it is also interesting to analyze the fact that the aspiration for new positions compels IT people to migrate to sale areas. This alternative requires capacity to broaden their knowledge in other subjects, such as trading, risk analysis, project management and negotiation performance.

In IT projects it is crucial that the customer and the supplier are in consensus about the software requirements. Some authors state that while the seller or the technologist is concerned to speak tactically about terms of applications or tools, the customer wants to speak in strategic terms - the benefits, risks and returns [20].

Besides, when technical IT professional is the leader of the software contract negotiation, he becomes a natural candidate to have credibility and, as a result, a candidate more accessible to discover the client's interests [17].

Some authors explained that the word seller is still mystified as a person who only wants the clients' money. This fact creates a necessity for IT professionals to assume this role through expertise in trading, risk management and software sale engineering [17][18][19].

Therefore, this article aims at showing how negotiation support systems may help IT professionals in their negotiations and also presents a proposal of computational environment.

2.3 Negotiation Support Systems

Following the direction of this work, five main negotiation tools were analyzed: Inspire, Negoisst, SimpleNS, WebNS and SmartSettle. In the next passages all of them will be examined consequently.

2.3.1 Inspire

Inspire (Interneg Support Program for Intercultural Research) was originally worked out in 1995 as a tool used for conducing negotiations on the Web. [21] Being a negotiation support system it is a game that can be used as a demonstration decision support system, a negotiation simulator, a demonstration negotiation support system and as a research and training tool. [21]

Since 1996, 3000 "bilateral negotiations" have been registered in Inspire [22]. Before the negotiations in Inspire users are to choose an option and give their preference on an

issue. Through this method, negotiator`s position is recognized by the system. It also uses visual and numeric tools to give a quantitative analysis of the steps taken by the negotiator. The system allows for the verification of compromise efficiency, provides graphical representation of negotiation dynamics, and has a message facility. [23] A research was held among the Inspire users that has revealed that without a previous exposure to the system and its usage negotiators have found it easy to work with.

Basing on the results of functioning of Inspire, Kersten has created the InterNeg Negotiation Support system (INSS). The lying principle of the system was called by the author "workbench approach". It is possible to use certain tools in this system accordingly to what tools have been already used by the negotiator and to the "activities incorporated into the system" [23]. Therefore, the user can see only the tools selected by the mentioned above principle.

2.3.2 Negoisst

Negoisst is also a negotiation support system but the main difference between the Inspire is that it is a tool that is used for real-life negotiations [24]. In this system, "negotiators communicate in an asynchronous, bilateral manner via semi-structured messages". According to the author, the messages are divided into four types: assertive representing facts, commissives representing a speaker's intention to carry out the action described, directives representing a speaker's intention of getting the hearer to carry out the action described in the message content, and declaratives representing a speaker's wish and ability to declare new facts.

To keep negotiators away from the "ambiguity" of the language they use in negotiations the system allows the users to comment on the parts of the message`s units with the help of previously defined terms, the number of which can be, by the way, extended by the negotiators [24]. The system creates two negotiation areas: formal and informal. In the last one the users of Negoisst can "interact without obligations". What is more, Negoisst disposes of the facilities for the management of documents and "integrates communication support" and another useful option of the system is to send messages with incomplete agreements [24].

2.3.3 SimpleNS

This system is a tool that helps its users to reciprocate messages and text offers. The communication process during negotiations becomes easier but the system has one disadvantage – it does not offer analysis, simulation and visualization [25].

The objective of this tool is the research that is expressed by the collection of data (that appears during negotiations) and its analysis. Like the Inspire it was generally accepted as "easy-to-use" [26]. SimpleNS shows the information needed to conduct negotiations, negotiation history displayed in one table with the time when they have been written [27]. Regarded a passive system is said to be a "communication platform" that helps to store, interchange and retrieve offers and messages [13].

2.3.4 WebNS

The Web negotiation system was defined by the authors [14] as a process-driven web-based negotiation support system that has dialogue windows through which the negotiators can interchange messages without a certain structure. The peculiarity of this system is that there is a third part in negotiations – mediator, whose objective is to "monitor" the interchanges of the negotiators, and who has a right to intervene and assist in the negotiations [14].

The developers of the WebNS intended to test: i) How effective online negotiation is how it will be accepted by the negotiators comparing it to the face-to-face negotiations; ii) How effective the online mediation is; iii) How the usage of various communication "media" is influencing the negotiation [15].

The authors as well define the objectives with which their paper has been created as follows: easy access through the Web, multiparty communication and interaction, multimedia communication, structured negotiation process, automatic documentation, security and privacy [15].

2.3.5 Smartsettle

Smartsettle is a multiparty eNegotiation system that is used by negotiators to model the situation they are dealing with and it also helps to detect their preferences. This negotiation system has a range of sessions. In the first one "parties exchange optimistic proposals to identify their bargaining ranges". In the following sessions negotiators use the "multivariate blind bidding method" that was created to get the negotiators rid of tiresome procedures that may take place during negotiations. The program offers the decision-makers an opportunity to concentrate on their own needs and objectives instead of responding the "concessions" of the second party. They also have a possibility to interchange proposals to "narrow the bargaining range". [16]

At the end of a session the system chooses the accepted packages and if more than one has been accepted, this set of packages is considered by the system to be a deal. Smartsettle rewards the negotiator that has come to the "zone of agreement" sooner than his opponent.

2.3.6 Tools Comparative

The Negotiation Supporting subject is not exactly a recent field related to the Supporting Decision System. Articles about this type of system started to appear in the literature throughout the 80's and specific sections about the theme started in the 90's [4]. However, the use of the

approach of these systems has been improved throughout time.

As a way of analyzing the systems presented in this section, it has been accomplished a comparison between these tools and the computational environment proposed on this work, considering:

1. Coverage area (worldwide or local)
2. Support based in chaos
3. Support based in decision rules
4. Support based in neural net
5. Utilize optimization techniques of Pareto to suggest optimal solutions
6. Enables the use of negotiation models
7. Provides a learning environment (e-learning or something similar)
8. Provides knowledge management negotiation environment (registering, data mining and treatment for future analysis)
9. Provides a risk management environment for the negotiation
10. Provides definition and testing in negotiation models based on Fuzzy Cognitive Maps
11. Public/Motive (general or specific)
12. Form of how it has been obtained the information (**A**rticles and other lectures, **D**emos e tutorials, **T**ests directly in the tool)

The systems being compared have in common the fact that they both possess free web versions. Table 1presents the comparison of the other items.

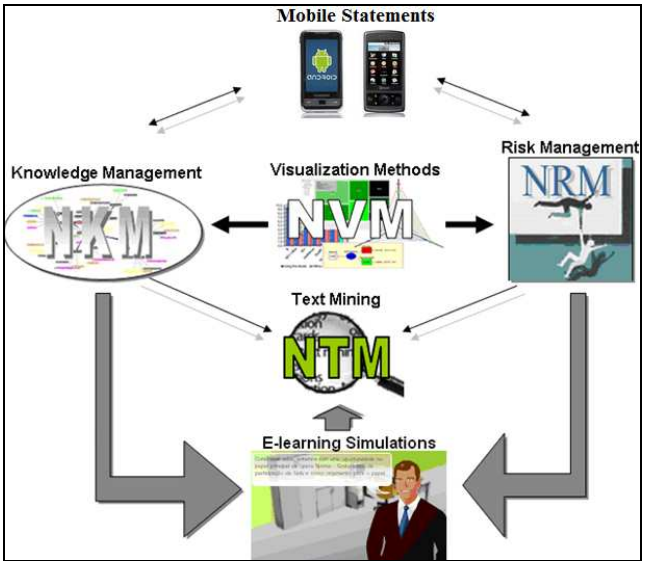
Table 1 – Negotiation Support Systems Comparative

Itens / Systems	Inspire (Interneg)	Negoisst	SimpleNS	SmartSettle	WebNS	E-NEG
1	Worldwide	Germany and USA	Worldwide	Worldwide	Worldwide	**Brazil, USA, Russia and Greece**
2	Yes	Yes	NO	Yes	Yes	**Yes**
3	Yes	Yes	NO	Yes	Yes	**NO**
4	NO	NO	NO	Yes	NO	**NO**
5	Yes	Yes	NO	Yes	Yes	**NO**
6	Yes	Yes	Yes	Yes	Yes	**Yes**
7	Yes	NO	NO	Yes	NO	**Yes**
8	Yes	Yes	Yes	Yes	Yes	**Yes**
9	NO	NO	Yes	NO	NO	**Yes**
10	NO	NO	NO	NO	NO	**Yes**
11	Preparation Step and Negotiation Table	Preparation Step and Negotiation Table	Knowledge Management and Negotiation Communication	Ensurence, Family, Business, Government, among others	Preparation Step and Negotiation Table	**IT Preparation Step and Risk Management**
12	ADT	AD	A	ADT	A	**ADT**

3 The Proposed Environment

The framework proposed in this work – called E-Neg – is based on a set of innovative technologies, such as Knowledge Management, Risk Management, Visualization Methods, Text Mining and, most recently, Mobile Statements. All these technologies are integrated through dynamic modules as depicted in Figure 1.

Figure 1 – E-Neg Modules



These modules were developed based on researches about software project negotiations. Although is not exclusive, the focus of this environment is IT projects. Thus, the negotiation knowledge flux was concept to prioritize negotiations involving IT context.

The environment is composed by four main modules and two innovative technologies. The modules are: i) Knowledge Management; ii) Risk Management; iii) E-learning Simulations and iv) Mobile Statements.

The Knowledge Management Module aims at controlling the basic negotiation information, such as: customer, contacts, deadlines, negotiators and initial negotiation prospects.

This module is composed of intuitive forms where the IT professional can be guided through ten core elements of negotiation: context, concerns, options, relationships, power, communication, criteria, authenticity, concessions and schedule.

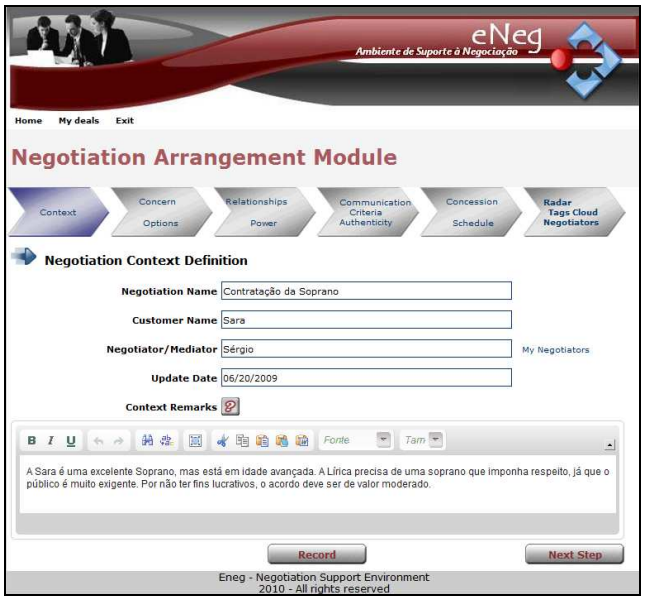
The system manages user`s profiles. After being authenticated, the splash screen displays the set of opened negotiations to the user. Figure 2 shows an example of interface with a negotiations open.

Figure 2 – Interface of Negotiations

When faced with the screen, the user can set whatever information he want to handle negotiation, for example, definitions, risk, reports, models, or meetings.

The knowledge management module allows the user to manage the information per each element of negotiation, as illustrated in Figure 3

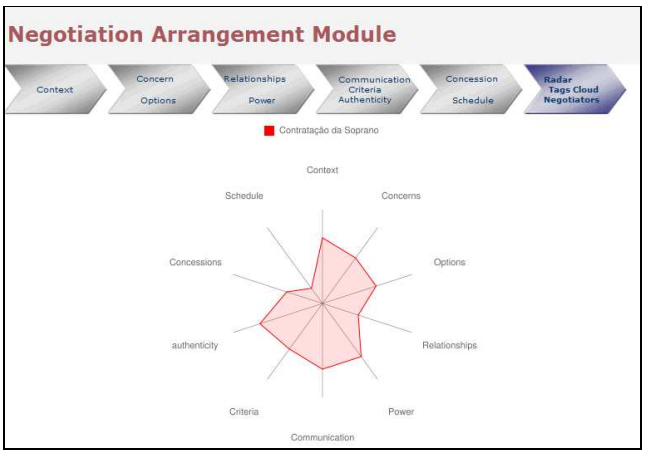
Figure 3 – Interface of Negotiations



The motivation for a negotiator to share his knowledge through this tool is the ability to have agreements stored and also to rely on analyses and reports based on text mining mechanisms.

All text entered by the user in the tool is mined. Then, the tool generates charts through visualization methods in orders to assist decision-making. Figure 4 shows an example of the user handling ten negotiation elements in the current negotiation. This chart is a result of text mining entered by the user during the negotiation preparation process and highlights the concern level for each element.

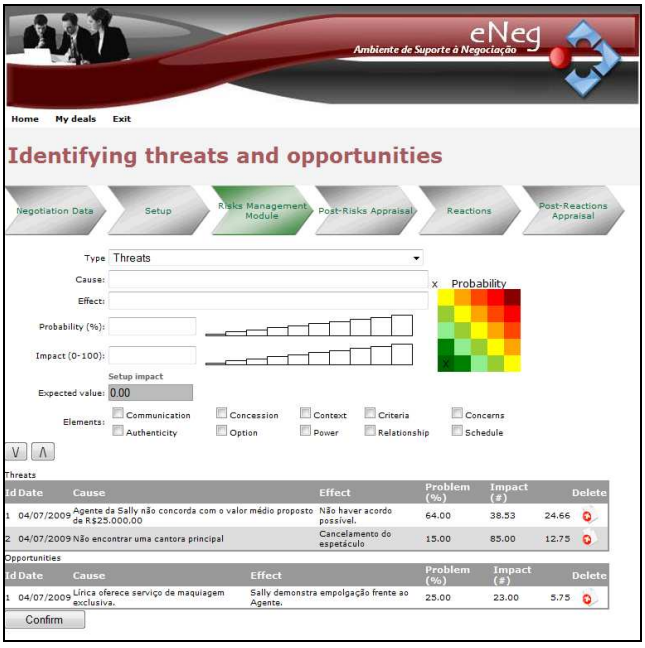
Figure 4 – Radar Graph



In addition to the knowledge management module, the radar also uses risk management data because the risk module is also based on the elements of negotiation that were previously submitted.

As shown in Figure 5, while the professional is identifying risks (threats and opportunities), he is invited to point out the negotiation elements that can be impacted by that risk. Moreover, this module contains a preliminary list of about 500 risks from software projects domain that assist inexperienced negotiators to manage them.

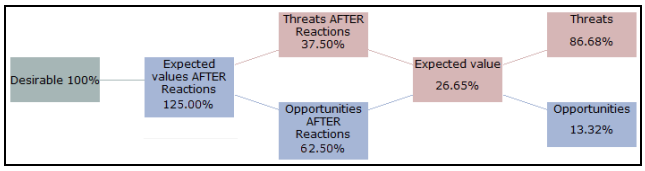
Figure 5 – Risk Management



The risk management module provides a wide range of features. Figure 5 shows that there is a workflow involving several steps, such as Negotiation Date, Setup, Risks Identification, Post-Risks Appraisal, Reactions and Post-Reactions Appraisal. Some graphics are generated from the

manipulation of these steps, as the Expected Value Graph, presented in Figure 6.

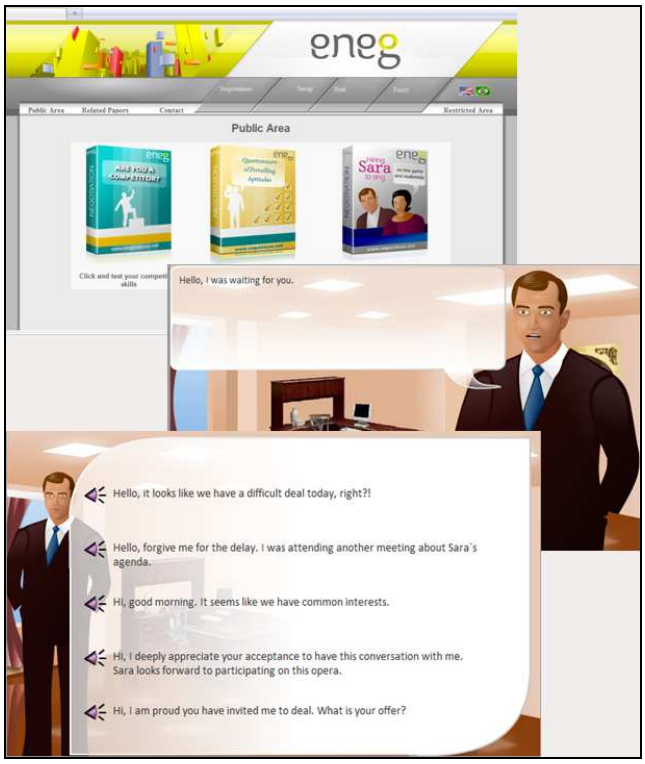
Figure 6 – Expected Value Graph



The chart shows, from right to left, the threats and opportunities perception evolution due to the identified risks. As soon as the risks are handled, the threats are mitigated and the opportunities increase, which may create perspectives above the initial desire.

The computational environment also provides mechanisms to increase IT professionals` negotiation skills. For this e-learning tools have been developed with a focus on the IT context, e.g., trading games, quizzes and psychological tests. Figure 7 presents an interface of a game based on a software project negotiation.

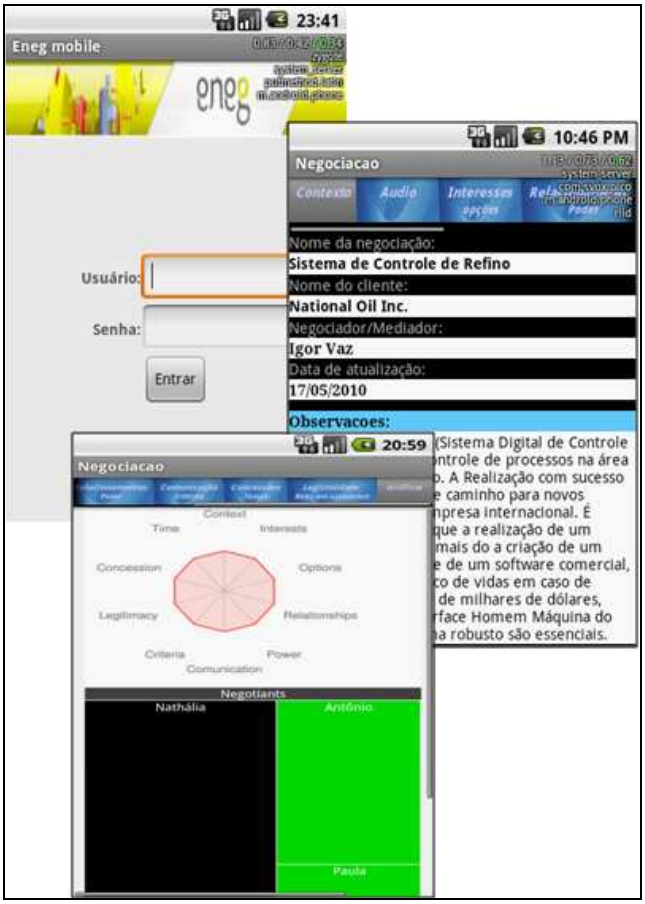
Figure 7 – E-learning tools



The e-learning infrastructure aimed at indicating to the IT professional that negotiating skills can be improved.

More sophisticated platforms have been developed to support experienced negotiators, which require agility and the most current information that can be possible to get. Based on these requirements, a new mobile platform has been developed which lets users manage the data registered in the negotiation. This platform is integrated into knowledge management Modules and risk management. Figure 8 shows few examples of negotiation management interfaces through the mobile platform.

Figure 8 – Mobile Interfaces



4 Conclusions and Essential Results

This work sought to show how decision supporting tools, specially, the negotiation account supporting tools can aid negotiations in IT domain.

The comparison table shows that the researched tools miss mechanisms that run specifically inside IT context. Thus, an environment that involves innovative technologies to address this gap has been proposed.

The environment presented has been developed for 4 years and many simulations were handled with students, researchers and professionals. Currently, there are about 15 real projects supported by this system, which corresponds to about 10 million dollars and 32 it managers. It is estimated that the continued usage of the tools of preparation and follow-up have increased almost 20% on opportunities,

through the identification of risks and obtaining concessions that were seen in previous negotiations.

The ongoing improvements focus on more extensions for the mobile platforms, creation of models based on fuzzy cognitive maps and OLAP reports generation of negotiations involving the same customer

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The New Field of Network Politics

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Abstract: *This research paper defines a new field called network politics. Network politics refers to politics and networks. These networks include the Internet, private networks, cellular networks, telephone networks, radio networks, television networks, etc. Network politics includes the applications of networks to enable one or more individuals or organizations to engage in political communication. Furthermore, network politics includes political regulation of networks. Finally, network politics includes the accompanying issues that arise when networks are used for political communication or when there is political regulation of networks. The domain of network politics includes, but is not limited to, e-politics* (*social networking for driving revolutions and organizing protests, online petitions, political blogs and vlogs, whistleblower Web sites, online campaigning, e-participation, virtual town halls, e-voting, Internet freedom, access to information, net neutrality, etc.*) *and applications of other networks in politics* (*robocalling, text messaging, TV broadcasting, etc.*). *The definition of this field should significantly increase the pace of research and development in this important field.*

Keywords: politics, networks, e-politics, e-voting, Internet, Web

1 Introduction

In this research paper, the authors define a new field that they are initiating called *network politics.* Information technology and communication networks have caused many changes in the realm of politics. The newest communication network to have a great impact on politics is the Internet. Recent revolutions in many countries in the Middle East and North Africa have started in large part due to social networking Web sites like Facebook and Twitter. The whistleblower Web site Wikileaks has had a tremendous impact in exposing government corruption. Politicians and candidates use their own Web sites and social networking profiles to get their message out. The mainstream media no longer has a monopoly on political commentary as anybody can set up a blog or post an article or video online. Political activists can network together online. Voting is often done using electronic voting machines, which has created many problems. In the future, voting will likely be done over the Internet, but there are many issues that need to be worked out. Internet freedom and network freedom are important issues that have many facets.

2 Network Politics

The authors have coined the term *network politics*, which refers to politics and networks. These networks include the Internet, private networks, cellular networks, telephone networks, radio networks, television networks, etc. Network politics includes applications of networks to enable one or more individuals or organizations to engage in political communication including expression, organization, or voting. Furthermore, network politics includes political regulation of networks. Finally, network politics includes the accompanying issues that arise when networks are used for political communication or when there is political regulation of networks.

The term *e-politics* [1] just refers to politics and the Internet. Therefore, e-politics is a subset of network politics.

The term *e-government* [2, 3] refers to the use of information and communication technologies in government operations, access to government data, interactions between government agencies, interactions between government and citizens, and interactions between government and external organizations. Only those e-government applications in the realm of politics, such as e-voting, are in the domain of network politics.

The domain of network politics includes, but is not limited to, e-politics (social networking for driving revolutions, social networking for organizing protests, online petitions, online political videos, political blogs, political vlogs, whistleblower Web sites, online campaigning, e-participation, virtual town halls, e-voting, Internet freedom, access to information, net neutrality, etc.) and the applications of other networks in politics (robocalling, text messaging, TV broadcasting, etc.).

A network politics layman activity could be posting a political blog entry, starting an online petition, or holding a virtual town hall, all of which can use existing software tools. A network politics research and development activity could be studying the characteristics of political bloggers, developing new software tools for organizing political activists, or

developing a tool for candidates to alert voters by text message when a candidate will be giving a speech in their particular geographical area.

One of the most exciting recent developments in network politics occurred in the recent Libyan Revolution against the dictatorship of Col. Moammar Gaddafi. To prevent rebel fighters from communicating, Gaddafi cut off their telephone and Internet service. Mr. Ousama Abushagur and his team of engineers hived off part of the Libyan cellular phone network and rewired it to run independently of the regime's control, so rebel fighters are able to communicate with cellular phones again. The efforts of Abushagur and his team are described more fully in [4].

3 Scope of Network Politics Research and Development

The scope of research and development in the field of network politics includes applications of networks to enable one or more individuals or organizations to engage in political communication, political regulation of networks, as well as the accompanying issues that occur as a result of the preceding. More specifically, the scope of research and development in the field of network politics includes, but is not limited to, the following:

Political Revolutions, Political Protests, and Citizen Activism in the Information Age
- role of social networking in political revolutions
- role of social networking in political protests
- online petitions
- political blogs
- online political videos
- political vlogs
- case studies

Whistleblowing in the Information Age
- Wikileaks
- whistleblower Web sites
- transparency
- advantages and disadvantages of transparency
- whistleblowing
- whistleblower protection
- whistleblower prosecution
- whistleblower persecution
- lawsuits against whistleblowers
- case studies

Political Campaigns in the Information Age
- online campaigning
- online campaigning using social networking
- online campaigning using multimedia tools
- political activism on the Internet
- political debates on the Internet
- e-participation
- virtual town hall
- robocalling
- text messaging
- case studies

Network Political Media in the Information Age
- political coverage on television
- political coverage on radio
- political coverage on the Internet
- case studies

Voting in the Information Age
- e-voting
- remote e-voting over Internet
- remote e-voting over telephones
- e-voting advantages and risks
- electronic voting theft
- stolen elections
- electronic instant results voting (IRV)
- case studies

Network Freedom
- global access to information
- equal access to information
- government restriction on access to Web sites
- freedom to connect on the Internet
- freedom to organize on the Internet
- net neutrality
- privacy issues in the information age
- right to privacy on the Internet
- citizen surveillance on the Internet
- warrantless wiretapping
- freedom of expression in the information age
- free speech in the information age
- Internet censorship
- freedom of religion on the Internet
- domain name seizures without due process
- disability accommodation in technology usage
- telephone access in prisons
- Internet access in prisons
- case studies

4 Conclusion

The definition of the new field of network politics will greatly increase the pace of research and development in this extremely important field. Recent events have demonstrated how important this field is. These recent events include recent revolutions in the Middle East and North Africa that were in large part organized using social networking tools such as Facebook and Twitter, the recent role of whistleblower Web site Wikileaks in exposing government corruption throughout the world, the ever-increasing role of the Internet in political campaigns and political activism, the extreme importance of preventing stolen elections using electronic voting methods, and the ever-increasing importance of Internet freedom issues such as net neutrality and government restrictions on access to Web sites.

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TELA: Towards Environmental Learning Arabic

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Abstract - *If language learning assisted by computer (CALL) has in recent years real progress thanks to the evolution of computer technology, it is nevertheless dependent on the reductionist view of language by those same technologies. Based on resources from the Language Processing (NLP), the project TELA attempts to provide new avenues for the CALL. This system is innovative, based partly on NLP tools and secondly on the use of ICT (information technology and communication for teaching). The description of the various stages of developing a complete system is presented in a detailed and clear (make scripts, activities, interfaces, etc.).*

Keywords: Keywords NLP (Natural Language Processing); CALL (Computer-Assisted Language Learning); Arabic.

1 Introduction

By its morphological, syntactic, phonetic and phonological, language, Arabic is considered part of the difficult languages to grasp in the field of automatic processing of written and spoken languages.

In the case of Arabic writing, the search began around 1970, even before the problems of Arabic text editing were completely solved. Early studies focused primarily on lexicons. For ten years, the internationalization of the Web and the proliferation of media in Arabic, revealed a large number of Arabic NLP applications. The researchs has thus begun to tackle issues such as more varied syntax, machine translation, automatic indexing of documents, information research, etc.

The couple's remarkable developments language teaching / computers are less constrained by the reductionist approach of language by computers [1]. Indeed, the computer deals only with the form, a word, phrase, a sentence ... are seen as mere sequences of characters on which it is possible to operate, for
Example, comparaison of the counts but not the levels lexical, morphs syntactic or semantic. This inability to take into account intrinsic a property of the language is strongly limited the possibilities of systems of CALL and, more generally, the use of computer technology in learning languages [2]. The project TELA purpose of this article, based on technology from the NLP (Natural language processing), is an attempt to answer some of these blockages. To clear these problems, we propose in this article, focus on First report on the current language teacher with the CIS. In a second time, we will present the project TELA allowing a substantial change in this report [17].

But after more than two decades since the early work, the advanced research in the topic of CALL based on the NLP remains weak, due to two main factors: the lack of NLP from language didactic psychoanalysts or computer scientists, and the cost of resources and products of natural language processing. For this there are only a limited number of prototypes and experimental systems for the Latin languages [3], [4], [5] and [6]. The CALL work based on NLP for the Arabic language is practically not existed, in despite of a rich literature on the automatic processing of Arabic. In addition to factors mentioned above, the deficiency of the Arabic language in this area is due to that Arabic is a language difficult to treat automatically [7], [8].

Under this situation, and willing to enrich the possibilities for creating educational activities for Arabic we have: As a first step, developed a labelled dictionary of Arabic (as complete as possible), a derivative, a Conjugator and a morphological analyzer of Arabic words [9], [10] and [11]. In a second step, we used these tools to create a number of educational applications for Arabic learning as a foreign language for French learners by using our system TELA [12].

2 Computing environments for human learning (TEL)

Computing environments for human learning (TEL) are used in many fields, such as driving, firefighter training and for learning languages.
Products Computer Assisted Language Learning (CALL) are mainly interested in exercises with various objectives in different forms. Indeed, the language learning computer-assisted calls the partnership between the various disciplines involved: teaching for "learning", the linguistic "languages" and the computer for "computer-assisted." Each domain brings its share in the development of the overall solution.

We limit ourselves in this work to technology development activities for teaching the Arabic language.

We will focus in this report on the appearance CALL for learning the Arabic language since after more than two decades of the beginning of the work, the progress of research in this area (that is to say using NLP in CALL) is insufficient, due mainly to two factors: ignorance of the TAL from the didactics of languages, or computer scientists, and the cost of resources and products of automatic processing of language. Why there is a number of prototype or experimental systems for the Latin languages. The works of CALL-based NLP for the Arabic language are virtually non-existent, despite a rich literature on the automatic processing of Arabic. In addition to the factors mentioned later, the deficiency in this area on the Arabic language is because it is a difficult language to process automatically.

3 Learning of Computer Assisted Language (CALL)

The products are mainly interested in CALL exercises with different objectives and different forms. Indeed, the language learning computer-assisted calls the partnership between the various disciplines involved: teaching for "learning", the linguistic "languages"and the computer for "computer-assisted. " Each domain brings its share in the development of the overall solution.

Viewpoint goals, a good product should allow CALL natural language, select the result of what must be taught to use the errors of the learner and improve teaching strategies and try adapt to the learner. Point of view forms, [13] classified the products into six categories CALL support functions (DVD / Web), method of use (training with a teacher, etc.) age of learners, etc.
We limit ourselves in this work to technology development activities for teaching the Arabic language.

4 CALL and the Arabic language

Arabic is spoken by 422 million citizens of the 22 Arab countries. This is the official language in many African countries: Senegal, Mali, and Tchad. This is one of the six official UN languages. She has been the vehicle for the transmission of Greek heritage in the west.

After more than two decades since the work began, the progress of research in this area (that is to say use of NLP in CALL) is still insufficient, due mainly to two factors: ignorance on the part of the NLP didactics of language or computer scientists, and the cost of resources and products of automatic processing of language. That‘s why there is a number of prototype or experimental systems for the Latin languages. The works of CALL-based NLP for the Arabic language are virtually non-existent, despite a rich literature on the automatic processing of Arabic. In addition to the factors mentioned later, the deficiency in this area on the Arabic language is because it is a difficult language to automatically process and it is a language of the third world: first it must wait technology transfer, on the other hand it has begun to be important for the West after the September 11 attacks in the USA.

There are some applications for learning Arabic on the net (eg Learn Arabic online). These applications do not come automatically and present several disadvantages, including:

- Interfaces poorly made or existing: very limited interactivity, learners can not respond directly to the interface.
- Lack of instructional tasks: the learner can select any level and any exercise without assistance and without any learning goal.
- Limiting numbers of students involved: the exercises are usually in Arabic, making them usable by Arabic speakers (but rarely ever for English for French speakers).
- Lack of feedback: no automatic fix, or help when needed.

All this has prompted us to move towards the learning environment of the Arabic language. Subsequently develop an overview of our system in more detail we will rigorously determine the objectives for which this work was performed. Then we will define an architecture leads not only to understand the different parties of the system but also the relationship between them. To subsequently review, a more detailed features of different components.

5 The Project TELA

5.1 The aims of the project

The project TELA lead to the creation of a CALL system for Arabic, based on NLP tools, hypermedia and complete, containing courses, NLP tools and many exercises. This system will be partially modified so that teachers can add their own sets of exercises. The system will use as efficiently as possible all the NLP tools available for the tutorials as for the exercises. It will operate on two different platforms with the same features: on the Internet for distance learning and on individual PCs for use in an enclosed environment [19].

The project is to develop a platform in Java NLP, configurable for the exchange of knowledge. The platform must be extensible and scalable. This allows easy operation

by all the user-teacher. The first goal of this project and allow all people, register and enjoy the wind system, a successful intervention in a specialized teaching to learning Arabic. Infrastructure for sharing knowledge will be organized around the Internet / Intranet servers. They will be dedicated to the reuse of knowledge or in-house systems or subsystems of receiving external teachers. This project will therefore focus on defining and developing such a platform emphasizing the aspect "configurable" by fiscal year (multiple choice, sentence holes, crosswords, etc.). The classic approach to creating applications is to use CALL databases (relational) to create and manage these applications. We propose to replace this approach with an innovative vision is to encapsulate the data stored in a SQL database with a layer of XML structuring and interpreting the data. By the nature of XML allows the desired configurability and serves to support a wide range of Java command filling the needs of users.

Moreover, these CALL applications are resident on servers, Internet / Intranet using Java will allow inheriting all the communication facilities Internet/Intranet ensuring seamless interoperability.

This new vision will dramatically extend the flexibility and power of these CALL applications and services that can be expected (knowledge sharing, data exchange, etc).

5.2 Description of functional TELA:

5.2.1 System Architecture

After identifying the inherent limitations of CALL tools without NLP components, we describe the general frame work of our project: It is a configurable platform for the exchange of knowledge. This platform is organized into four distinct layers and successive functions scripts, scenarios and activities. This architecture allows the implementation of NLP conventional functions with in scripts, which makes design, without computer skills prior to teaching activities, with them elves eventually integrated into more complex sequences or scenarios.

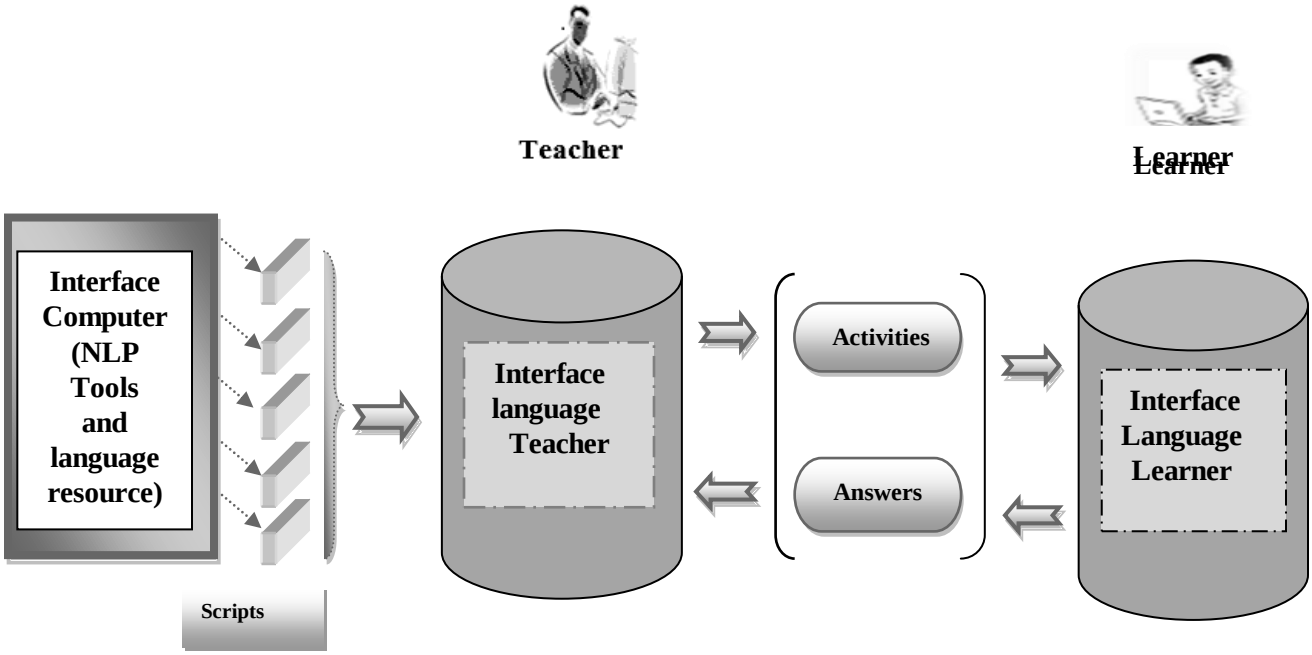

Fig.1. System Architecture

5.2.2 The interface:

Computer interface: Its importance's script is reflected by an update always possible NLP tools and language resources on all scripts.

Fig.2. Arabic learning environment

Interface teacher:

Among the interests of this system is that it requires no computer knowledge to allow a teacher. To use this interface is simple and easy to master. Access to the scripts their teacher can present activities to learners. These can contain errors that can be corrected by the intervention of the teacher interface. In fact, the parameters of activities are to encourage their users. Based on the principale that a teacher is not a computer expert in NLP it will be difficult to use these parameters and he prefers not to be formalities better and satisfactory. Aside from the development of appropriate interfaces, such an approach demands banish any specialized term of setting activities and to use that terms that have direct meaning for teachers of languages, terms from their problems and in a accordance with their skills.

Interface learner:

A student connects with the system as a visitor for the first time then he uses several methods cited on line for instance a research engine would be prompted to create an account register by filling a set of personal information according to their natures and they may be compulsory or primarily as a login or a password that will be used later on to record the answers. After being registered in the site, they become members. The advantage of this system is that the student will be able to choose the level of difficulties and answer question activities: Each student can choose learning activities or assessment tests corresponding to his or her level, a manual help is available in case of need.

Fig.3. Example of Interface learner

5.2.3 Scripts:

Script is special components that enable the teacher's language for the representation of the activity. It use on line model that integrates resources and TAL treatment by setting an automatic generation activity for example grammar exercise.

This step takes into account theexpectation of specific d esired objective and hope needs. The creation's script requires computer and NLP skills. All these information's are going to be treated by our group. While NLP tools will be expired by other work available. The script are numerous that's why we are obliged to characterize each one of them by suggesting identifying farms outside the system.

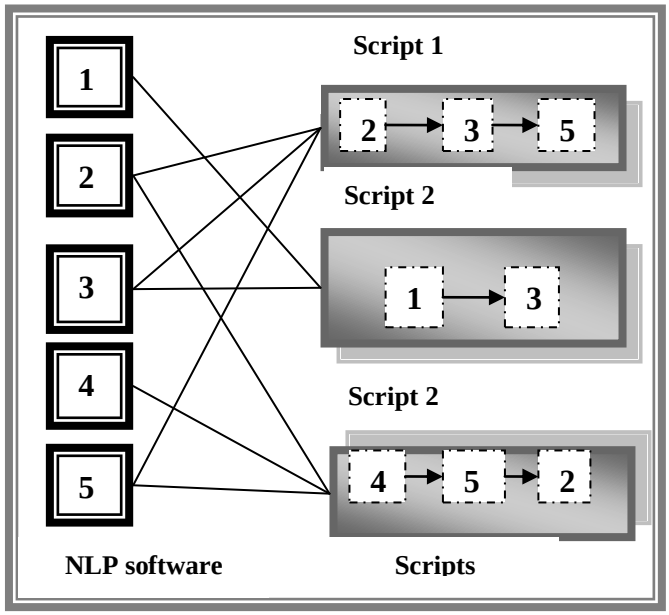

Fig.4. Scripting

5.2.4 Activity:

The activity is a specific component empowering to be used by the learner. That leads teachers to make the design activities .It is the exercises direct worm learners of languages that lead to testing the level of learner. Our system is a platform of communication between teacher and learner. Its work involves several steps:

- We all have a first script chosen from a pool available. The teacher cares the [18] rafters by setting script parameter accessible so simplified.
- Finally the teacher presents the instructions of the activity and whether or not it is possible to have an automatic evaluation.

The effectiveness of the system is explained by the fact that a script can result in a huge number of activities increase the performance and efficiency.

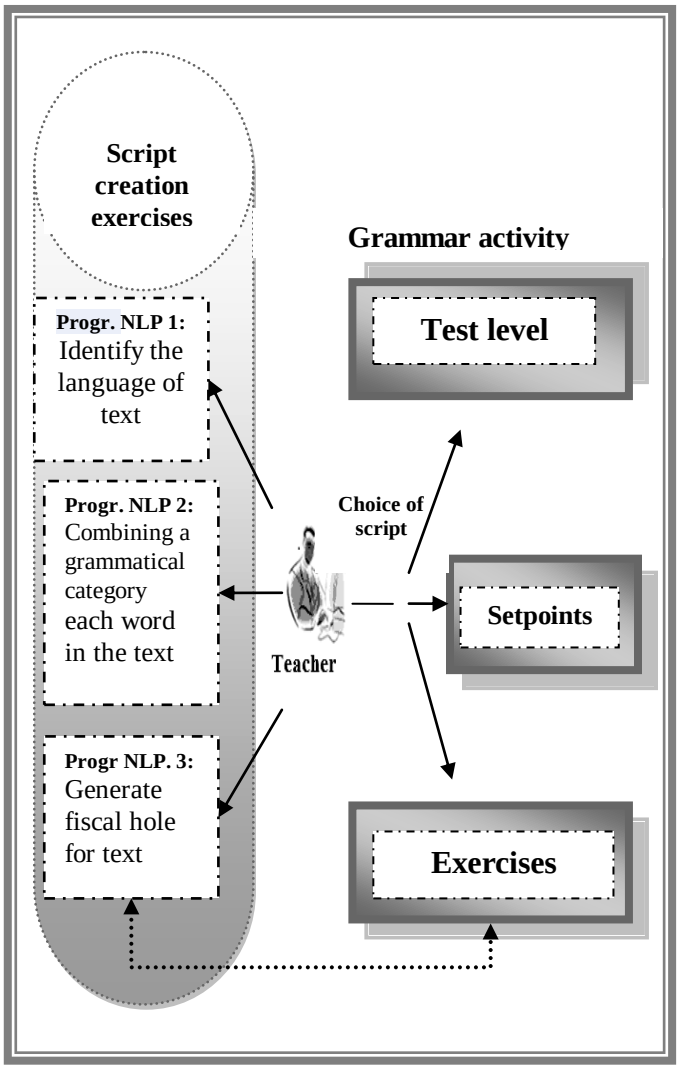

Fig.5. Design activity

6. Examples of activities

We have designed about twenty activities that continuously changes with each call, eliminating the cases dealt with later. Most modules contain the activities of aid that are available after a certain time given to the learner. This aid is in the form of cues depends on the activity such as the length of the word and the first letters, so as to guide the learner towards the correct solution. The following example (see the figure below) represents an analysis of words, the application chosen at random a word of Arabic, using the random function, from the dictionary. The learner must make the choice of pattern for this word in a list box, enter the root and see if his answer is correct or not. This interface is used to assess learner knowledge

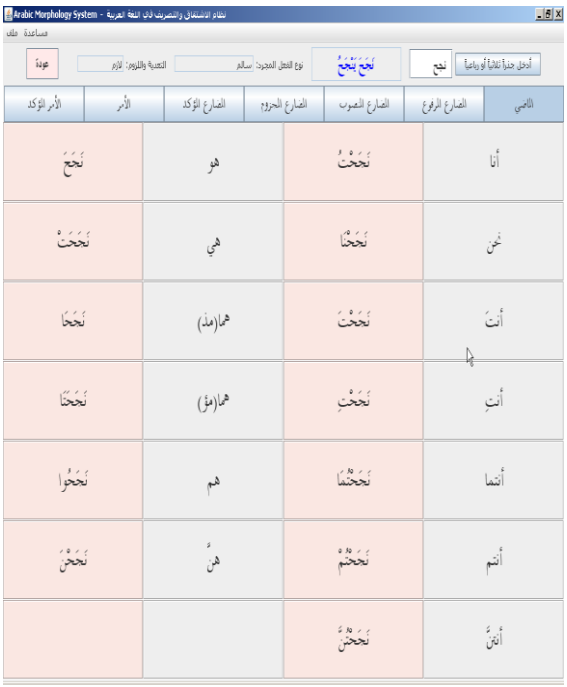

Fig.6. Example of activity

The result reflects the activities of partially correct answers with the diagnosis according to adapt responses from the learner. Indeed, a response is not always completely false and can be broken down into several components, some of which are proven correct [20].

7. Curent state of and prospects TELA

The development of TELA began a few months ago. We believe, now, that depending on how the project, three years in total, are necessary for the completion of the first version

of the prototype. A period of ownership by language teachers is expected. The deployment of TELA will in a first phase in intranet deployment in the Internet poses legal problems that have not yet found a solution.

The development so far has mainly concerned the creation module scripts. Its completion has enabled the integration of a number of NLP software (not NLP). Other software, including NLP, must be integrated. The choice of the number and nature of embedded software to run can not be done in a process of exchanges between language teachers and specialists in NLP. For now, embedded software have created a sufficient number of scripts, in our opinion, experimental use of TELA.

The goal of our project was to design and implement a system for Arabic CALL with the objective analysis and evaluation of automatic teaching learner responses using the tools and techniques offered by the NLP.

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SESSION

E-LEARNING + E-COMMERCE + HEALTH INFORMATICS + BANKING SYSTEMS + IR + BUSINESS, MARKETING, AND ENTERPRISE APPLICATIONS + METHODS FOR SOCIAL MEDIA AND RISK MANAGEMENT

Chair(s)

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Moving toward e-learning: a preliminary study at Hellenic American University

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Abstract – *This paper discusses a study undertaken at Hellenic American University in light of the University's efforts to move toward e-learning. The study examines students' background knowledge in computer usage, their level of familiarity with current e-learning technologies and platforms, with emphasis mainly on Blackboard and Moodle, and their attitude towards using these two platforms to attend a course completely online.*

Keywords: E-learning, Distance learning, Computer literacy, E-learning platforms, Online learning

1 Introduction

Online education has been growing significantly in the past few years especially in higher education. Researchers attempt to determine whether learners and language instructors are computer literate enough to cope with the demands of online learning, how ready they are to learn and teach through an online environment as well as which is the most effective e-learning platform. The development of new, more intuitive and easier to access online technologies and e-learning environments along with the increasing student and instructor use of collaborative tools in their personal lives offer more opportunities for interaction, collaboration and communication leading to effective learning and teaching.

2 Purpose

The purpose of the preliminary study is to use current students in the Language and Communication course [MAAL program] to investigate their background knowledge in computer usage, their level of familiarity with current e-learning technologies and platforms, with emphasis mainly on Blackboard and Moodle, and their attitude towards using these two platforms to attend and/or teach a course completely online. An equally important element of the study is also to record the students' perceptions of and attitude towards the Blackboard and Moodle platforms.

Considering some of the benefits that new technologies bring into higher education, Hellenic American University is investigating the possibility to introduce fully online courses and shift from the current Blackboard e-learning platform to Moodle. Discussion has also begun concerning the most efficient and appropriate methodological approach to learning and teaching online. A possible second phase of this study would also contribute to this discussion.

3 Literature Review

3.1 A need to prepare the ground for new online technologies

Significant research [Agostini et al, 2000, Anderson [ed], 2008; Dalhberg [2004]; Malhotra et al [2007]; Mulder et al, 2002; Petersen et al, 2008] has been undertaken concerning the integration of new online technologies, rich multimedia and collaborative learning tools. Researchers however seem to agree that these components alone are not sufficient to ensure that the human computer interaction established online is instructionally meaningful. Learning, as Martinez, 2000 supports, is a highly complex process, which depends on individual cognition as well as on the surrounding organizational factors. In this respect, the current study initiates a discussion concerning the needs and knowledge of specific students and their attitude towards a number of 'surrounding organizational factors' which may help instructors as well as the university be more prepared for learning in the 21st century. Where little pedagogical theory is applied [Hannum, 2001], which may be the case with online learning, and the integrated instructional intentions fail to be communicated clearly enough to the learners [Kerres, 2001 in Voigt, 2003: 1081] the learning outcome is seriously impeded. Therefore, a learning environment that promotes online human-computer interaction should place emphasis on the integration of learning objectives, learning situation – motivation, capacities, environmental support – and the form of instruction creating an active notion of community [Petersen et al, 2008]. A learning environment where computers ease personalization and learners are free to evoke instructional events – examples, feedback, etc – when they want and for as long as they want could be considered the first step to a successful merge of technology and students [Anderson et al, 2008].

Technology is relevant only if its usage adds real value to the learning process [Shneiderman, 2002]. The underlying concern is that simply putting technology at the learners' disposal would not provide sufficient feedback about the pedagogical relevance of the various technology-enhanced functionalities and applications [Stephanidis, 1997: 473-476; Shneiderman, 2002]. A carefully established and authentic

online human-computer interaction cannot always guarantee success [Dix et al, 2006]. However, this interaction is an important component of success in any e-learning effort. Learners see themselves as parts of teaching and feel that they are included and accepted in the development and application of what and how they are taught. This may well have a very positive and decisive impact on the overall acceptance of technology's crucial role in their learning efforts [Gulati, 2004]. This is why it so important that learners need to be part of any discussion that concerns the learning tools that could be available to them in the near and/or the distant future.

The old computing [Shneiderman, 1992: 13-26] was about "what computers could do; the new computing is about what users can do". The old computing was about mastering technology; the new computing should be about supporting human relationships and accelerating learning. The old computing was about formulating "query commands of databases"; the new computing is about "participating in knowledge communities". The new computing capitalizes on the shift from "machine-centered automation to user-centered services and tools". According to Shneiderman, 2002], in the modern context of fast technological expansion and innovation, successful technologies could only be those which are in harmony with the users' needs, and support relationships and activities that enrich the users' experience, and facilitate learning. Information and communication technologies and applications seem to be most appreciated when users experience a sense of security, mastery and accomplishment. It could be argued therefore, that it is only under these circumstances that these technologies enable users to relax, enjoy and explore [Shneiderman et al, 2000: 88-95; Shneiderman et al, 1998: 23-42; Preece et al, 2002]. It is important for a university and especially for instructors to know the degree to which students understand and are ready to accept 'new computing' before they are introduced to a fully online learning environment.

A number of researchers [Anderson et al, 2008; Solomon et al, 2007; Wenger, 1998; Wenger et al, 2002] also argue that a significant number of learners in the foreign language context seem rather frustrated and powerless and fail to see a role for themselves in the process of technological innovation. This attitude towards technology on the part of the learners could mobilize the educational community to challenge technology developers in order for the latter to focus on learner needs more diligently and eventually produce applications that are more effective [Hug et al, 2005; Ward, 2004]. The Web 2.0, a term used these days to indicate the shift to a new era of technological innovation, offers a completely new range of tools and functionalities like wikis, blogs, podcasts, videocasts and virtual spaces of social interaction. There is a growing and pressing need to investigate how this technology can be adapted to become integral component of a new concept in distance education that facilitates active and collaborative learning and brings down the barriers that the lack of physical contact may raise.

3.2 Learning Theories – A prelude to online learning theories

As early as in 1910 behaviorists [Pavlov, 1927 and Skinner, 1974] have claimed that learning is a change in observable behavior caused by external stimuli in the environment [Skinner, 1974]. This observable behavior is an indication whether the student has actually learnt anything. Some have moved beyond this stage claiming that we cannot be sure of learning unless we discover what is happening in a learner's mind and simply a change in the behavior is not enough. This has led to the rise of theories of cognitive psychology [Craik et al, 1972; Ausubel, 1974], which sees learning as an internal process. They claim that what is learnt depends on the processing capacity of the learner as well as of the effort put during the learning process, the learners' existing knowledge etc.

3.2.1 The theory behind e-learning platforms: Constructivism

The past few years there seems to be a trend towards constructivism in online education and e-learning platforms such as Moodle it is claimed that they have been designed based on the principles of constructivism [*see section 3.2.4.*] Constructivism claims that learners interpret information and the world based on their understanding of it, by observing it and by interpreting what happens around them [Cooper, 1993; Wilson, 1997]. This information then they turn into personal knowledge which helps them to learn new things after they have contextualizing them and by putting them into practice and implementation. The introduction of the constructivist approach [Doolittle, 1999; Gulati, 2004; Salmon, 2000] in on line learning environments has brought along concepts that have been familiar so far but viewed under the perspective that the lack of physical presence seems to have imposed. As Doolittle [1999, 1] argues, in constructivism, knowledge is "not passively accumulated, but….[it] is the result of active cognizing by the individual". In other words, it seems that constructivism acknowledges the learners' active role in the development and creation of knowledge, and the realization that the "the knowledge created will vary in its degree of validity as an accurate representation of reality".

3.2.2 The theory behind e-learning platforms: Connectivism

A more recent theory in online learning is that of Connectivism, which integrates principles explored by networks and self-organization [Downes, 2006; Siemens, 2004]. Because of the huge influx of information from different sources and directions, they argue that learning is not always under the control of the learner. Under this perspective, the new learning is determined by others and keeps changing. Connectivists argue that information and procedures may become obsolete because of the rapid changes in technology. This means that students or those involved in distance learning must unlearn old information and old models of learning and adapt to the new environments

keeping in mind always that even these will change. This surplus of information must also make stakeholders more selective in order to tell the useful from the trivial which presupposes that all are active learners in the network of learning. Taking into account the fact that computers become more and more intelligent one may have to explore further the impact of human-computer-interaction on distance learning.

Globalization has made information not location-specific and this means that many contribute a lot from different backgrounds without sharing the same experiences. Therefore, learning cannot be absorbed by one source but instead should be compiled by accessing different media and sources from a variety of places and types of thinking [Siemens, 2004 in Andersen [ed] 2008, 34- 36]. Following this approach, online learning must be designed to deliver content and knowledge promoting experiential and authentic learning. Andersen argues that technology offers the chance to use a global classroom inviting and joining experts and stakeholders from all over the world in an effort to continually update knowledge and expand exposure to new things.

This also means that learning becomes in a way multidisciplinary. For example, a language teacher who is involved in distance learning is also learning information that relates to information technology and applications and communication skills besides the ones necessary to teach in a traditional classroom. Connectivism in a way promotes not only the close cooperation among various experts when e-learning is designed but also encourages stakeholders to take action and move beyond the limits of their discipline and learn by experimentation from others becoming themselves knowledgeable in the new field. It is not enough for an English teacher to expect the technical staff to set up a class for them ready to teach, but instead they should take initiative to be personally involved in the making and why not become independent in the design without the need to refer constantly to others for help and support. Once this feeling permeates the teacher, it may encourage learners to become independent and explore for knowledge beyond what is already given to them. Such an attitude towards distance learning brings a challenge to educators to design instruction that allows for close interaction between computers and humans.

3.2.3 Pre-requisites for e-learning

Since constructivism and Connectivism are theories of "knowledge acquisition, not a theory of pedagogy*"* [Doolittle, 1999: 7] it could be argued that the connection to online learning could be tentative. However, researchers like Rachovides et al, 2007 claim, that when certain factors exist it could be argued that these theories could relate to the milieu of online learning.

The *first* factor has to do with the need for learning to take place in authentic and real life environments. Technology seems to offer this perspective since it is in a position to provide virtual environments that allow room for simulation and authenticity. The *second* factor involves social negotiation and mediation. To this end, online learning provides a variety of interaction and communication tools [both synchronous and asynchronous] that can be found and used independently or embedded in commercially available e-learning platforms and applications. The *third* factor has to do with the necessity for the learning material to be relevant to the learners. Online education constitutes a huge reservoir of data and information which can be tailor made either by the instructor or by the students themselves, addressing, each time, learning needs that arise.

A *fourth* important factor is the need for the e-content and skills taught, to be understood within the framework of the learner's prior, and background knowledge. Although it could be argued that this may be difficult to materialize in an online environment, the only fundamental prerequisite seems to be the continuous and systematic transaction between the user and the online environment established for this purpose. Such a transaction or interaction may help secure that students and teacher alike adjust their pace to get to know each other as learning evolves. The need for students to become more autonomous, self-aware and self-regulatory is another factor for successful engagement in the learning process. Although educating students to behave in an online environment is necessary, it could not be ignored, how comfortable young students feel these when they are called upon to operate in similar environments [e.g. on line communities like my space etc].

Although the role of the teacher as facilitator of learning is gradually becoming more acceptable in the context of the traditional classroom, this is the rule in distance education. A distance environment may be constructed in such a way as to effectively emphasize the role of the facilitator for the instructor at the same time when students engage in simulation and multi purpose and role activities. Finally, the teachers' attitude towards the new learning environment plays a significant role in the success or failure of the whole effort. Teachers are those who should provide for and encourage multiple perspectives and representations of content so that they manage to hold their virtual class together despite the lack of "traditional" conduct and communication. The more diverse the learning population, the more challenging the task for the teachers to offer themselves and their students the possibility of true learning using the tools that technology has made available to them.

3.2.4 A discussion on Blackboard and Moodle

An interesting paper presented by Dave Bremer and Reuben Bryant in 2004 makes a comparative analysis of the Blackboard and Moodle e-learning platforms focusing on a number of key features and characteristics. The two researchers designed a course to operate exclusively on Moodle using students with prior experience and exposure to Blackboard. Although the course itself was primarily on-site, Moodle was used as a vehicle to provide students with "…external access to various resources [handouts, links, and software] as a forum for asynchronous discussion of various

topics."[p.135]. The purpose of the researchers was to identify whether and to what extent Moodle constituted a viable alternative to the established Blackboard learning platform already used by their university.

Overall, it seems that the researchers agree that opting for open source software may offer flexibility as far as development is concerned, but development and maintenance costs seem to be rather high. Their results show that Moodle was more straightforward and easier to handle to the average instructor emphasizing a number of features such the ability "…to move files between collection groupings…" [p.137], or the ability to "…hide or show items by clicking on an icon, rather than entering a whole configuration page via a control panel…" [p.137]. Bremer and Bryant also emphasized that Moodle is closer to the constructivist philosophy model since this is being designed into the application, "…rather than as an afterthought…" as it is the case [so they claimed] with the Blackboard e-learning platform.

Blackboard and Moodle are the two e-learning platforms presented in my study and the simulation/workshop session held with my students used elements from Bremer's and Bryant's research to investigate the participants' initial reactions towards them.

4 Research Questions

I investigated our students' knowledge of and attitude towards technology and online learning and at the same time exposed them to the tools and characteristics of two e-learning applications [Blackboard and nd Moodle] that may promote interaction and communication during distant delivery. In an effort to design and develop a vigorous distance course in the near future, the following research questions have helped me lay the basis for this preliminary research.

1. What is the students' general computer literacy level?
2. How do the students feel about computers?
3. Are the students familiar with any e-learning platforms and the opportunities for collaboration and interaction that these platforms may provide?
4. What is the students' attitude towards online learning?
5. How willing would the students be to attend/teach a course completely in online mode?
6. What is their attitude towards two e-learning platforms [Blackboard and Moodle]?

5 Participants

I have used students in the MAAL program that attend, or, have attended the *Language and Communication* course. The main reasons for selecting these students have been the following:
1] I personally teach the Language and Communication course and I am familiar with its content.
2] The fact that I teach this course has allowed me to design a fully online version of it and present it to the participants in the framework of this study.
3] It has been easier for me to convince my former students to spend some extra time to participate in this study.
The Language and Communication course is a prerequisite in the current structure of the MAAL program and consists of two major components, the *writing component* and the *communication component*.

The *writing component* of this course is designed to provide students with the necessary skills for reading, evaluating, and successfully presenting academic research in a variety of written formats. The *communication component* of the course is designed to provide students with the necessary skills for speaking and presenting before an audience. Students are taught to communicate their thoughts, ideas, and information to others through effective presentation, and to become good listeners in their own academic and/or professional environment. For the communication component of the course, selected student presentations are videotaped for discussion and analysis. The course meets once a week for a period of 12 weeks in a three-hour [3] session. This particular course, as is the case with all Hellenic American University courses, is offered in the traditional mode and not online. It is a general university policy however, that all courses should have some kind of 'presence' in blackboard. Practically, this means that most instructors simply upload material [mostly ppts], post announcements and collect assignments. Furthermore, MAAL program instructors who teach this course simply use a regular class with no hi-tech infrastructure or any other computer applications but a laptop connected to a projector and to the internet.

The majority of the students who attend this course have a teaching background, although their experience varies among them. Most of them teach in private English language schools [frontisteria] in Athens and Attiki in general. The vast majority of the students are female, and their age ranges from 23 to 40. Eleven students [11] accepted to participate in the first part of the study filling out the questionnaire distributed to them. All students have completed the Language and Communication course offered in the Master of Applied Linguistics program of Hellenic American University. The four age groups described in the questionnaire [see Appendix 1] are represented in this study. The first age group ranges from 23-26 and consists of four students [36.3%]. The second age group ranges from 27-30 and it is represented by one student [9%]. The third age group ranges from 31-34 and this is represented by two students [18.2%]. The fourth age group ranging from 35 and above consists of four students [36.3%].

6 Research Ethics

Participants were informed at a brief 10-minute session during their class time that they were asked to participate in a mini study. They were told that they would have to fill in a questionnaire and join a workshop/simulation discussion session. Further, they were informed that their responses to the questionnaire and their participation and contribution to the workshops would help design a distance-learning program that will facilitate individualized and group learning and will encourage active student involvement in the learning process.

Participants were assured that all individual information gathered in this study would remain confidential and anonymous and the data collected would not be disclosed to any third party. The questionnaire collected by the participants as well as their contribution during the workshop/simulation discussion would be anonymous.

Finally, it was pointed to them that involvement in this study is voluntary and the decision to withdraw from the study at any time would have no adverse impact on the students' grade and on their eligibility for future services provided by the University. All students agreed to participate in this study and filled out a written consent form agreeing to filling out the questionnaire and to participating and being audio recorded during the simulation/workshop discussion.

7 Methodology

For the purposes of this study, I elicited reports and opinions from students both quantitatively and qualitatively. The study took place at Hellenic American University and began in the spring term of 2010. The idea was first to use a closed questionnaire to elicit information to answer research questions 1, 2, 3 and 5. Fuchs [2009] in Oxford et al [2009: 31-51] has presented empirical findings from a similar survey study in German secondary schools. For the purposes of that study, a questionnaire was designed to record students' self-evaluation of their level of computer literacy. The questionnaire I compiled for my study reflects a few of the ideas and questions, although modified for my research group, which appear in Fuchs' questionnaire. Having to choose between a questionnaire where participants are called upon to self-evaluate their knowledge in computers and an actual computer placement test, I selected the first. Personally, I am not convinced that computer placement tests can reveal the practical knowledge and computer skills of a user since grading is based on whether test takers follow specific procedures before completing an action on a computer. This means that, for instance, a user may practically know how to edit a text using Word but if they do not follow certain steps, they lose points. In my opinion, a self-evaluation allows users to focus only on the way they perceive their computer skills in relation to the successful completion of a number of actions such as the ones described in the questionnaire in Appendix 1.

In the questionnaire, I further attempted to explore the participants' attitude towards interaction and communication in relation to specific tools of the two e-learning applications. Then, in order to deal adequately with research questions 4, 5 and 6, I offered students during their class hours, one short, hands-on workshop/simulation on the use of the selected e-learning platforms in order to familiarize them with the distant mode of content delivery, communication and interaction. At this stage, students were exposed to the main features of the Blackboard and Moodle e-learning platforms.

I also used this workshop/simulation to discuss the students' attitude towards an online learning course. Due to participants' lack of time, the workshop lasted for 60 minutes instead of two 40-minute sessions that I had originally planned. The session was audio taped as an extra tool to help with my note taking [see Appendix 3]. The session started by presenting in detail the Language and Communication course being set-up by me on two different e-learning platforms; Blackboard and Moodle. Despite my attempts to offer the simulation/workshop I had planned a week after the completion of the questionnaire, it took me three weeks to gather the participants and find time to go through and discuss the two platforms. Nine students participated in this second stage of the research.

7.1 Instruments and Procedures

7.1.1 Instrument 1- The Questionnaire

For the purposes of the study, I designed a questionnaire and distributed it to the students upon the second week of their course. The reason for distributing the questionnaire during the second week of the course was to give them some time to adjust to their classes and freshen up their memory, after the Easter break, concerning the use of the blackboard e-learning platform. Although blackboard is not used by all MAAL instructors extensively, it is a requirement by the university that all MAAL courses should have some kind of 'presence' in blackboard. In most cases, this presence is limited to the posting of announcements, the uploading of PowerPoint presentations and notes, and links to external resources and readings [*see section 5*]. Therefore, I do not expect students to understand the concept of an e-learning platform in its entirety, but I believe it would help them answer the questionnaire in a more intuitive manner. The purpose of the questionnaire was to help me look for an answer to research questions 1, 2 and 3 [*see section 4*].

7.1.2 Instrument 2- The simulation / workshop session

As mentioned, I met with the students as a group once during their regular class session [1]to discuss their experiences

[1] Originally, I had planned to run two forty-minute sessions to be scheduled at a time different from their class hours, but due to students' heavy schedule, it did not work out.

and reactions from the simulated use of the two e-learning platforms, Blackboard and Moodle. These two sessions were also audio-recorded to help me in my note taking. This workshop/simulation focused on characteristics and specifications of the two e-learning platforms. Posea et al [2009, 67] in their research concerning the evaluation of e-learning programs place emphasis on the need to collect feedback from students concerning their expectations from an e-learning platform before they are actually exposed to such one. In their article they also refer to Hall's evaluation criteria of e-learning systems [Hall, 2007] and which have to do with "…content, instructional design, interactivity, navigation… use of media… and aesthetics" [Hall, 2007 in Posea et al, 2009: 67]. I have decided to focus on a number of those criteria during the workshop/simulation as I feel that it can be very important in determining the degree of receptivity of an e-learning application on the part of the students. In their research, Posea et al also emphasize the significance of having students use and try themselves the various tools in an e-learning platform [68]. I expected the workshop to provide students with an opportunity to ask clarification questions and even discuss amongst themselves a comparison between the platform they currently use [i.e. Blackboard] and a completely new one with a different approach to e-learning and distance education [Moodle]. During the workshop/simulation, students first had the opportunity to watch a brief tour of the tools available in each platform and then experiment with the e-learning applications themselves. The presentation and the discussion were audio-recorded.

At the workshop, students were divided in pairs or small groups and under my supervision and support tried out the communication and interaction tools using real material from their course. The idea was to reproduce, or rather simulate, with the students the actual 'learning environment' they would have been exposed to had they decided to participate in the course via distance mode. During the workshop/simulation, students were shown the kinds of skills that are important when operating in such an environment which would allow and encourage them for systematic cooperation, active interaction and involvement in the learning process. This workshop/simulation was meant to offer students the chance to get a closer look to a learning and teaching process, which is growing in popularity and be prepared as both students and teachers to learn and benefit from this experience.

8 Results – The Questionnaire

The questionnaire was distributed during their class session and students were given fifteen to twenty minutes to fill it in. At this stage, students were once again, informed briefly about the purpose of the research, and an effort was made to secure their participation in the workshop/simulation session to be held a couple of weeks after the completion of the questionnaire.

8.1. Part I- General Information Section – research question 5

Some of the primary aims of the questionnaire, related to research questions 1, 2 and 3 were to investigate whether and to what extent the participants in this preliminary research have access to a computer and to the internet, their knowledge of computers and their willingness to attend and/or teach an online course. Judging from the results of the questionnaire analysis it is evident that all participants [100%] have access to a computer and to the internet regardless of their age groups. It is important to note that their attitude towards attending and/or teaching an online course is overall very positive. Nine [9] participants [81.8%] are in favour of attending a fully online course, and two [2] participants [18.2%] are reluctant to attend such a course.

Analysing the results shown on table 2 one can see that participants in the age group 23-26 with the exception of one are willing to attend a course online. The participant who represents the age group 27-30 is negative, while in groups 31-34 and 35 and above all participants are ready to attend such a course. It is interesting to note that participants belonging to the older age groups are more willing and prepared to expose themselves to a new type of learning in contrast to younger ages. Given the general impression that representatives of younger age are keener on new technologies, it is encouraging that older age groups are still determined to experiment and learn from their involvement in a distance learning experience. Even though, the number of participants is too small to draw generalizations and conclusions regarding age and willingness to attend a fully online course, I feel that it is still worth pointing it out. In the framework of a more extended future study, I feel this issue should be further explored.

The analysis shows that the results are slightly different as regards the participants' willingness to teach an online course. Eight [8] participants [72.7%] are willing to teach an online course whereas three [3] participants [27.3%] are reluctant to teach online. Concerning the age group 23-26 three participants out of four are positive in regards to the possibility of teaching a course online. In the age group 27-30 this participant is against the idea of teaching online. This is similar to his/her reaction concerning the possibility of attending an online course. All participants in the age group 31-34 are in favour of teaching online while one participant from the age group 35 and above is reluctant to teach online. A possible explanation for this differentiation is maybe the fact that this participant would feel more comfortable to gain some experience from being exposed to online learning before committing themselves to the actual teaching of an online course.

8.1.1. Part II – Knowledge in using computers – research question 1

One of the fundamental aims of this questionnaire was to record the participants' computer literacy [research question 1]. This section of the questionnaire addresses eight basic skills that participants need to record their level of knowledge starting from zero [non-existent] to three [very good]. It could

be argued that word processing [see Table 4] is a key skill in computer usage since it allows users to type their own documents. Seven participants [63.6%] claim to have very good knowledge of word processing, followed by three participants [27.3%] who claim that their knowledge is good. Still it is worth noting that one participant [9.1%] considers his/her word processing skill as basic [*see section 7*].

Document attachment [see Table 5] is considered a rather common action in today's computerized world. As expected, 8 participants [72.7%] are able to attach documents and three participants [27.3%] evaluate their skill as good. Saving documents [see Table 6] is also considered one of the first actions that computer users are taught when they begin working with computers. The results show that slightly fewer participants [63.6%] claim knowledge of the specific skill with four participants [36.4%] evaluating their competency as good. Although the need for structured and, why not, impressive presentations, has been growing rapidly the past few years, two participants [18.2%] claim basic knowledge in the use of PowerPoint [see Table 7]. Five participants [45.5%] evaluate themselves as very good and four participants [36.4%] as good users of PowerPoint. The Web [see Table 8] is considered the primary source of information as well as entertainment and one would expect that answers to this question would be rather positive. Six participants [54.5%] give the highest score and five participants [45.5%] rate themselves as good users

Along with the Web, email is a key factor in online communication and interaction [see Table 9]. Two participants [18.2%] however, rate themselves as having basic knowledge of the email functionality, followed by the same number of those who claim good knowledge. Seven participants [63.6%] claim that their knowledge of the email functionality is very good. Podcasts and video casts [see Tables 10 and 11] are two very popular functionalities for the electronic publication of any kind of messages, ranging from university lectures, to poetry readings and from highly professional recordings to homemade material. Despite their popularity nevertheless, the vast majority of the participants [63.6%] are completely unaware of their existence, followed by two participants [18.2%] who claim basic knowledge, one participant [9.1%] who claims good knowledge and only one participant [9.1%] who seems to know more about podcasts. A similar situation we witness in knowledge about video casts. Eight participants [72.7%] are completely unaware of pod casts, followed by one participant [9.1%] who claims basic knowledge and two participants [18.2%], slightly more than that of podcasts who claim very good knowledge.

In an online environment, users are provided with a variety of electronic tools and applications that help them communicate and interact using all forms of written text, images, sound and media. This section of the questionnaire starts with one of the most popular free communication software in the 21st century, Skype. It is surprising to discover that only two participants [18.2%] claim very good knowledge, followed by five participants [45.5%] with basic knowledge and four participants [36.4%] being absolutely ignorant of Skype [see Table 12]. Oovoo [see Table 13] is free software, similar to Skype, which allows for multiple audio and video conferences with up to six people. The key feature of Oovoo is that participants do not need to download the application onto their computers, as is the case with Skype. Instead, what they should do is click on the web link sent to them by the organizer and join the videoconference using their browser. Given the relatively low popularity of Oovoo, the results have been rather straightforward with few positive surprises. Eight out of eleven participants [72.7%] seem to ignore the existence of Oovoo, but still two participants [18.2%] claim basic knowledge of the application followed by one participant [9.1%] with very good knowledge.

MSN is a popular Microsoft application, especially among teenagers, to communicate and chat with each other [see Table 14]. Four participants [36.4%] claim absolute ignorance of the application, one participant [9.1%] claims basic knowledge, two participants [18.2%] rate themselves as good users of MSN and four participants [36.4%] feel more than confident in using this application. Yahoo has been in the market for quite some time and it is of no surprise that seven participants [63.6%] are very good users, followed by two participants [18.2%] with good knowledge of the application. The list ends with two participants sharing equally their knowledge of Yahoo between basic and non-existent [see Table 15].

It seems that these days, almost everyone has some kind of presence in Facebook. It is considered one of the most popular networking applications whose use by universities, schools and companies is growing rapidly. In Table 16, seven participants [63.6%] rate themselves as very good users of Facebook. There is only one participant [9.1%] who claims basic knowledge. The list ends with an impressive 27.3% [three participants] who claim ignorant of Facebook. Twitter is another popular application for those who love sending short messages and do not have the time to expand further on their texts and thoughts [see Table 17]. In our research, eight participants [72.7%] are unaware of Twitter, followed by only two participants [18.2%] with basic knowledge and one participant [9.1%] who claims very good knowledge. Flickr [see Table 18] completes the list of distance communication tools available through different e-learning applications. The results show that nine participants [81.8%] have never heard of this application, whereas two participants [18.2%] claim basic knowledge. Even though the list with distance communication tools was not meant to be exhaustive, none of the participants is aware of any other similar application [see Table 19].

Search engines constitute powerful tools, which enable users' immediate access to a wealth of information. Google [see Table 20] is considered the most popular search engine and results show that seven participants [63.6%] claim very good knowledge and four participants [36.4%] good knowledge of this tool. Yahoo [see Table 21] is a similarly popular search engine but one of the participants [9.1%] seems to be unaware of its existence. The rest of the participants are equally divided between very good [45.5%] and good [45.5%] knowledge of Yahoo. Although Microsoft is the world's most known trademark, its search engine, Bing, [see Table 22] does not seem to carry much of Microsoft's popularity. Hence, it is of

no surprise that almost half of the participants [45.5%] claim non-existent knowledge of Bing. Two of the participants [18.2%] claim very good knowledge, three participants [27.3%] claim good knowledge and one participant [9.1%] self rates his/her knowledge as basic. No participants seem to be aware of any other search engine [see Table 23].

8.1.2. Part III - Computer Usage – research questions 1 and 2

An interesting section in the questionnaire is the kind of usage that participants make with computer applications as well as the frequency of this usage [research questions 1 and 2]. Considering that most of the participants are teachers, it is surprising to find that four participants [36.4%] type documents only twice a week, followed by two participants [18.2%] who type only once per week [see Table 24]. The rest of the participants [45.5%] agree that they use their computers to type in documents on a daily basis. Half of the participants [45.5%] respond that they use computers to search for information, followed by exactly the same percentage [45.5%] of those who search for information twice a week [see Table 25]. Still there is one participant [9.1%] who claims to search for information only once per week. The next question is also very interesting because it indicates the level of the participants' familiarity with one of the most common features of word processing; that of in-text commentary. Four participants [36.4%] never use computers to correct their students' written work [see Table 26], followed by an alarming 54.5% [six participants] who correct once a week. Finally, only one participant [9.1%] claims systematic use of the computer to correct student work.

Concerning the use of computers in the class, the participants seem to be equally divided throughout the frequency scale [see Table 27]. Three participants [27.3%] never use computers for class activities, followed by the same number with those who use computers only once a week. Two participants [18.2%] use computers twice a week and three participants [27.3%] claim that they use computers for class activities every day. The last question of this section [see Table 28] seems to be quite revealing of the participants relationship with computers. Even though it is promising that six participants [54.5%] use computers as the main means of communication on a daily basis, still two participants [18.2%] use it twice a week and three participants [27.3%] just once a week.

Looking at the high degree of willingness among participants to attend and/or teach an online course one can draw an important conclusion. Their willingness and determination is further strengthened considering their lack of prior experience in or exposure to distance learning. Although one might expect from them some kind of uncertainty to moving into unknown territory, participants are more than ready to experiment and learn from this experience. As is obvious from the analysis in table 29, nine participants [81.8%] have never had any experience in teaching an online course and seven participants [63.6%] have never had any experience in attending an online course. Similarly, it is promising that four participants [36.4%] have attended a distance-learning course and two participants [18.2%] have themselves taught an online course.

8.1.3. Part IV – E-learning Platforms – research question 3

Ten years ago, distance learning meant nothing more than the exchange of emails or any other form of written text. In the 21st century, distance learning is primarily implemented through the extensive use of mechanisms called e-learning platforms. The following section of the questionnaire attempts to investigate the participants' knowledge of and about e-learning platforms [see research question 3]. Blackboard and Moodle are among the most popular and widely used platforms in both the academia and the corporate world. Of those participants that have been involved into some form of online learning seven [63.6%] have used the Blackboard e-learning platform [see Table 30 in Appendix 2] and eight participants [72.7%] are not familiar with Moodle [see Table 31 in Appendix 2]. Given that Hellenic American University is currently using Blackboard as its main e-learning platform, it is not surprising that the majority of the participants do not seem to be familiar with Moodle or any other similar platform [see Table 32 in Appendix 2].

The fact that an institution has incorporated an e-learning platform in its curriculum does not necessarily mean that the use of it follows certain standards and specifications. Even among the faculty of the same institution, there are significant differences as to the extent to which the platform is used for the benefit of the students and the institution. To be more specific, excluding the three participants who have never used any platform, only three participants [37.5%] have used the discussion forum to communicate during their course. Exactly the same figures appear in regards to another communication feature of the e-learning platform, the chat. Video conference is a tool that allows for live communication during an online course. The analysis shows that only one participant [12.5%] has ever used videoconference followed by the negative answer by the rest of the respondents. The whiteboard is a feature embedded in chat and allows the instructor to "write" notes and key points live during a chat discussion. As expected, six participants have not used it, followed by two participants [25%] who seem to have been exposed to the whiteboard functionality. PowerPoint presentations are among the most common files that instructors upload on an e-learning platform. This is evident in the analysis since seven participants [87.5%] have used PowerPoint presentations uploaded by their instructors in the e-learning platform. The in-built email feature available in most e-learning applications seems to be quite popular since seven participants [87.5%] have used to communicate. The announcement tool proves to be equally popular with seven participants [87.5%] using it to get information about their course. Finally, all participants have used the submission tool to submit course work.

Using a number of tools is certainly an important piece of information. In the questionnaire, I have attempted to record more details concerning two other important elements as regards the communication and interaction tools available to students. The first element involves the usefulness of a tool for

the participants. The analysis shows that three participants [37.5%] argue that the discussion tool is useful, followed by exactly the same number with those who believe that the chat and the white board features are also useful. The video conference is considered useful by two participants [25%] whereas the PowerPoint presentations and the email capability are considered equally useful by six participants [75%]. Finally, the ability to read announcements related to the course is considered useful by seven participants [87.5%].

Before completing the analysis of the responses to the questionnaire, it is worth exploring the final section, which records the extent to which the participants find certain communication tools difficult to use. Although one might suspect that the responses to the questionnaire may be lacking valid information close to it final sections, it is worth noting a number of significant conclusions. There seems to be unanimous agreement among participants that almost no tools present any major difficulties in their usage.

8.2. Results: The workshop/simulation – research questions 3, 4, 5 and 6

Even though there is no direct way for me to identify exactly the participants with specific questionnaire responses, I gather that the people present [nine participants] were those who responded favorably to the possibility of attending and/or teaching an online course some time in the future. Their overall positive attitude, enthusiasm and excitement, during the simulation/workshop, for an online course have been quite a strong indication towards this direction. Overall, the participants agreed that it is worth attending an online course if there is systematic communication with the instructor and easy access to technical support [see research questions 3, 4, 5 and 6].

8.2.1. Commenting on Communication and Interaction – synchronous and asynchronous tools

Participants found very helpful the supporting documents that are meant to accompany each PowerPoint presentation and provide students with more information and details on key slides of each PowerPoint presentation *["... it helps a lot…"]*. The podcasts and videocasts were also very favorably received and participants considered them a challenging and intriguing means of communication, pinpointing also the "mobility" characteristic in them. The fact that almost all students use mp3 players these days made participants feel familiar with the podcast and video cast technology although not all of them were familiar with the use of podcasts for pedagogical purposes. The chat feature was also discussed.

Although they admitted the need for commitment on their part to be available at specific predetermined times, ["*…time could be a problem…*" "*….though it is not necessary for everyone to participate…*"] they recognized the need for synchronous communication and interaction between students and the instructor as well as among students throughout the course *["...or have two types of discussions, an ongoing one and one preset..."]*. A number of them raised their concerns [*…when there is no synchronous communication the lesson sounds artificial…*] regarding the lack of systematic live contact and they agreed that the need for synchronous communication channels is more than necessary in the context of a distance-learning course like this.

The availability of video conference was also rated high stressing that such a tool would help establish closer and "real" communication with the instructor and their fellow classmates. They were also very positive to the possibility of video conference with multiple participants besides the one-to-one that most free applications seem to offer. Overall, the participants agreed that the more communication and interaction tools are available, the more structured and productive the course will be.

8.2.2. Commenting on problems and need for training

When asked to compare the two platforms, their reactions were almost unanimous with the exception of one participant who felt quite comfortable with Blackboard. Given that Blackboard is the only e-learning platform these participants are familiar with, it is rather promising that most of them are willing to experiment with something new and different ["*…we know the shortcomings of blackboard so it might be a good idea to experiment…*"]. They all favored the Moodle e-learning platform because of its interface, which they considered more user-friendly and easier to handle although they were not specific in their comments ["*…seems more structured…*"]. At this point, however, it should be noted that the participants have had bad experience with blackboard ["*…even if you don't install Java, Blackboard doesn't work...*"], which may explain their positive attitude towards a new and fresh application such as Moodle. Examples of this negative experience are the difficulty to upload material, watch videos, connect to the application or understand the functionality of some tools.

What participants seemed to appreciate in both applications, but especially in Moodle, was that this online course was designed in such a way to exploit a large number of tools and mechanisms, which can make online learning a challenging and engaging experience ["*…there are many tools to work with…*"]. The fact that students have access to discussion forums, blogs, personal journals, wikis, live chats and videoconferences all in the same course framework seems to have made a strong and positive impact to their attitude towards distance learning. Participants favored very much the functionality of the general blog available in Moodle, which allows stakeholders [students, instructors, etc] to communicate outside the realm of their own class contributing to the concept of community, belonging and knowledge sharing.

It is also interesting that a number of participants pinpointed that an online course seems to be far more demanding *["... do you think students will have some training time…like a week to learn how to use it..."]* and time consuming for the students and the instructor since it involves the design, development and use of multiple learning tools and channels of communication and interaction. Some students also commented on tools available online that could help at the training in the new platform for students who are located away

from the university ["….*there are sites where you download lessons*…"]

Another tool that participants found interesting as well as challenging was the link to Facebook as an extra learning environment to discuss and practice what they have been taught in the "classroom". Given the popularity of Facebook, it was of no surprise that their reaction was positive. Nevertheless, for some of them training might be necessary to feel comfortable while using it for their classes. Participants were informed that the Facebook page designed for the course would not be accessible to outsiders and it would function as another communication mechanism available during their studies.

The option of a parallel learning space in Second Life was received very favorably and many of the participants asked for clarifications and information. During the session, I toured the participants to Second Life using the avatar I had designed for the purposes of the course. Although at this point, there is no specific HAU location in Second Life, participants got a "feeling" of this three dimensional world and the movements and functionality of the avatars in it. Second Life demands a higher degree of commitment and contribution on the part of the students since it involves the design of the avatar and its characteristics. While discussing this extra work with the participants I was positively surprised by their willingness to accept an extra burden that is not directly related to their academic obligations towards the course. When time comes for the implementation of the course everybody's intentions will be tested, but it is encouraging that, now, the participants seemed ready for more active involvement in the learning environment that an online course can create.

9 Conclusions

This study has tested the ground before moving towards the design and implementation of a fully online course in the framework of the MAAL program offered by Hellenic American University. The study has attempted to answer six research questions through a closed questionnaire and an open simulation/workshop session with eleven participants.

Through the closed questionnaire, the study has investigated the level of computer literacy among the participants [research question 1] based on their self-evaluation. Further, participants were asked to express their feelings towards computer usage and e-learning [research questions 2 and 4] and their willingness to attend and/or teach a fully online course [research question 5]. Moreover, participants were asked to provide their feedback on two of the most commonly used e-learning platforms [Blackboard and Moodle] regarding a number of tools and functions that were presented to them during the simulation/workshop session [research questions 3, 6].

The first results of this mini study indicate that the participants' self-evaluation of computer literacy level is high enough to help them cope with the demands of an online course. An issue, which has raised and needs to be addressed however, has to do with the need for training prior to the beginning of any online course. A training session would help participants not only learn how to use the e-learning platform but also make them feel more comfortably to deal with a new learning environment without the traditional presence of the instructor and the classroom.

The participants' attitude towards computers is generally positive and it is rather obvious that they use computers to perform a number of tasks and activities. However, participants, according to the study, are not familiar with e-learning platforms, with the exception of Blackboard, which they use at the University. Participants are also willing to attend and those of them with a teaching background to teach a fully online course.

It is true that the sample of students who participated in this study is too small to draw generalizations and establish that the majority of the students at Hellenic American University share the same opinions and ideas. However, one could argue that the results of this study indicate that there is positive ground among a number of students to experiment with a fully online course. Students seem to have the necessary computer literacy background and the willingness to move a step forward from the current situation, which is a very basic combination of onsite traditional teaching and some kind of presence in an e-learning environment. The next step would be the design and development of the Language and Communication course in full online version and an open invitation to a group of students to take the course in the coming semesters.

It is understood that the introduction of a fully online course in a program has a number of consequences for the stakeholders involved in this effort. Instructors, to begin with, need to undergo vigorous training so that they are able to design their courses exploiting to the fullest the capabilities of the tools available to them. Moreover, instructors need to negotiate with the administration the cost of the extra amount of work which is needed for the design and teaching of the course. Students need training that will help them use the technology to meet their learning goals as well as technical support during the course that will help them address any technical issues that may arise. Last, the university administration needs to make a number of important and strategic decisions concerning the adoption of the appropriate technological infrastructure that will allow instructors to improve their teaching efficiency and students to consolidate their learning efforts and consider the cost of e-learning delivery for some or all of the university's programs.

10 References

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Collaborative Learning in Internet-Based Distance Education

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Abstract

Collaborative learning is for people to learn together in a collaborative manner. Through collaborative learning, not only can learning become more efficient and effective, learners can acquire and improve their team-work skills as well. In this paper, we will discuss how collaborative learning can be done in Internet-based distance education (IBDE). We will first present some background of the research, and then present the tools and systems that can be used for collaborative learning in IBDE. We will then share with you some strategies and techniques we used to implement collaborative learning in teaching a graduate course in an IBDE setting.

Keywords: collaborative learning, e-learning, Web-based distance education

Introduction

Education is for learners to acquire knowledge and skills. The success of education depends on what sets of knowledge and skills designed for the learners to acquire, and how efficiently and effectively these knowledge and skills are acquired by the learners, and such success can only be proved with the success of the learners in their future careers. Among the knowledge and skills learners should acquire, team-work skills are essential for almost all learners to possess for their future [12]. In traditional education, team-work skills can be more easily acquired through collaborative learning amongst learners in classrooms, labs and within small groups formed for specific learning tasks. In distance education, however, such close interactions needed for collaborative learning was much less and even impossible.

Fortunately, since today's distance education has advanced to Internet-based, the impossible has now become not only possible, but more convenient as well [1] [2] [3]. If effectively utilized, many Internet technologies and systems available today can be used to support collaboration among learners [11], and hence, to help them developing team-work skills.

In this paper, we will discuss about some Internet technologies and systems that can be used to support collaborative learning in today's Web-based distance education, and present some strategies and practice in teaching a course on information security to a group of graduate students over the Internet. The paper will then be concluded with some lessons we learned from experiences about collaborative learning in Internet-based distance education.

Tools and systems for collaborative learning in IBDE

In the old days when distance education was done through paper-based correspondence and telephone, collaborative learning was hard to

implement among students who were geographically separated. With the drastic expansion of the Internet and the development and deployment Internet technologies and Internet-based systems, today's distance education has moved to Internet-based, and a variety of Internet technologies and systems available for instructors and learners in distance education have made collaborative learning not only possible, but also convenient, even compared to collaborative learning in traditional universities and colleges. In this section, we will present an overview of available Internet and Internet technologies and systems, and discuss how they can be used to support collaborative learning.

Electronic Mail (Email)

Email is almost the first communication system on the Internet. Started as a text-only communication service on ARPANET, the first portion/generation of the Internet, email has been extended to be able to carry multi-media content within the message body or as attachment. Because of its capability of carrying different types of contents, because of its support to communicate in an asynchronous manner, because many people especially those who are not so young are so used to using emails, email is still a good Internet/Web system to use to support collaborative learning in today's distance education.

When using email for collaborative learning, it is important to ask all participating learners to use carefully chosen subjects for all messages related to the collaborative learning session, so that email filters can identify all the messages and put them into different folders or subfolders.

Threaded Discussion forum

Threaded discussion forums may be the second most popular communication system used in today's distance education. Because postings to the forum are threaded and because communication in a forum can be asynchronous, discussions within a forum can be easily organized and followed. We have been using threaded discussion forum in our online course delivery since later 90s, and we are still using it as a main channel for communication with and between students. Compared with email, threaded discussion forum presents everybody in a course, or a collaboration group with a consistent body of knowledge generated during the course or collaboration.

Blogs

Originally coined by Jorn Barger in late 1997 [6], Blog has evolved to be a popular and very powerful media for the general public to publish all types of information on the popular Internet: small or big articles, short commentaries, photos, audio and video clips. Compared to traditional media such as newspapers, magazines and even formal Web pages, publications on a blog site are more casual, but provide the general public world-wide with almost instant access to news and new ideas; compared with email and threaded discussion forum, however, postings to blog sites are a bit more formal.

In some cases, a blogging site may provide a mechanism for interactions between original author and the readers, by allowing the readers to leave comments [10]. This feature of blogging is especially favorable in collaborative learning: imagine that each participant in a collaboration group posts an answer to a question or topic to a blogging site as a blog, and then all others in the group can comment on the answer using this feature of blogging.

Wikis

Wiki is a Web technology developed for the easy creation and editing of Web content through a Web browser using a simplified markup language or a WYSIWYG editor [7]. In

fact, Wiki was developed for collaborative authoring. In that sense, it is a favorite Web technology and system for collaborative learning in today's distance education. A well-known example of collaborative Web content authoring may be Wikipedia (http://www.wikipedia.org).

A wiki system can be best used in report or paper development in a collaborative learning session. For example, a report/paper can be initially divided into several sections, including abstract, introduction, and a few sections for the body, a section of discussion/conclusion, and references, and assign each section to a different member in the collaborative group as a chief author to draft the section, and all others may be allowed to edit, or comment. Such collaboration will significantly speed up the authoring of the report or paper.

Instant Messenger

Instant messengers are systems that provide users with instant communication services using the Internet. Initially only plain text is supported, today's instant messengers support audio and video calls as well. Using an instant messenger, people can also share documents [9].

Currently, there are many Internet-based systems that provide instant messaging services. Good examples of such systems are Windows Live Messenger (http://explore.live.com/home), formerly called MSN Messenger, and Skype (http://www.skype.com/). Although not initially designed for instant messaging, Skype can now be used as an instant messenger for convenience, because other services such as audio calls to other Skype users and landline phones, as well video conferencing are all built in. All these communication services are useful in collaborative learning.

Compared to other Internet technologies and systems we have previously discussed about, systems such as Microsoft Live Messenger and Skype can be best used for meeting and conferencing in collaborative learning. One must remember that text messages, audio and video calls generated in such systems are not automatically archived for future uses. Also, in terms of conferencing, only limited number of people can be supported in such systems. Currently, Skype voice conference supports up to 25 people at a time.

Strategies for collaborative learning in IBDE

A good collaborative learning session must begin with a good plan. So, the first step toward a successful collaborative learning is planning. Such planning can be done by the instructor, or jointly by group members, lead by the instructor or group leader. In any case, the purpose of the planning phase is to develop clear instructions for participating learners and make everybody know what are to be achieved through the collaborative learning session, and what each participating learner should be doing for the group. According to (Kollar, Fischer & Hesse, 2006), such instructions must clarify the following for each and every learner in the group:

- ✓ ***Set up the objectives***: it has to be made clear to every learner about the learning objectives the group and each learner need to achieve, though the collaborative learning process.

- ✓ ***Define the activities***: learning activities must be clearly defined to support the learning objectives, and every learner in the group must know clearly what he or she is expected to do as a collaborator in the group. These activities may include searching for articles, books or other references for the group, providing summaries of those articles, books and references, generating questions for

others to think and answer the questions others have asked.

- ✓ ***Put the learning activities in the right order***: it is also necessary to let everyone in the group know in what order the activities specified above should be taken. Some activities may depend on others so that they have to be taken before others. The sequencing process will also set deadlines for activities.

- ✓ ***Distribute roles within the group***: the nature of collaborative learning is that different learners may play different roles by carrying out different learning activities for the group. So, it is important to clarify the roles each individual will play throughout the collaboration, or during different stages.

- ✓ ***Make clear about the outcomes and the way(s) they are presented***: the outcomes of collaborative learning of the group essentially depend on the outcomes of each individual, which shall be, and must be presented to the group in some form. So, it is very important to make every learner in the group know how his/her outcomes should be presented and in what format, where and when.

After a good plan has been made, the next step is to kick-start the collaborative learning session. This step is important but simple, after the activities have been clearly defined in the plan.

Once the collaborative learning session is started, the next big step for the learners is to carry out the learning activities according to the plan; for the instructor or group leader at this step, it is important to monitor the activities of all participating learners to ensure that the activities are completed on time and done correctly, and the objectives have been achieved. During the collaborative learning session, there may be need for changes to the activities. For example, some of the planned activities may not be well planned after all, hence need to be revised or adjusted; another situation where changes may need to be made is that for some reasons, a participant in the group may not be able to meet a deadline.

The last step of a collaborative learning session is for the group to summarize the learning outcomes, and to ensure that everybody in the group has acquired the knowledge and skills he/she is supposed to get from the learning session, although different learner in the group may have carried out different learning activities during the session.

Our Experience - The Need for System Integration

We utilized collaborative learning when teaching a graduate course on information security in the fall session of 2010. The systems we used in the collaborative learning session include email, Skype, Wiki, discussion forum and peer-to-peer messaging built into Moodle, an open source LMS system adopted by the university. In the plan, we give a list of topics covered in each unit of study and assign the topics to students in each collaboration group, and then ask each student to post his/her findings about the topic assigned to the threaded discussion forum in Moodle, while ask others to read, comment and add further findings. One each topic, a report is generated collaboratively using Wiki. To assess the learning outcomes of each collaborative group, some information security problems related to the topic are given to each student, and then students in the same collaboration group, working on the same topic, exchange answers to mark and discuss through audio conferencing on Skype.

From this experience, we feel there is a need for system integration to support collaborative learning [4]. Using several systems makes information generated during the collaboration hard to track. We cannot ask students to use only the threaded discussion forum built in Moodle, because it doesn't provide other services needed to support collaboration, such as audio and video conferencing; most of our graduate students in the course are full-time employed in the IT industry, often in senior positions, and they want to use their Blackberries or iPhones to email or message others to collaborate. It would be more effective if all the data generated through these communications can be archived and accessible within an integrated system. Note that integration of certain systems previously discussed will form a new Web technology called social network, which has been tried for collaborative learning as well [8].

Discussions

We presented in this paper how collaborative learning can be implemented in today's Internet-based distance education. We argued that collaborative learning is necessary for students in distance education to develop their team-work skills, and to make learning more effective and efficient. We discussed several Internet technologies and systems that can be used to support collaborative learning in today's IBDE. We further presented some strategies for collaborative learning in IBDE we developed when implementing collaborative learning during a fall session of teaching a graduate course on information security.

There are two lessons we learned from our experience in implementing collaborative learning in IBDE. First of all, the collaborative learning must be well planned, and everybody in the collaboration group must be made clear about the objectives of the learning session and activities/tasks he/she must carry out; Secondly, good monitoring and necessary adjustment during the collaboration are important, and the instructor or team leader must be prepared to do that, to ensure everyone in the group will meet the deadlines, while leaving some rooms for changes due to unforeseen circumstances.

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Creditable Learning Assessment in Internet-based Distance Education

----- A protocol for online supervised examination with authentication

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Abstract
Education has two main purposes: one is to transfer knowledge, skills and abilities to learners, while the other is to award credentials to students based on some effective and reliable assessment of learning outcomes. While the first purpose may have been well served with the advances of e-learning technologies and systems in today's Internet-based distance education, the second the purpose cannot be served automatically with e-learning technologies and systems designed mainly for the delivery of learning contents and for the convenience of learning management. This paper discuss how the second purpose can be well served, and explores various issues related to learning assessment in Internet-based distance education, and propose a new protocol for online supervised examination with authentication.

Keywords: learning assessment, e-learning, Internet-based distance education, student evaluation, learner authentication

Introduction

Education has two main purposes. One is to transfer knowledge, skills and abilities to learners [1], while the other is to award credentials to students based on some effective and reliable assessment of learning outcomes. The knowledge, skills and abilities may be in different aspects including physical, mental and social aspects, and the credentials awarded may be in different disciplines, but a good educational institution must serve both purposes well in the aspects and disciplines it has its mandate in.

In order to serve the first purpose, an educational institution must identify some good sets of knowledge and skills needed in the current and future job market, and then design courses and programs that can genuinely convey the identified knowledge and skill sets, or provide effective guidance to the learners in acquiring the identified sets of knowledge and skills. Traditionally, the delivery of these courses and programs are done in classrooms by qualified professors and instructors in a general term. In distance education [2] [3], however, those courses and programs are not directly delivered to students by instructors. There are several forms of course delivery at a distance, such as individualized self study, individualized study online, self study in a group with supervision in classroom, and virtual group study online. Regardless the differences, in all cases of distance course delivery the actual instructors and even tutors don't see the learners in person, so that the instructors and tutors don't have the opportunity to know about individual learners, and in some cases don't even know whether a given learner has actually studied. In most cases, therefore, asking the learners to submit their work for the course, such as in forms of online quizzes, assignments, essays and reports becomes necessary to check what course work has been done and how well it has been done. However, in most cases of distance course delivery, especially in the case of individualized self study, this is still not sufficient for the instructor or course administrator to tell if the

work is actually done by the student registered for the course, because there is no effective mechanism in place to authenticate the learners in those submitted coursework. Without an effective mechanism to authenticate learners during course delivery, any credit awarded for the coursework submitted is questionable, because the work may have been done entirely by someone else. Therefore, in order to serve the second purpose of distance education, that is, to award creditable credentials to students, other means of learning assessment is needed to authenticate the learners, and to put direct links between the genuine learners and the learning outcomes. Naturally, supervised exam is considered to be that other means. Can it be?

Supervised exams and cheating in supervised exams

Throughout the education history and in today's education across the world, credits are generally given to students based on the work they did during the course, and/or the results of examination they did at the end of the course, and supervised exams have often been used as a determinative factor for awarding credits. A credential awarding institute may not have to really teach, but it must have a creditable examination mechanism in order to ensure the awarded credentials creditable.

We all know that cheating can happen in supervised exams. Articles at http://www.cheatinexams.com/ and http://www.wonderhowto.com/how-to-cheat-test-exam-like-professional-198628/ even teach people how to cheat in supervised exams. So, it is a well-known fact that cheatings are not uncommon in supervised exams, as shown in the studies at http://findarticles.com/p/articles/mi_m0FCR/is_3_38/ai_n6249222/. In [5], McCabe and Trevino reported that a study of 6,000 students at 31 selective colleges and universities has found that 70% of students admitted to cheating on exams, 84% to cheating on written assignments, and almost half to inappropriately collaborating with others on assignments [5]. Many outstanding researchers have even warned that "cheating has reached epidemic levels or that student cheating is inherent to the college experience" [6] [7].

What does this mean? Shall we conclude that supervised exams can no longer be used in student evaluation and learning assessment? Are there alternative assessment methods better than supervised exams based? If the answer to this question is 'yes', we must ask why supervised exams are still widely used in student evaluation across all levels of education around the world by millions of professors and teachers in all universities, colleges and schools. Apparently, the answer is 'no'. We know there are corruptions in law enforcement, shall we conclude that law has become useless and police men and women, prosecutors, lawyers and judges should all be disbanded?

One may claim that creditable learning assessment in Internet-based distance education [4] can be done through innovations in online course design. In traditional education especially in final project or thesis courses, creditable assessment can be done without supervised exams because in those cases students are taught in classroom by instructors and tutors, and learning activities are closely monitored. In distance education even in today's Internet-based distance education, however, because instructors and tutors usually have no in person contact with students, and in some cases even interactions through email, discussion forum or other social media are limited, there is generally no effective and reliable way for the instructor to be sure who the learners are, how they did, if a genuine learner has actually done the coursework. We may be able to identify plagiarism if the coursework or even part of it was taken from a published source; we may also be able to identify cheating if the work was done by several others by checking the inconsistencies. However, we won't be able to tell there is a problem if all the coursework was done entirely by someone else. Hence in Internet-based distance education, awarding

credits purely based on the coursework submitted during the course would put the credibility of distance education at great risk.

There is no doubt that supervised exams are unfriendly to some students, and there is no doubt that a degree program without any supervised exam would be more attractive to students but only if the degree is still creditable, and accepted by government agencies, business corporations and the general public. If the credentials they paid for became worthless, there would be far less students coming to the program. In the world, there are not many people coming to university just for fun.

Therefore, in creditable distance education in particular, supervised exams must be used extensively in learning assessment because it is the only way to authenticate the learners, and to put a direct links between the genuine learners and the learning outcomes. Exam is not a perfect way of assessment, but is still the one that is most widely accepted by the general public. All we should be doing is to improve the administration of supervised exam or devise a better creditable examination protocol for Internet-based distance education.

Requirements for Creditable Learning Assessment

In order to devise a better examination protocol for Internet-based distance education, let's first investigate the criteria or requirements for creditable learning assessment.

Requirement No. 1 – be able to authenticate the learner being evaluated

Essentially, students can, and can only be assessed based on what they know, what they can do and how they do certain things. But before the evaluation process starts, the first thing needs to be done is to make sure the student being evaluated is really the one registered for the course, and is the one to get the credits for the course based on the evaluation. Therefore, the first requirement for a new student evaluation and learning assessment scheme to be creditable is that it must have a mechanism to authenticate the learner.

Requirement No. 2 - Genuinely evaluate the authenticated learner for learning outcomes expected from the course

In order to know whether the students have acquired the knowledge and skills they are expected to get from the course, the questions and problems must be well designed to have the right coverage and depth, and the questions and problems must be answered or solved genuinely by the students. This requirement simply implies three tasks to be well accomplished: the composition of exam papers, protection of exam papers before the exam, and invigilation of the exam process.

Requirement No. 3 – the scheme must be trusted by the government, the employers, other educational institutions, and the general public

When devising a new scheme for learning assessment and student evaluation, we first have to convince ourselves that the scheme is valid and creditable, but it is more even important for us to convince others, in other word, the new scheme must be trusted by the government regulatory agencies, various organizations as potential employers, other universities for credit transfer and future education, and the general public. Without their acceptance and trust, credentials awarded based on the new scheme will be worthless.

Requirement No. 4 – the scheme must be implementable with today's technology and resources available to the institution and the learners

The last requirement is about the feasibility of the scheme. When devising a new scheme for learning assessment, we must make sure the technology and resources needed to support the scheme are available not only for the educational institution, but also accessible to all the learners to be assessed.

A New Protocol for Online Supervised Examination with Authentication

The new protocol is intended to provide a creditable mechanism to evaluate one student at a time for learning outcomes in a course, by using an Internet-based system with video conferencing support, through which the student will be authenticated.

Before we get to the details of the new exam protocol for Internet-based distance education, let's first see how supervised exams are done in today's distance education.

As mentioned, distance education can be in different ways. In China, the Open University of China (http://www.crtvu.edu.cn/) used to have radio and television as the sole platform to deliver courses and programs, but started to use the Internet in recent years. Regardless the advancement, supervised exams are still hosted at its local branches across the country. In China there is also a system allowing students to get credentials through self-study, learners must be undergone invigilated exams at authorized examination centers. Relevant organizations may provide learners with course packages, but don't really teach students. The credibility of the credentials awarded through this system purely relies on the supervised exams.

At open universities in other countries, such as Athabasca University in Canada, distance education has gone through a phase of paper-based correspondence with telephone support, email, and Internet-based. Regardless the changes, the exams are done at examination centers approved by the university. These centers can be universities, colleges or public libraries. This assessment system has been highly appreciated by the external bodies and the public. The disadvantages are its cost and efficiency. The university has to charge the students for invigilation and examination venue, and also has to pay for mailing the exam papers back and forth, which takes time. That is why it is less efficient. The goal of the examination protocol proposed below is to reduce the cost, make supervised exam more efficient, and to maintain the credibility of supervised exams, and Internet-based distance education in general.

Types of examination

1. Interactive examination: questions will be presented to and answered by the student one by one;

2. Standard examination: examination questions will be presented all together to the student at the beginning of the exam, and answered by the student continuously without disruption;

3. Staged examination: examination questions will be divided into groups and presented to the student at several stages of the exam;

4. Presentation-based exam: a topic will be given to the student ahead of the exam. For the given topic, answers will be prepared by the student, such as in form of thesis, essay, technical report or a computer program or programs, which will be submitted to the examiner ahead of the exam. Based on the submitted material, exam questions, at least part of the questions, will be prepared by the examiner before the exam starts. At the exam, the student will make a presentation, followed by answering questions asked by the examiner(s) and the observers. Presentation-based exams are highly recommended for project-based courses.

Participants of online supervised exam with authentication

- **Examiner(s)**: course professor and/or other academics appointed by the school
- **Observers**: tutors, university officials and invited students in the case of presentation-based exams
- **Student**: the learner to be evaluated. The protocol is designed to assess one learner at a time, to ensure cheating has

less chance to occur. The advantage is that no special venue is needed as the exam can be done at learner's home or office, and one video camera will be enough.

System requirement for student to be examined

A computer running Windows or Linux with high speed Internet access and video camera installed; a video conference system or a specially designed system which supports video conferencing and text/multimedia-based communication. If a student cannot get a proper system set up for the exam, such a facility will be provided to the student at an exam centre close to the student.

System requirement for examiners

A computer running Windows or Linux with high speed Internet access and video camera installed; a video conference system such as Adobe Connect, or a specially designed system which supports video conferencing and text/multimedia-based communication.

Access to the exam system

All access to the exam system will be password-protected, and only authorized users (the student being examined, the examiners and observers) will be able to join a given exam session and participate in the video conferencing. In some cases, observers may only be able to watch and listen.

Student authentication

Before an exam starts, the student will be authenticated by the examiner based on a government issued photo id and live image of the student shown in the video camera; the exam session will be recorded and archived for reference in the future. The record together with a copy of the photo id will be kept at university on a secured media. The photo id and personal information of the student will not be shown to the observers, and will not be kept by the examiner.

Formation of exam questions

Exam questions can be taken from a test bank, or prepared by the course professor or a group of academics. In the case of presentation-based exam, some of the questions may be formed during the exam and asked by the examiners and observers.

Delivery of exam questions

The questions can be delivered one by one to the student in real time in the case of interactive examination, or delivered all together at the beginning of exam in the case of standard examination, or delivered before the exam in the case of presentation based examination. The questions should be delivered in a form so that they may not be copied and saved on students' computers.

Answer collection

Answers by the student will be collected by the system and sent to the examiner right after the exam. The recorded exam session will be delivered to the university such as the Registrar's Office for archiving.

Process of the exam

The online supervised exam with authentication will be done in the following steps:

step 1. formation of exam questions

step 2. System set up

step 3. authentication of the student

step 4. delivery of exam questions

step 5. the student is answering the questions, or doing a presentation following a questioning period

step 6. collecting answers

step 7. closing the exam session and archiving session record

step 8. marking and grading

To ensure the quality and credibility of each exam, tasks required at every step above must be done properly. Any imperfection may cause some major problem.

Discussions and Conclusions

In this paper we discussed various issues with learning assessment and student evaluation in distance education, Internet-based distance education in particular, and proposed a new examination protocol for today's Internet-based distance education. With authentication and online video-based supervision, the online supervised exams designed in the protocol can be as reliable as traditional in-person supervised exams to provide creditable learning assessment in Internet-based distance education, while cost can be significantly reduced. There will be no need for mailing the examination papers back and forth; there will be no need to book an examination room, and no need to hire an invigilator onsite.

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An Adaptive e-Learning Hypermedia System for Teaching Entity-Relationship Diagrams: a Case Study

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***Abstract* — Adaptive Educational Hypermedia Systems (AEHS) are widely used in E-Learning nowadays. To which stimuli they are adapting and to what degree they can adapt differs according to the application area, the technical possibilities, and the need for adaption. The problem being addressed in this paper is how students receive and analyze information differently and how that can influence their perception of lessons and the learning outcomes. This article describes an AEHS that reacts to acceptance and outcomes by students. A sample of students has used an adaptive web-based educational system to teach them how they can map and Entity Relationship Diagram (ERD) into table schemas. This web-based educational system adapts to each student's learning style defined after he or she takes a survey based on the VAK model.**

Different models are researched to define categories of students based on how they learn optimally. The VAK models in this paper associate how people learn using the human senses. Since smell and taste are not useful in the technological education processes that are considered here, only the remaining three methods are discussed: Visual, Auditory, and Kinesthetic. Our paper discusses the influence of having students learn by their preferred style, and if it will be useful for them to try different learning styles, rather than learning according to one static method as is usual in an e-Course.

***Keywords* —** Information Systems Development, e-Learning, Adaptive e-Learning, Learning Style Models, VAK Model, Mapping ERD into Tables.

1. INTRODUCTION

e-Learning is used to describe a learning environment that takes place away from the actual traditional classroom and campus. Various definitions of e-Learning have been given [1], some more satisfactory than others. The definition in [1] emphasizes that e-Learning is electronically supported learning and teaching with a procedural character. In addition, the goal of e-Learning is to construct new knowledge for the learner [1]. The media to implement this process are information or communication systems.

However receiving and analyzing information is different from one learner to another. Different students at the same intelligence level but with different learning styles may differ in their grades and performance. From this observation the importance of considering learning styles in courses preparation is apparent, since learning style is an important concept not only for teaching practices but also in order to clarify issues that help faculty and administrators [2][3].

Knowing the learning styles of students can help in designing courses that match students to their learning styles. This is important especially for E- learning since the instructors are not present during the learning process so that they can't change their teaching style based on feedback from the student. From this a need for adaptive E-Learning appears.

This paper attempts to answer the question: Is it possible to devise an adaptive system for computer science students that takes their learning styles into account? And what influence does such a system have on learning quality? In framing a possible answer to this question, we must consider the challenge of this learning enhancement which is largely to identify the learning styles of the student and to make the

learning flexible enough so that it can be changed, so that it matches the learning style of the student and can convey the desired information to the learner. However this is not easy since the main goal is how to deliver the right content to the right person at the right time through technology with or without human assessments [4, 5].

A considerable amount of research has been conducted to define learning styles. One of most popular among educators is the VAK (Visual-Auditory-Kinesthetic) model. The idea behind this model is that we receive information via different senses. Many questionnaires were developed and used to define learner style such as the VAK Learning Styles Self-Assessment Questionnaire [20].

In this paper we discuss the ideas behind an adaptive learning system for teaching Entity-relationship Diagrams (ERDs) to Computer Science students. Those diagrams are used in the design of database tables. Dependent on the learning style of the student the system presents a different interface. This learning style is switched dependent on the results of the feedback that the student provides, in particular the learning outcomes.

This paper is divided into six sections. The first is this Introduction, the second section contains Background and related works, and the third section demonstrates the Used Learning Model in the literature. Our 'Educational Adaptive Hypermedia System: Mapping an ERD into Tables' is explained in section four, and the Results of the study and the Conclusions drawn from those results will be presented in section 5 and 6 respectively.

2. BACKGROUND AND RELATED WORK

Kolb et. al. [9, 10] introduced learning styles based on the Experiential Learning Theory. He used the following experiential learning circle: first comes a concrete experience, then follows observation and experience after this step. This leads to abstract concepts, which are then followed by testing in new situations. Kolb divides learning styles in four categories: the Converger, Diverger, Assimilator and Accommodator learning style.

Convergers feature abstract conceptualization and active experimentation. They are good in ideas and practical application, they focus on deductive reasoning for specific problems, they are unemotional and they have narrow interests.

Divergers can be characterized by preferring concrete experience and reflective observation. They are able to imagine strongly; also they are able to generate ideas and see things from different perspectives.

Assimilators use abstract conceptualization and reflective observation. They have strong ability to create theoretical models and they excel in inductive reasoning.

Accommodators are characterized by concrete experience and active experimentation. They solve problems intuitively, they are good in doing things, and when they are required to react to immediate circumstances they perform well.

Honey et. al. [11,12] introduce a new model similar to Kolb's model. Differences are however that the model stage is described as (1) having an experience, (2) reviewing the experience, (3) concluding from the experience and (4) planning the next steps. Also learning styles are slightly different in their model and were aligned to this cycle as Activist matched to having an experience, Reflector matched to reviewing the experience, Theorist matched to concluding from the experience and Pragmatist matched to planning the next steps.

Gregorc et. al. [12, 13] proposed a model which was based on mind styles, perceptual quality and ordering ability. Perceptual qualities were categorized to concrete and abstract, while ordering abilities are random and sequential. Each individual has a combination of these two categories:

1. Concrete Sequential (CS)
2. Abstract Random (AR)
3. Abstract Sequential (AS)
4. Concrete Random (CR)

Dunn and Dunn [5, 9, 14] believe that learners are affected by sound, light, temperature, and design in their immediate environment, by emotionality (motivation, persistence, responsibility, and structure), by sociological factors (self, peers, pair, adult, varied and team), by physiological factors (time, intake, perceptual and mobility), and finally by psychological factors (analytical or global, impulsive or reflective processing style).

The model by Fleming et al. [15] divided learners in visual learners (V), auditory learners (A), student learners preferring reading/writing (R), and kinesthetic learners (K).

This model distinguishes learners from the senses that they receive information from. Visual learners have preferences for seeing. They prefer maps, charts, highlighters, graphs, different colors, diagrams, brochures, flow charts, pictures, word pictures, and different spatial arrangements. Auditory learners learn best through listening, they like to explain new ideas to others, discuss topics with others, use a tape recorder, and attend lectures and discussion groups. Read/Write learners prefer lists, essays, textbooks, definitions, printed handouts, readings and taking notes. Kinesthetic learners prefer to learn through moving, touching, and doing in order to understand lessons. They prefer hands-on approaches.

3. USED LEARNING MODEL IN THE LITERATURE

In this research the VAK [18] model is used. This model is basically the VARK model by Fleming et al (section 2.1) without the "R". Most researchers consider the "R" part of the model redundant. The VAK model [18] is widely used by

teachers and has been described many times in the peer-reviewed educational literature. The idea behind this model is that we receive information via different senses; normally each of us has five senses. However we do not normally associate our senses of smell and taste as being useful for learning purposes, this leaving us with three methods (or modes) of receiving and processing information. Therefore the VAK model is focusing on the three other senses and learners are divided in Visual, Auditory and Kinesthetic.

Visual learners learn best by seeing and tend to use and respond to terms such as "I get the picture", "I see that now" and "from my perspective".

Auditory learners learn best by listening and tend to use and respond to terms such as "I get the message", "that rings a bell", "that strikes a chord" and "that sounds OK to me".

Kinesthetic learners learn best by doing and tend to use and respond to terms such as "how does that grab you", "a grasp of the basics", "it certainly feels right" and "I can relate to that".

In order to pass information to visual person most likely diagrams, pictures and charts will be used, while for auditory person stories and anecdotes are useful, and finally for kinesthetic persons activities and hands-on methods should be used.

This model is very similar to the VARK model that was reviewed in Section 2. The origin of this model was in the 1920s to help with teaching children with dyslexia [19].
The reason of using this model in our research is that it is easy to implement and use, there is no complexity, and presenting content based on this model is not difficult or complex. Moreover, the peer-reviewed educational literature seems to prefer this model. Many questionnaires were developed and used to define learner style such as the VAK Learning Styles Self-Assessment Questionnaire [20]. This was the one that was used in our research. It has sufficient face validity.

4. OUR EDUCATIONAL ADAPTIVE HYPERMEDIA SYSTEM

Using VAK model, the e-Course for mapping an ERD into tables starts with the administration of the VAK questionnaire to the students in order to measure the relative proportion of the students' learning styles in the three different styles. The process workflow of this e-Course is shown in figure 1.

The lessons of this e-Course are divided into three modules. The learning style in which the student follows a module depends on the results of the student in the previous module. The student starts out in the learning style that according to the VAK questionnaire is the most preferred. If the student scores more than a grade of 7 (on a scale of 1 to 10) in the quiz for a module, the student continues the next module in this learning style. However, if the grade is 7 or lower, the e-Learning delivery system automatically switches to the second most preferred learning style. The same procedure is followed after the second quiz with a switch to the next (second or third) preferred learning style.

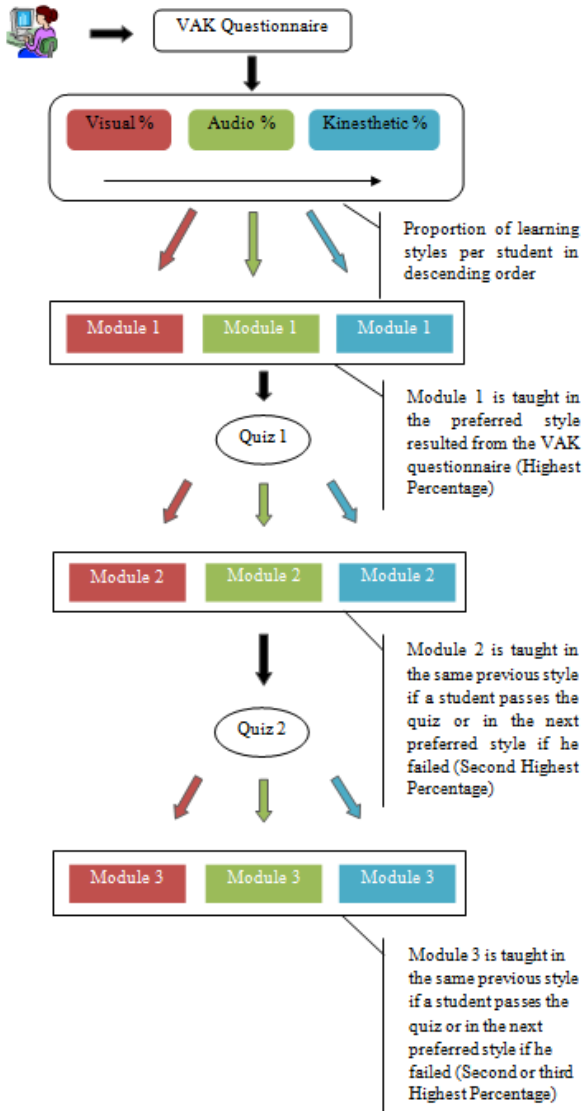

Fig. 1 Work flow of the e-Course

The three learning styles resulted from the VAK questionnaire describes the students' preference for learning. The three styles description is presented in table I.

Table I: Learning Styles Desciption

Learning Styles	Description
Visual	Preference to perceive material by watching
Auditory	Preference to perceive material by hearing
Kinesthetic	Preference to interact with learning material

To satisfy students' preferences the lessons were designed in the 3 different styles that were as similar as possible apart from the presentation mode:

- Audio lessons: The student hears an explanation about how to map a specific concept in ERD to tables. Figure 2 represents a sample of an audio lesson, it views the final pictures of what happens during the mapping process.

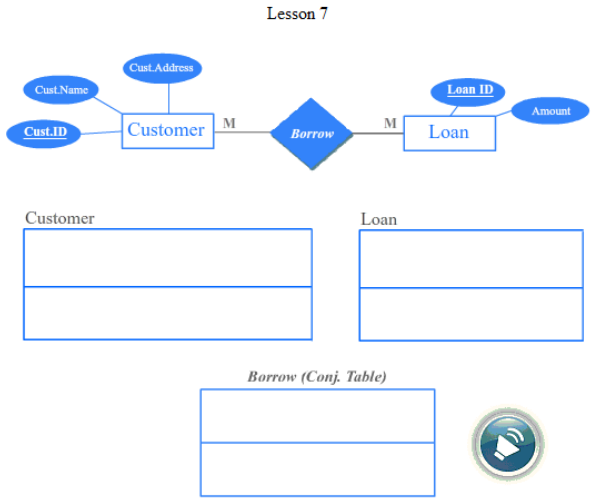

Fig. 2 Sample for an audio lesson

- Video lessons: The student can see how attributes and relations are mapped into tables in moving objects. Figure 3 represents a sample of video lesson, it views the movement of entities into their correct tables.

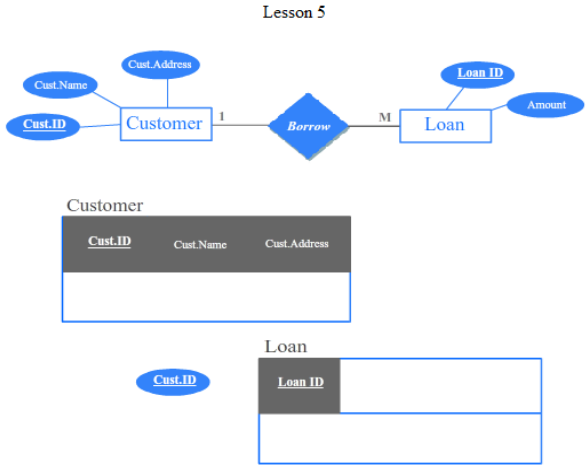

Fig. 3 Sample for video lesson

- Kinesthetic lessons: The students are able to move objects by dragging and dropping them to their correct tables based on instructions telling them what to move and where to move it. Figure 4 represents a sample of kinesthetic lesson, it allows for students to interact with entities by dragging and dropping them into their correct tables.

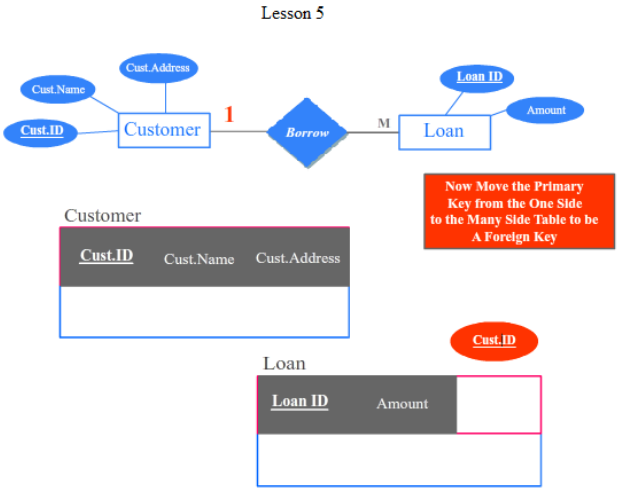

Fig. 4 Sample for Kinesthetic lesson

The content of the course consists of 10 lessons grouped into 3 modules as follows:

- Module one:
  1. Mapping Entity with Simple Attributes
  2. Mapping Entity with Composite Attributes
  3. Mapping Entity with derived Attributes
  4. Mapping Entity with Multi Valued Attributes
- Module Two:
  5. Mapping Related Entities (One-to-Many)
  6. Mapping Related Entities (One-to-One)
  7. Mapping Related Entities (Many-to-Many)
- Module Three:
  8. Mapping Weak Entity
  9. Mapping Is-A Total Participation
  10. Mapping Is-A Partial Participation

To test the adaptive e-Learning delivery system described in the previous section, we carried out an experiment with a group of thirty third-year students from King Abdullah II School for Information Technology in Amman, Jordan. The idea was to measure the effectiveness of the educational system in term of student learning outcomes for the lessons by grading them with two quizzes while they were taking the lessons in the educational hypermedia system.

Students were enrolled in a Database Management System Course. This course requires them to build as a project a fully automated system to serve an organization. The system needs

to be built from scratch, starting with designing an Entity Relationship Diagram (ERD), after that creating the database, and finishing by building the interfaces and linking it with the underlying database. This project takes 20% of the course grade.

Most students find it difficult to understand the ERD materials. Wilson finds a number of problems and issues that make it difficult for the students to apply the concepts correctly [8]. One stumbling block is cardinality, the notion if the relationship is one-to-one, one-to-many or many-to-many. This is essential for a correct design. Sometimes students omit cardinality and sometimes the included cardinality information is incorrect. Other problems for students are incorrect non-binary relationships and syntactic errors in ER diagrams.

In the not-e-Learning modality the student has to take a unit about how to map an ERD into tables. This unit is explained to students in the class by instructors It takes at least 3 classes, each with 1 hour length, in a class rooms with at least 40 students.

The objective of the research was also to test whether there were any differences between the learning outcomes of the students who took the unit using traditional learning methods, and those of who took the unit via the Educational Adaptive Hypermedia System. The differences have been measured in the following terms:

- Were the students who used the systems more motivated to learn?
- Were the students satisfied with their preferred learning style result?
- Did the students like the way the system adjusted the delivery of the materials in a different learning style?

5. RESULTS

At the beginning of the course the 30 students who were following the e-Learning module were classified based on their preferred learning style into 3 categories:

- Visual learners: 14 students.
- Auditory learners: 6 students.
- Kinesthetic learners: 10 students.

In the e-Learning modality 60% of the students received a grade higher than 7 when they took the first quiz. In accordance with the protocol those students got the learning materials delivered in the next module according to the same learning style. 40% of the students received a grade of 7 or lower after the first quiz, and therefore the system changed the delivery of the learning materials to their second preferred learning style. After the second quiz 30% of the students changed their learning style which means that 70% of the students managed to have a grade in the second quiz of more than 7.

Only 13% of the students encountered the three different learning styles, because they failed to get high grades in both quizzes. 40% of the students kept the same learning style for all 3 modules of the E-Course.

We asked 3 yes/no questions to perceive students' satisfaction about traditional learning for teaching this unit of the course, the questions were as follows:

Q1: Are the students motivated to learn the lessons of this unit using traditional learning?

Q2: Were the students satisfied with their learning results?

Q3: would the students like to use different learning styles (Video, Audio, and Interactive) styles to learn this unit?

The answers of this small survey represent students' satisfaction as agree or disagree on using the traditional learning. The following graph will demonstrates the results. Figure 5 shows the results of this survey.

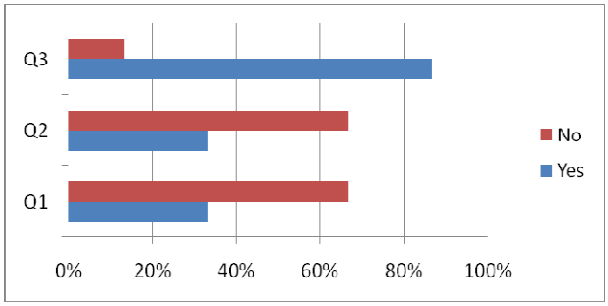

Fig. 5 Results of students satisfaction on traditional learning

The results indicate that students have positive attitude towards experimenting other teaching techniques for teaching this unit.

Also we asked 3 yes/no questions to measure students' satisfaction about using the educational hypermedia system instead of traditional learning to teach this unit, the questions were as follows:

Q1: Were the students who used the systems more motivated to learn the material?

Q2: Were the students satisfied with their preferred learning style result?

Q3: Did the students like the way the learning system adapted?

The answers demonstrated students' satisfaction as agree or disagree on using the E-Course. Figure 6 shows the results of this survey.

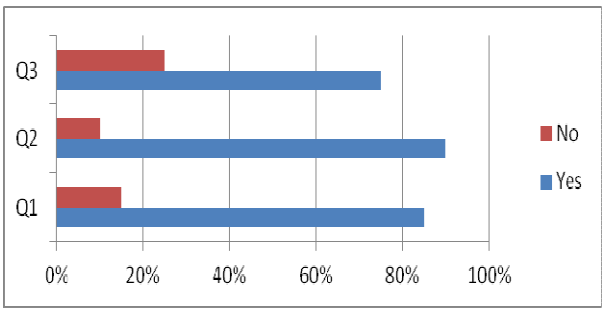

Fig. 6 Results of students' satisfaction on the e-Course

The results are certainly a positive indication to use this educational hypermedia system as part of teaching the database management system course taught in our faculty. Of course the results may be affected by several aspects like, the ability to take the whole unit in less time than it usually takes in the classroom and also the ability to repeat the lessons as many times as one needs. In our experiment we did not have any problem with the student' ability to use the technology considering that they are IT majors. Our only technical problem was insufficient availability of headsets.

6. CONCLUSION

This paper presented an adaptive e-Learning case study which uses the VAK model to measure learning style and mapping ERD into tables as the learning material. Our work is still in progress and we are in the process of gathering more data to test the hypothesis that taking the learner style into account in teaching should enhance learning. We also aim to improve our determination of the learning style of students not only based on the questionnaire but also on the basis of how the students interact wit the software and adjusting presentation mode of the lessons accordingly.

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Paying Attention to the Socio-cultural Issues While Taking Advantage of Computer and Internet

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Abstract-*Postmodernism has clearly affected life in all aspects. It is believed that it is a factor to change technology. A matter that has to be concerned is that such change is not happening similarly in all countries. There is a question which states what factors result in not using such technologies like computer and internet to provide necessary changes; yet there are enough infrastructures to use computer and other technologies of this kind.*

To answer this question, a study has been conducted in Iran. The results showed that the socio-cultural factors can either increase or hinder the use of technology even in education.

In this qualitative study in which grounded theory has also been utilized, semi-depth structured interviews were used to collect the data. The interview questions were about different socio-cultural issues like: religious values and beliefs, sex, media, national economy, language and national identity, and the use of new technology in education.

The results showed that the socio-cultural factors are more influential in many cases than the new technologies.

Key words: Socio-cultural factors, culture, technology, e-learning, Information Technology (IT)

Introduction

The emergence and development of Information Technology (IT) as well as the formation of knowledge society have greatly changed the world of education. Such change results from social environment and formation of networked societies in which information, new technologies such as computer, internet, etc are the leading characters. Knowledge based societies tend to overcome the current traditions as well as structures of place and time, to combine such matters, and to move toward multiplicity and complicated interactions. All these features remind us of *globalization*.

Globalization is considered first as a cultural phenomenon in which there is a kind of process, dialectic evolution, exchange, and cultural excellence. It also brings out the matter of globalization of culture along with culturalization of the globe. Such phenomenon not only results in diversification and multiplicity of culture but also leads to the emergence of common and local cultures while considering the basic principles of human rights. All these produce supranational communities. A supranational community contains a great deal of communication, reflection, and the values of new cultures joining which without consideration of ideologies, geographical borders or, as Tomlinson believes, districts especially culture district leads to bleaching the region (Sa'ei and Safarpoor, 2009). Such matter is true about education and technology as well. Cross-border interactions allow the values, expectations, and new norms to dominate in different communities; yet, continuation and resistance of communities and values put doubt about expectations and traditional norms and eventually revise and change them.

Raymond Williams outlined four important meanings for the culture: first, special position of mind; second, intellectual growth of a community; third, human science; fourth, general lifestyle of a group or a nation (Milner and Brawitt translated by Mohammadi, 2007 p: 9). Hartman made a dichotomy of the meaning of culture. The first one states culture as a clear-cut formation of classification and correlation; and the second one refers to culture as its general idealistic meaning which points to the freedom of thought. Culture sometimes deals with the lifestyle of people in a specific community, with their beliefs and traditions.

It should be mentioned that people who are born to a special culture experience the same cultural conditions due to this matter that they are exposed to values, beliefs, and norms of the society. As a result, the person and the culture are mingled in a way that their segregation culturally is a really

difficult job (Lash, 2005). Now, it should be considered whether cultural forms play a direct role in utilizing technologies like computer, internet, etc. This study has been conducted to see if socio-cultural factors affect e-learning in Iran.

Statement of the Problem

New technologies in learning have motivated every one especially ministry of education, as the core to promotion and training of the people, to make use of them. E-learning is one of such technologies which encompasses a wide variety of processes in education, such as, web-based learning, computer-based learning, virtual learning, and digitally cooperated learning. The materials are presented through internet, intranet, extranet, satellite, audio-visual tapes, TV, compact disk, etc. Taking heed of this matter is necessary that e-learning as well as socio-cultural factors will receive their credit in a society only if learning and its components do their utmost in fulfilling community's need. If this happens, e-learning will be able to construct scientific attitudes regarding culture and society, socialization, cultural variability, discipline, responsibility, democracy, positive individualism, formation of identity, socio-cultural pluralism, and educational equality without sexual discrimination (Ra'oof, 1996).

In spite of positive points of e-learning, the effect of socio-cultural norms on this method of learning should be regarded precisely. Due to proper educational atmosphere provided by e-learning, such norms can encourage the community to reinforce their socio-cultural fundamentals, to freely exchange their culture, and to flourish cultural and moral values along with their local and national traditions (Sharafi and Taherpoor, 2010). They can even move a community toward globalization. On the other hand, socio-cultural norms can pave the way for cultural aggression or cultural recession whose final point is the stagnation of culture and society.

Although e-learning happens in a virtual environment, its correct utilization to reach society's objectives as well as transcendental goals takes place in a real world. Such goals and objectives will be met only if e-learning, as a method of teaching and learning, along with socio-cultural factors be analysed in its best possible way. All these are done to show that whether e-learning is considered a need in Iran or whether socio-cultural factors provide an opportunity to express values and norms. E-learning also reinforces socio-cultural bases of the society and exchanges the cultures. As a result, it is welcomed warmly and expands widely. On the other hand, due to socio-cultural norms, if e-learning be considered as a threat and also be identified as a kind of cultural aggression, cultural oppression conflict, or deteriorates society's foundations, the society will reject it (Yamani, 2001).

Methodology

In present applied study, qualitative research method with grounded theory approach has been used. The data were collected through in-depth semi-structured interview. The subjects were all the e-learners in Iran. The subjects in sampling were chosen via theoretical saturation after interviewing 20 e-learners, but to reach complete assurance, 30 were interviewed.

The data were analysed using grounded procedure. A theory is derived from this procedure; such procedure can determine an interaction or a process in a vast area (Bazargan, 2009 P: 96). In present grounded approach, systematic approach has been utilized (Strauss and Corbin, 1992).

The socio-cultural factors considered in this study contains: globalization, information technology(IT), market factors along with producing human forces, geography, values, national, and religious beliefs.

1. Globalization

Undoubtedly, because culture is the fundamental link among nations and places (Kabiri P: 9), culture is the main part of globalization. Globalization is considered as a powerful and new force to change the society not only from the economical dimension but also from socio-cultural and political dimension. It is also well thought out as a historical process due to its role in making a connection and link among nations. It affects cultural, political, and economical systems so that it can be acclaimed that politics and economy will be globalized only if they are mixed with culture (Waters, 2011 p: 21). Concepts like cultural pluralism, modernism, identity even formation of new cultures are happening in globalization process and in globalizing the world economy, and development

of IT. From the viewpoint of culture, on the one hand, it can be said that globalization can produce religious unity among people and on the other hand leads to diversity, pluralism, and lack of harmony (Pahlavan, 2002 p: 404).

Globalization as a socio-cultural factor points to cultural convergence, cultural divergence, cultural conflict, cultural dominance, and cultural attunement.

2. Information Technology

Technology is one of the most important cultural features of the people through which people can dominate the surrounding environment and solve the problems related to the surroundings. Technological advancement has greatly influenced the cultures as well as the formation of society's values along with socio-cultural situations (Fazeli and Fazeli, 1998 p: 59).

Today's world is a new world in which information is considered as the paramount power and all other skills and abilities like economy, education, culture, etc are derived from information. IT revolution which has been emerged to clarify all the cultural and economical complexities in a society has covered all aspects of human activities. In fact, *it is* a society by itself and understanding a society without technology is not possible. Characteristics of the present IT revolution are not based on knowledge but the application of such knowledge in a cycle of novel feedback and novel application. The result of such processes is the nearness of relationship between social processes, the application of society's culture, the capacity of production and distribution of goods and services.

Most interviewers urged to have a better socio-cultural atmosphere to improve e-learning via media, culture of families, and their attitude toward learning. They believed that media can play the main role in acceleration of e-learning throughout the society.

3. Market Factors along with Producing Human Forces

New economical development models are emerging. The global systems of production and distribution are moving from Taylor and Ford models toward a model based on "invention" as Florid believes. The knowledge-based identity of this development model entails great investment in research and development not only as chic merchandise or gaining competitive result but also as perpetuity and insolubility (Ataran, 2005).

The development of economy which is influenced by economical opportunities and desires possesses its own behaviour and culture. Such cultures and behaviours can detect the opportunities and react against them. Even peoples' behaviours can affect the economical process. All dimensions of culture can affect economy. A case in example is the Iranian carpet or rug which has great advocates around the world. This eco-cultural thing can provide job opportunity and directly influence job opportunities and increase national production level.

The socio-cultural factors in business as well as providing labour forces are in need and the investment should be done in a way that support e-learning.

4. Geography

The greatest German philosopher, Immanuel Kant (1724-1804), believed that geography talks about phenomena which are along with each other or are affected by each other. He was on this idea that history and geography are considered as the mother of all sciences without which people are not able to understand the world. Ratzel, the founder of paradigm theory of environmental determinism, emphasises on the relationship between the natural conditions of the planet earth with people's culture. Famous geographers like William Morris Davis, Alan Churchill Semple, and Ellsworth Huntington are greatly influenced by this theory and relate the expansion of the borders of environmental determinism to lives and cultures of the people.

We should consider geography as a cultural factor in which factors such as equal teachers for all learners in all places even small towns become available. Justification of virtual education to reach educational justice, feeling psychologically secured, experiencing learning in well-known universities like Harvard, eliminating distance, and at last unity in education are among other factors that increases the need to expand e-learning.

5. Gender

The concept of humanity has been taken from social life and gets its meaning only if its personality as well as its behavior are both defined and elaborated inside society. If the discrepancy existed among members of a society get initiated based on natural characteristics and be evaluated on the basis of socio-cultural criteria; hence, some will be credited to a high degree while some not. As a result of this, social inequality emerges. A case in point is gender inequality. In most communities, gender is considered as a socio-cultural phenomena related to sex. Gender inequality can be expressed as an imparity between men and women in the use of available facilities. It also refers to every behavior, policy and performance reflecting constant, comprehensive and institutionalized viewpoints of members of the society toward women as an inferior creature in various fields such as occupation, education, etc.

6. Values and national and religious beliefs

Olson believes on values as a group of assumptions toward what has been accepted which show the deepest common emotions toward the world. Giddens (1979) believes that values are affected by culture and believes on relativity of values. He mentions that values are the beliefs people have about everything which is good, bad, or suitable. He also states that different values show different variation in culture of which people are affected. Some followers of structural functionalism define value as follows: values are elements of common symbolic system which are used as an index or a criterion and all values can be entitled as social reference.

Considering e-learning and its investment to be developed should be viewed from two dimensions: opportunity and threat.

- Opportunity dimension: expanding Islamic-national values and beliefs in the country and around the world
- Threat dimension: expansion of atheism and devastating of Islamic-national values and beliefs of the people; formation of internal conflicts, socio-cultural problems

From the viewpoint of opportunity, e-learning should be developed but from the second one it is an important impediment for the expansion of e-learning.

Conclusion

Paying attention to socio-cultural norms is the cornerstone of utilizing and developing new technologies such as: computer, internet, etc. Due to this fact that people are dependent on their society as well as their culture and each person is completely soaked in his community socially and culturally, the results of this study show the effect of socio-cultural factors on e-learning as an education based on IT.

Suggestion

a) Needs assessment:
- IT can fulfill the needs of different societies in which needs assessment is done based on their culture and socio-cultural norms.

b) IT selection:
- Choosing proper IT after needs assessment to meet the local needs of the society
- Utilizing education to change socio-cultural norms in a society

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An Empirical study on the Stage of E-commerce Adoption in Cameroons' SME Sector. An Approach based on Theories and Frameworks of E-commerce adoption in Developing Countries.

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Abstract *-Electronic Commerce (E-Commerce) has been very crucial in transforming many economies in the world today, as it has a significant potential to add a sustained competitive advantage for businesses. Yet, difficulties arises in adopting information and communication technologies (ICT) and aligning them with strategic development that emerges within the case of small and medium enterprises (SMEs). This paper identifies the stage of e-commerce adoption in the SME sector in Cameroon and looks at what can be done to increase the level e-commerce adoption amongst SMEs in Cameroon. Both qualitative and quantitative research methods were used to establish which e-commerce adoption level the SMEs in Cameroon are at present. Three hundred questionnaires were self administered with 129 valid questionnaires returned, giving a valid response rate of 43%.*

This research findings showed that only about 1.6% of SMEs in Cameroon have attained the interactive e-commerce stage. The research findings call for immediate action by the government to develop an e-commerce perspective that addresses the barriers to e-commerce adoption by the SMEs in Cameroon and ICT solution providers should provide innovative e-commerce solutions that comprises of a roadmap for how the SMEs can advance after initial e-commerce adoption.

Keywords: *E-commerce, Developing Countries, SMEs, Cameroon,*

1 Introduction

The rapid improvement within society's on the use of ICT has brought forth a new and different way of doing businesses, as it has changed the way in which many businesses work. This increase in the adoption of ICT and especially the internet has provided a solid base for electronic commerce (e-commerce) activities.[1] Notes that the effective use of ICT is vital for the success of businesses especially SMEs. In Developing Countries (DCs) businesses are cautioned that if they do not incorporate e-commerce activities in their businesses, they will be left behind as large multinational buyers will eventually insist that their trading partners be linked via online business to business (B2B) portal [2]. To date, there has been evidence from some studies showing businesses in developing countries achieving various e-commerce benefits [4]. For example [5] in their handbook identified some opportunities that ICT provides for SMEs in developing countries. As a result, the way of doing business has changed, and for the businesses within the SMEs, this could pose a real challenge. While Businesses in the developed countries forge ahead in transforming their businesses, businesses in the DCs struggle to keep pace with emerging technologies. However, [6] revealed that DCs have the potential to achieve rapid and sustainable economic and social development by building an economy based upon an ICT enabled and networked SME sector, that will be capable of adopting affordable yet effective ICT solutions.

The SME business sector is a major contributor to the national economy in terms of wealth created and employment generated [7]. For example in Europe, 99% of their companies are SMEs and employ almost 81 million people, which is 66% of Europe's total employment. SMEs need to grow bigger by using ICT to grow; expanding their variety of product and services offerings; improved decision-making([8], [9]) and become more innovative e-businesses; eliminate the barriers to distance; trade worldwide without expanding their physical network of offices and shops. However, despite its great benefits, some SMEs are sceptical about ICT and e-business adoption especially in DCs, because they believe IT solutions are still too expensive; networking security; training costs; consultancy support; organizational restructuring and untrustworthy [10] which thus become imperative to encourage the use of ICT in SMEs. Therefore, understanding the stages at which e-commerce activities are present in the SME sector in DCs and providing future directions will increase the adoption of e-commerce by SMEs. When e-commerce adoption increases in the SME sector and the SMEs start to reap the benefits of e-commerce, it will result in more contribution of wealth to the national economy

Recent research in DCs has provided a good number of conceptual frameworks and theories that can be used to investigate e-commerce activities in the area. [11] provided a conceptual framework for examining the structural properties

of e-commerce in SMEs in DCs. The study looked at e-commerce adoption from a three dimensional view (organizational, external and innovation) and explained how it shaped the thinking of SME owners. [12] made available a conceptual framework on resource-based analysis of e-commerce in DCs context and provided a good base for empirically grounded research on e-commerce adoption in developing countries as well as LDCs. Other e-commerce conceptual frameworks in DCs contexts include the PERM model developed by [13], the business model framework (BMF) by [14], E-commerce SME Classification Scheme and profiling framework by [15].

Researchers who focused on theoretical frameworks such as [16] looked at the benefits of the internet to businesses in DCs and explained how the open network nature of the internet provides numerous opportunities for business in DCs to become competitive through worldwide marketing and sourcing. 17] Brought forth another framework that explored the barriers to e-commerce adoption in developing countries and identified the lack of ICT infrastructure, lack of qualified staff to develop and support e-commerce sites, lack of skills among consumers needed in order to use the Internet, lack of timely and reliable systems for the delivery of physical goods, low bank account and credit card penetration, low income, and low computer and Internet penetration as the main barriers to e-commerce adoption in DCs. Such an acknowledgement is not a criticism of this research; rather it is an attempt to try and draw attention to the direction of the existing literature to distinguish the purpose of the research.

With these available theoretical and conceptually grounded frameworks, there is thus enough knowledge guiding empirical research on determining the actual stage of e-commerce activities in any given region in DCs. This study thus draws the existing theoretically oriented knowledge from the above mentioned researches and empirically deploys the knowledge in the e-commerce context of Cameroon. [18] Made a review of studies on e-commerce in DCs published between 1993 and 2005 and found that Asian studies where prevalence, could possibly be attributed to the relative maturity of ICT infrastructure in terms of roll-out and usage in Asian DCs as compared to African DCs. Nevertheless, since 2001, e-commerce has been listed as one of the priority areas in the Cameroon National Information and Communications Infrastructure (NICI) policy document and thus becomes imperative to understand the stage in which e-commerce activities has evolved from over the past 10 years to present date in Cameroon.

This study have as main objective to apply theoretically grounded knowledge on e-commerce in DCs to the Cameroon context using empirical findings to understands and analyze the current stage of e-commerce adoption and dissemination in Cameroon. According to [19] empirical evidence lags behind theoretical developments in DCs. The empirical findings of this study can then help policy makers in Cameroon to know if they need to revise certain policies to either increase or manage the level of e-commerce activities. Also Cameroonian e-commerce solution developers can use the findings of the study to gain a better understanding of the type of e-commerce applications to develop for the immediate needs of the Cameroon market.

2 ICT and E-COMMERCE in CAMEROON

E-commerce can be defined in several different ways. In this study, we merge the e-commerce definitions by [20] and [21] .As a result we define e-commerce as the use of ICTs to carry out business activities involving both businesses and individuals where the business activities includes any form of business transaction in which the parties interact electronically and not by direct physical contact. [22] Notes that Cameroon is one of the leading Sub-Saharan countries making massive progress in the use of ICT for developments in various sectors. However, according to [23], e-commerce activities in Cameroon are neither established nor intensive. In Cameroon, firms have a reluctant approach to invest in ICT adoption, with firms investing on average less than 7% of their total investments on ICT infrastructure [24].

In an attempt to promote e-commerce and e-business activities in Cameroon, some organizations (ASAFE, Cameroon Business Forum, and Africa Business Forum) have implemented certain training programs and conferences to educate local businesses on how to integrate e-commerce into their activities. Another emerging trend that will increase e-commerce usage in Cameroon is the coming in of online payments systems. A couple of local and intentional companies are now providing online financial services to Cameroon. The local companies include Mobile Money Cameroon SA (www.mymoneysa.com), BICEC E-Pay Box (www.bicec.com), Afriland First Bank's I-Card (www.afrilandfirstbank.com) while the international companies include VirtualPayCash (www.virtualpaycash.net) and BelCash (www.belcashcameroon.com).

In 2009, internet prices in Cameroon reduced by about 90% when the two telecom operators (MTN and Orange), the State telecom operator (CAMTEL) and new internet services provider (ISP) Ringo and about 20 other small ISPs started offering internet services by use of wireless modems. Mindful of these drops in prices, Cameroon still has some of the highest internet rates when compared to other African countries with similar economic profiles like Senegal [25]. The expected penetration rates in the telecoms sector in Cameroon for mobile, fixed/fixed-wireless and internet are 43%, 4% and 5% respectively ([26]).

3 Theories and Frameworks of E-commerce in Developing Countries (DCs)

E-commerce has brought about hope to developing countries because of its potential to reduce transaction costs and augment international trade, with the result of boosting economic growth [27].Nevertheless, key important components- handling non- (cash payments, anonymous and electronic based intra and inter-business relationships), vital in an e-commerce environment, are not common in developing countries [13].In Cameroon for example, 90% of transactions are cash based and less than 10% of adults have bank accounts [28].A number of studies ([12], [13], [14], [15], [17], [19]) have outlined various theoretical and conceptual frameworks for e-commerce adoption and dissemination in DCs.

3.1 Resource Based Theories

[12] Reviewed the Resource Based Theory (RBT) and brought about a conceptual model linking the RBT to e-commerce in developing country context. Their model looked at a combination of internal and external assets, ordinary, core and dynamic capabilities which can enable the organization to create and sustain e-commerce benefits at a given point in their strategic orientation. [12] Adopted the hypothesis that "*Firms that develop valuable resources are more likely to develop e-commerce capabilities that create (largely) operational and informational benefits*." In conclusion, their conceptual framework emphasized the need for business in DCs to seek to develop resources that are valuable, rare, imperfectly imitable and non-substitutable.

3.2 E-commerce Readiness theories and frameworks

[13] Constructed a theoretical model called the Perceived eReadiness model (PERM) which identified the relevant contextual and organizational factors that influence e-commerce adoption in DCs. The PERM model focuses of two constructs-Perceived Organizational eReadiness (POER) and Perceived External eReadiness (PEER). Interactive e-commerce has been accepted by many researchers as the commencement of e-commerce [29]. It is in this light that the PERM model considers a business to have adopted e-commerce if it has obtained an interactive e-commerce status. According to [13], e-commerce in developing countries is classified into six phases of adoption: : no E-Commerce (not connected to the internet and having no email), connected E-Commerce (connected to the internet with email but no website), static E-Commerce (having a static website with basic business information), Interactive E-Commerce (interactive website that accepts queries, emails and online form entries from users), transactive E-Commerce(online purchasing and selling of products and also offering online customer support services) and integrated E-Commerce (integrated website connected to suppliers and customers through a back-office system allowing most business transactions to be done electronically). The variables that describe the PERM model are categorized in three dimensions (POER, PEER and e-commerce adoption). POER variables include awareness, commitment, human resources, technological resources, business resources and governance. Variables that investigate the PEER include (i) government eReadiness, (ii) market force eReadiness and (iii) supporting industries eReadiness. The last set of variables which are initial e-commerce adoption and institutionalization of e-commerce represent e-commerce adoption. The PERM model with its instrument thus provides a good base to empirically identify the stage of e-commerce adoption in any region in DCs.

3.3 E-commerce theories and frameworks based on factors influencing its adoption

[19] Conceptualized the factors impacting the diffusion of e-commerce in DCs. In his study, he looked at the various barriers to e-commerce adoption in DCs. Barriers to e-commerce adoption fall in three categories of negative feedback systems: economic, sociopolitical and cognitive [30]. Of the three categories, some e-commerce analyst argue that cognitive barriers are more serious in DCs than the other two categories [31]. [19] Divided the three categories of e-commerce barriers into three transactional levels of e-commerce operations that are affected by the various barriers. The three transactional levels are Pre-transaction barriers; Transaction barriers and Post-transaction barriers. Table 1 below summarizes the framework developed by [19] for the factors impacting the adoption and diffusion of e-commerce in developing countries.

Table 1: Factors affecting e-commerce adoption and diffusion in DCs

Barriers to E-Commerce in Developing Countries			
Pre-transaction Barriers	Transaction Barriers	Post-transaction Barriers	Resulting effect
Internet Penetration	Credit Card penetration	Delivery infrastructure	Consumers' and businesses' propensity to use the internet for e-commerce activities resulting in a higher e-commerce
ICT Skills	Financial transaction laws	Delivery services	
ICT infrastructure			

			potential in DCs.

Looking at these levels of barriers in the context of Cameroon, will provide a good understanding of the stage of e-commerce activities in the country. Also, from these barriers, specific strategies can be established to suit the current stage of e-commerce activities in Cameroon.

[17] Proposed a framework addressing impeding issues of e-commerce adoption by SMEs in DCs that can help policy makers and other stake holders understand and address such issues. The eSME framework by [17] covered internal and external barriers of e-commerce adoption in DCs and also internal and external support systems for e-commerce adoption by SMEs in DCs and showed that at any given stage of e-commerce adoption, only a subset of barriers and support are significant. The eSME framework comprised of four internal stages and four external stages of e-commerce adoption. The internal stages are (i) Manual (ii) Effective Individual (iii) Effective team and (iv) Effective organization. While the four external stages are (i) No website (ii) Basic website (iii) Interactive website and (iv) E-Commerce website. Using these set of stages in the Cameroon context will help identify the level at which current e-commerce activities are operated and thus strategies for future developments can easily be developed.

[15] Proposed a role based change agency intervention model that assesses the potential of SMEs in developing countries to benefit from e-commerce adoption. [32] Defines a change-agent as an individual or an organization that influences a client's innovation-decision in a direction that the agent considers desirable. Based on [15] framework on E-Commerce SME Scheme and Profiling, e-commerce development within SMEs in developing countries was classified with the use of dimensions. The five dimensions used are: organizational readiness, organizational capability, e-commerce capability, e-commerce motivation, and commodity chain position. Each of the five dimensions was further divided in to four states namely; Foundation state; Exploratory state; Graduation state and Expert state. Foundation state businesses make no use of computers and had no online capabilities. The exploratory state businesses had access to email and online information. The Graduation state businesses had a basic website without advanced features while expert state businesses have more advanced websites with interactive and transacting capabilities as well as integrated back office functions. These four state e-commerce classifications by [15] provide a good base to empirically find out the stage of e-commerce adoption in any DC.

3.4 Stages of E-commerce Adoption

[33] Defined different stages of e-commerce as depths of linking electronic means in business. Many levels of e-commerce adoption have been examined in a wide range of aspects specific to SMEs and their adoption of e-commerce [34]. For example, [35] in Greece; [36] in New Zealand and [37] in Ireland, conducted a study to examine the determinants and inhibitors for IT adoption in SMEs. [38] Established that e-commerce adoption offers a vital opportunity for businesses to access prospective global customers and suppliers via the Internet. However, many SMEs are failing to attain the levels of e-commerce skills necessary to benefit from IT investments in e-commerce [39], and this is as a result of the complexities in adoption and evaluation of IT investments in ecommerce.

[33] Developed the Model of Internet Commerce Adoption (MICA) for a study in the Australian metal fabrication industry. This model proposed that in developing commercial web sites, SME organizations usually start by setting up a static Website and then build on functionality over time, as their experiences with expertise in the use of Internet technologies increases. The MICA comprises of three stages – promotion, provision and processing, which provides a road map indicating where a business is in its development of Internet commerce applications. Promotion means businesses are mostly using electronic channels to promote their products and services. Provision means both the interaction between the business and its customers, and the depths of knowledge interacted with third parties such as customers will all increase. Its main components are value added information, FAQ, email, technological information, online enquiry and value added links. Processing brings more integration in to the directions of business relationships and entails full ennoblement of communication and information channels between parties involved in buyer – supplier relationships. Its main components are order status enquiry, online sales, link distributors, link warehouse, online order and online payments.

[40] Adopted the extended model (eMICA) that added several layers of sophistication of functionality and innovation within the MICA three main stages, in order to provide an extensive range of Internet commerce development confirmed in industries such as tourism. The first stage (Promotion), added two layers- basic information and rich information, with functionalities such as (company name, physical address and contact details, area of business) and (annual report, email contact, information on company activities) respectively. The second stage (Provision), added three layers-low level interactivity, medium interactivity and high interactivity, with functionalities such as (basic product catalogue, hyperlinks to further information, online enquiry form); (higher-level product catalogues, customer support) and (chat room, discussion forum, multimedia, traveller reviews newsletters or updates by email) respectively. The third stage, (Processing), made use of functionalities such as secure online transactions, order status and tracking, interaction with corporate servers and databases, Web 2.0, and User Generated Content.

Furthermore, [41] in their study on Australian SMEs identified three distinct stages in the adoption of e-commerce: planning, implementation and post implementation reviews. Their study assumed that both planning and implementation stages consist of key issues and practices that are linked to the organizational adoption and evaluation processes. Key issues in the organizational adoption include; e-commerce adoption

objectives and user involvements for the planning stage, and top management commitment and user resistance management for the implementation stage, while key issues in the organizational evaluation includes pre-project justification and change management in the planning stage, investment evaluation and benefits realization methodologies in the implementation stage. Similarly, [42] also developed the three-quarter moon in UK where in, they stipulated that the adoption of E-commerce in any country should go through three stages of an adoption life cycle. These three stages of adoption (before, while and after) are driving by the four E-Commerce adoption actors (Government, Technologically advanced countries, companies, and E-Commerce users). Firstly, the before stage comprises - telecommunications infrastructure; postal infrastructure; payment system; legislation and regulation; education and labour training; E-Government strategies; low cost hardware and software; international trade; removing barriers for foreign investment; establishing E-Commerce department; lowering taxation and culture, religion and values. Secondly, the While stage involves- the needs of using local language in websites; accept credit cards and international payment; transaction security; encouraging expatriate workers to return from overseas; new strategies; change business culture; culture, religion and value; and training and education. Lastly the adoption stage consist of- security; monitoring and updating; online promotions; customer satisfactions and customer trust; culture, tradition and value; training and education. These researchers emphasized that the importance of actor's varies for each country and each of the four actors play different role. However, they stress that both the adoption actors and stages, together completes the digital economic activities in any country, creates a complete moon and that the failure of adoption may be a result of a failure of one issue or a number of issues together.

4 Methodology

This study intends to determine the current stage of e-commerce activities in businesses in Cameroon as a means to help ICT practitioners and policy makers to have a way forward to enhance e-commerce adoption and dissemination in the country. We considered an investigation approach using both quantitative and qualitative methods suitable. This multi-method approach allows for a combination of benefits to both quantitative and qualitative methods, and permits empirical observations to guide and improve the survey stage of the research [43].The empirical research selected Yaoundé and Douala the administrative and economic capitals of Cameroon respectively. These two areas have a good mix of the various types of SMEs that are functional in the Cameroon economy and attract a good combination of various business cultures from all around the country.

The study was conducted in two phases. First we started with a few preliminary pilot interviews of semi-structured nature. 13 interviews were conducted during the pilot study. From the observations of the pilot study, we then modified the semi-structured interviews to form a structured questionnaire that was issued to the businesses for data gathering. Cameroon being a bilingual country (English and French speaking) the initial questionnaire in English was then translated to French also in order to cater for the French speaking population. Top management is always considered to more knowledgeable about a company's various strategies including the decision to adopt e-commerce activities [44]. Our target subjects were then the SME owners and members of the SME management team.

Three hundred questionnaires were self-administered. The 13 people who participated in the interviews during that pilot study also answered the modified questionnaire. A total of 182 questionnaires were completed. Of the 182 completed questionnaires 33 were partially completed with missing values. This brought the valid number of questionnaires used for data analysis to 129. Data analysis was done using GNU PSPP an open source statistical software.

5 Results

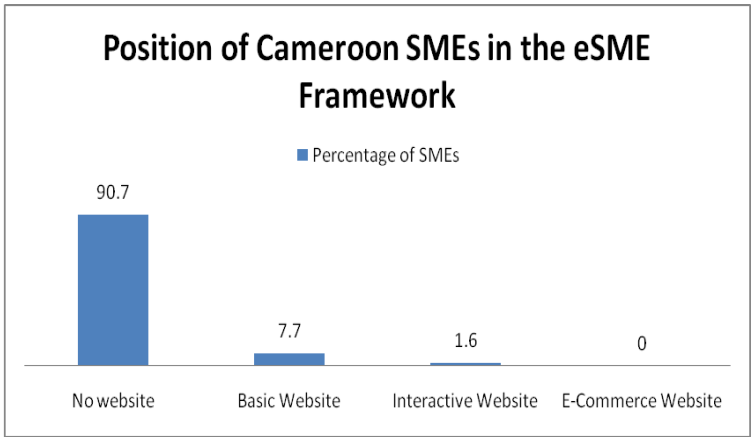

Figure 1: Position of Cameroon SMEs in the eSME Framework

Figure 1 represents the four levels in the eSME framework. 90.7% of SMEs in Cameroon have no website, 7.7% have a basic website, 1.6% have and interactive website and none of the SMEs have an e-commerce website. So the total population of SMEs that have a website in Cameroon is only 9.3%.

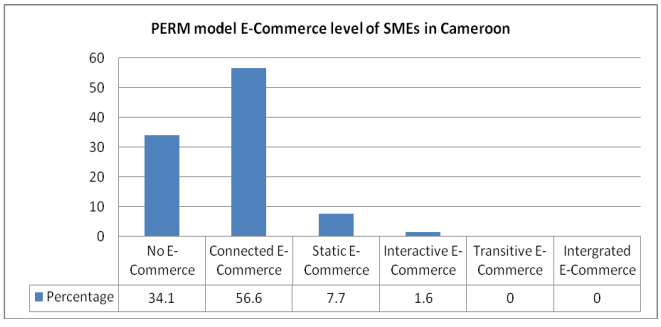

Figure 2: Level at which Cameroon SMEs are in e-commerce adoption in relation to the PERM model

In line with the six phases of e-commerce adoption in developing countries detailed by [13] in the PERM model, 34.1% of SMEs in Cameroon fall under the No E-Commerce phase, 56.6% fall under the Connected E-Commerce phase, 7.7% fall under the Static E-Commerce phase, 1.6% Fall under the Interactive E-Commerce phase and both the Transitive E-Commerce phase and Integrated E-Commerce phase have zero percent.

Futhermore, the state of Cameroon SMEs in relation to the E-commerce SME Classification Scheme and profiling framework by [15]. The findings showed that that 28.6% of SMEs in Cameroon are in the foundation state, 62.2% are in the exploratory state, 7.6% are in the graduation state while 1.6% are in the expert state.

Inline with the Barriers to E-Commerce in Developing Countries established in table 1, the percentage of percieved barriers to ecommerce adoption by SMEs in Cameroon was established. 55% of the SMEs in Cameroon complain of the internet penetration rate, 72.1% complain of lack of ICT skills, 89.1% complain of poor ICT infrastructure, 92.2% complain of no availability of credit cards, 84.5% accept they don't know about the laws governing online financial transaction and thus are not ready to risk their money online, 90.7% complain of lack of delivery infrastructure for goods purchased online since most goods are not electronics, lastly 88.4% complain of lack of delivery services in case they wish to engage in B2B ecommerce services..

In regards to the various stages of the e-commerce life cycle by [42]. 95.3% of Cameroon SMEs are in the Before stage, 3.1% are in the While stage and 1.6% are in the Adoption stage. While in regards to MICA model, 41.1% of Cameroon SMEs are in the promotion stage, 57.3% in the provision stage and 1.6% in the processing stage.

A relationship between valuables resources and e-commerce benefits in the Cameroon SME sector was carried out. The valuable resources used in this study where e-commerce knowledge and skills. After determining that 10.9% of the SMEs had both e-commerce knowledge and skills, we then analyzed what percentage of the SMEs enjoyed certain e-commerce benefits. For the SMEs with valuable resources on adopting e-commerce services, 86.7% enjoyed cost reduction and increased competiveness, 100% enjoyed information availability, 78.6% enjoyed an increase in sales, 71.4% enjoyed rapid time to market and niche market advantage, while 64.3% enjoyed efficient procurement. This results show that for each of the e-commerce benefits, above 71% of SMEs with valuable resources enjoyed the benefits

6 Discussion

The results of this study revealed that about 90.7% of SMEs in Cameroon do not have a website and thus cut out from the many benefits of having a website like 24/7 visibility. Most SMEs do not understand the benefits of having a website and this is an issue they need to be educated about by website development companies in Cameroon. This also shows a wide unexploited market for website development in Cameroon which Information Technology practitioners in the Country can exploit.

In relation to the PERM model, most SMEs fall under the Connected E-Commerce level (56.6) and the No E-Commerce level (34.1%). This implies that 34.1% of SMEs in Cameroon do not use a computer for any reason and 56.6% of SMEs do have email addresses. Most often these email addresses available, are those of the business owners or managers who use their personal emails for business communication purposes. In line with the PERM model, a business is considered to have adopted e-commerce if it has attained the Interactive E-Commerce Level which only 1.6% of SMEs in Cameroon have attained. This shows a very low rate of e-commerce adoption which can also be reflected in the poor economic growth in the country. Also looking at the lack of ICT skills as indicated in the results it can also be evident that with such low levels of ICT skills, attaining the interactive E-Commerce level is difficult. It is thus necessary for ICT solution developers in the Country to increase their skills and move from building basic websites to fully functional and interactive websites. Nonetheless, this will also lead to an increase in cost of adoption which is also one of the factors hindering the adoption rate of e-commerce in Cameroon.

Also seen in the results are the predominate factors affecting SMEs e-commerce adoption. These factors include lack of credit cards; lack of delivery infrastructure for goods purchased online since most goods are not electronics; poor ICT infrastructure and unawareness about the laws governing online financial transaction which 92.2%; 90.7% ,89.1% and 84.5% respectively. These findings are in line with the PERM model, specifically under the POER variables, which identifies variables such as awareness, commitment, human resources, technological resources, business resources and governance that are exactly the predominant factor hindering SMEs adopting e-commerce in Cameroon.

Lastly, when looking at the stage of Cameroon SMEs in relation to the E-commerce adoption Life Cycle, it is seen that the 95.3% of SMEs in Cameroon are in the before stage, while only 3.1% are in the while stage and 1.6% are in the adoption stage. These results again tie up with perceived factors hindering SMEs adoption of e-commerce in Cameroon, since factors such as transaction security; accept credit cards; customer trust and international payment, which fall under both the while and adoption stages happen to be factors perceived to hinder the adoption of e-commerce by SMEs in Cameroon, as seen from the results. In this regard, this study therefore calls for an urgent need for SMEs in Cameroon to gain an understanding of the importance of e-commerce adoption by them, without which they will lack behind the rest of the world as explained by [2].

7 Conclusion

This study aims to determine the current stage of e-commerce adoption in the SME sector in Cameroon. After haven related the level of e-commerce adoption in the SME

sector in Cameroon to various theories and frameworks of e-commerce adoption in DCs, it is evident that there is still much to be desired from the SMEs in Cameroon to achieve a fully e-commerce status. Given that interactive e-commerce is considered as the commencement of e-commerce ([13], [29]) and with only 1.6% of SMEs in Cameroon in the interactive e-commerce stage, it is clear now that the e-commence adoption in the SME sector in Cameroon is very low. Various stake holders such as the government needs to implement favorable e-commerce adoption conditions like training schemes and licensing more Telecommunications services providers. Cameroon is amongst the few countries in Africa left with only two telecom operators (MTN and Orange) and also Camtel has been allowed to monopolize the access toast-3/WASC international fiber optics submarine cable, and this has led to extremely high prices [20]. These high prices account for the low internet penetration rate and low level of e-commerce adoption as the SMEs are unable to afford such prices.

The second groups of stake holders who have an important role to play in e-commerce adoption are the ICT solution providers. Companies providing e-commerce applications development in Cameroon need to provide services that are at the interactive stage and also ensure the services they provide are valuable in terms of return on investment and cost effective for the SMEs. This will encourage more SMEs to adopt interactive e-commerce applications. Post delivery maintenance, upgrading and training should be included in the e-commerce application packages. Furthermore Electronic financial service providers (EFSP) should ensure their payment portals are interoperable with the applications developed by ICT companies in Cameroon. This can be achieved by the EFSPs providing Electronic programmable interfaces (EAPIs) for adaptation of their payment systems to the applications developed. This will make payment systems available to the SMEs once they purchase the developed e-commerce applications.

Furthermore Information technology training institutions should focus more on training students on development of applications that are relevant in the Cameroon context and not only focus on computer literacy. E-commerce researchers also need to carry out more research in the section of implementation and use of e-commerce in the SME sector in Cameroon; this will bring more knowledge about the situation to the lime light. Case study based researches of successful implementation of e-commerce in Cameroon will encourage more SMEs to adopt e-commerce applications in the businesses.

Lastly business support forums like (ASAFE) which focuses on ICT and e-commerce training needs to be encouraged in Cameroon as a means of e-commerce information orientation to the SMEs. This will make the SMEs be aware of the various benefits of adopting and using e-commerce in these business operations.

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A Proposal of a Resource Discovery Component for Virtual Learning Environments (VLEs)

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Abstract - *With the wide use of Virtual Learning Environments (VLEs) across universities, many researchers are looking to make the most effective use of such environment to enhance the learning and teaching experience. Many valuable learning resources are uploaded to the VLEs systems every day such as lectures, tutorials and labs, assignments and other learning objects. Making these resources available and discoverable through the VLE is critical to reuse and share such resources. This could increase the added value of these systems, save time, and enhance course content development. This paper proposes a component that will be added as a plug-in to a VLE in order to facilitate resources discovery and extraction in order to reuse them through the use of metadata. Furthermore, it aids creating an open access repository for learning objects that assist in developing course content. The paper will also present a background review of VLEs, learning objects, metadata, and resource discovery.*

Keywords: Resource Discovery, E-learning, Virtual Learning Environment VLE, Metadata, Learning objects.

1 Introduction

Information and Communication Technology (ICT) has offered new opportunities to higher education institutions around the world to facilitate and enhance the learning and training experience. It helps to provide practical solutions for flexible learning and teaching experience.The Web-based learning technologies are becoming an everyday experience for most campus-based university students [1]. Furthermore, e-learning have become an essential component in the higher education institutions. Recently, one of the most used e-learning technologies in universities around the world to support traditional learning is the Virtual learning Environments (VLEs) such as Blackboard and Moodle. In addition, Web 2.0 tools such as wikis, blogs and whiteboard have been integrated with many VLEs to add more strengths and advantages.

In VLEs, information resources are organised where knowledge could be distributed and information could be shared and reused easily and effectively. However, locating and reusing these resources is a complex process which needs an application that is able to meet up with the rapidly developing technologies and the rapid expansion of learning resources added everyday; and at the same time provide simple means for content authors and users [2, 3]. The VLE aims to support the creation, management and sharing of information on the web [4]. Yet resource discovery tools are not integrated with every VLE.

Searching resources is a complicated process and a time consuming activity and many of the most valuable resources remain undiscovered and underused [5]. Facilitating information discovery is a key success for the VLE especially that one of its main goals is sharing and reusability. Researchers have been investigating the available VLE's features to explore to what extent higher education's institutions are making use of the powerful VLE tools to create a learning environment that facilitates and enhances knowledge acquisition for 21st century student. Despite the fact that the existing VLE have included a variety of great tools and technologies, still more work and research is needed to be done in order to enhance the existing VLEs systems.

This paper proposes a resource discovery component for Virtual Learning Environments. The component should be installed into the VLE in order to discover and extract learning objects that have been stored in the resources databases, such as lecture notes, presentations, assignments, links to external resources and other learning objects. This operation should be done in an effective way using the metadata that have been used to classify the learning objects; in order to facilitate resources discovery and extraction to be reused by tutors. Furthermore, it helps creating an open access repository for learning objects that assist in developing course content. The structure of the paper will start with a review of the VLE technology, this is followed by a background review of the learning objects, metadata and resource discovery. Then, a detailed explanation of the proposed component will

be presented. Finally, the paper will be concluded by a discussion of future work and a conclusion.

2 Virtual Learning Environments (VLEs)

VLEs have emerged towards the end of the 1990s and have transformed the traditional and distance learning. Liber and Britain in [6] described the VLE as a learning management system that blends the functionality of computer-mediated communications software (e-mail, bulletin boards, newsgroups ... etc) and online methods of delivering course materials.

A VLE is a web content management system that designed to support teaching and learning in an educational setting, which enables the customization of course materials and management. It provides the ability for users to access course content from remote locations by using a web based application to deliver content over the network. It also integrates the student information systems and authentication protocols to control who access what via a user name and password. On the course page, course materials are called learning objects [7].

VLEs can be used to support traditional learning because they offer the student a wide range of learning tools and functions for that aids in delivering, communicating and managing the course. Main functions it offered as stated in the literature [4, 6, 7, 9] are: communication facilities such as e-mail and discussion board that could offer synchronous or asynchronous communication; course content publishing tools, such as course notes and interactive course material content; announcements or a notice board facility to publish information that the tutors or administrators wishes to pass on to the students; testing facilities, self evaluation tools and grading tools, allowing students to take course tests from a remote location; automatic feedback to the student's learning behavior; scheduling/ calendar, to provide scheduling information; resources facility to link other web resources; course management facilities to control access and submission of work by students; assignment submitting; group projects facility which supports students' collaboration; web 2.0 technologies such as wikis, blogs, whiteboard, authoring tools, and polls.

In addition, VLE's can also facilitate the delivery of course content in a variety of formats, catering for the varied range of learning styles and learning preferences found in any class group [7].

There are several available VLE software systems in two forms, commercial and open source software, for instance, Moodle, Blackboard, Sakai, ATutor, and others [8].

3 Learning objects and Metadata

Content of VLE's materials are developed in smaller manageable chunks known as learning objects [7, 10]. Learning Objects are defined as any entity that may be used for learning, education, or training. It can be a document, file, image, or even an entire module that can be taken as stand-alone units of instruction. Learning object can be programmed, tagged, and stored. They have increased sharing and reusability [10]. Moreover, learning objects can be created within the VLE, or imported from external sources.

Metadata is "data about data". It is a record that consists of structured information used to describe Learning Objects. Metadata enables the identification, storage, retrieval, and management of learning objects. It allows the learning objects to be searched based on keywords or tags that are describing each learning object when uploading them with an aim to facilitate its retrieval from a collection of resources [3]. Haase in [11] has defined the metadata as *"*any data which conveys knowledge about an item without requiring examination of the item itself." The key benefit is to describe resources in order to facilitate resource discovery [7]. Description of resources normally would give better results for search than resources that are not described in standard models. Therefore, metadata helps to search, organize, and retrieve resources efficiently and precisely [3].

There are different available standards aiming at standardizing the educational metadata. For instance, Learning Object Metadata (LOM) from the IEEE and the Dublin Core (DC) [12, 13, 14]. In metadata standards, each resource is described using multiple statements. For instance, the element set of a simple Dublin Core consists of 15 statements known as elements like Title, Description, Creator, Subject, Date, Language etc. To clarify, when a presentation is uploaded to a course on "programming with Java" taught to undergraduate students of computer science program, then the metadata of that presentation will be classified under "computer science", "programming with Java", target audience set to "higher education".

For educational resources, it is usually described using LOM and DC, however, these standards may leave out some useful and related information. Therefore, some researchers suggested combining metadata standards for educational resources with manual metadata.

Manual metadata is manually created metadata by experts, authors, or end-users. In contrast to automatic metadata, the generation can be of high quality, given an understandable metadata schema. Scientific and educational publishers organize their contents along standardized or proprietary metadata schemes in order to make their resources more retrievable and reusable. Generating metadata manually however may be slow, expensive, and not scalable. It may be inappropriate in dynamic domains and authors may produce inconsistent metadata [13, 14].

Metadata plays an important role in electronic learning repositories to achieve domain based knowledge retrieval; semantic interoperability; learner centric educational architecture; and reusability [3].

4 Resources discovery

Tutors use a range of tools to discover resources they require. These resources may be located physically within library or digitally on the Web or other electronic databases. Many academic resources failed to be discoverable and that this may in turn affect the perceived value of them. The usefulness of the content and collections depends on how easily it can be discovered, located and gained access to them [3]. Making learning objects available and discoverable is critical to the purpose of reusing learning resources in the VLEs and will add value to the VLE systems.

The learning objects metadata should allow an application to recognize the structure of a resource by enabling field-based searches such as author or title, which would facilitate resource discovery capabilities [12]; that in turn will allow the reusability of learning objects. Metadata provides sufficient information that describes a resource to enable intelligent resource discovery agents to differentiate between what is relevant, irrelevant, or redundant to a specific search query [3, 11].

Metadata has improved the resource discovery process as it ensures encoding of semantic distinctions of various elements. For example, a search for work written by "Shakespeare"; the search will yield results where the element name "author" carries value "Shakespeare". Thus in a collection of resources it becomes simpler to identify works by "Shakespeare" instead of retrieving just everything about or by "Shakespeare" in reply to particular query [3].

There are several projects and research proposals that aim to discover resources and link it to VLEs. One of the well-known projects for resource discovery in VLE is the DiVLE Program that aims at linking Digital Libraries with the VLE which was funded by the Joint Information Systems Committee (JISC). PORTOLE was part of that project that aims to produce a range of tools for tutors, which could be used to enable them to discover information resources from the library such as journal papers, and then embed these into their course modules from within a University VLE [15].

In addition, a framework proposed by Brusilovsky and Nijhavan in [16] that allows course materials reusing by allowing a course author to search for the relevant learning objects in repositories of educational material and include them in their courses. Their approach aims at reducing course development time and improving the quality of courses by making high-quality educational material available for the learning community. However, their system aims to replace the VLE, whereas in our paper, the aim is to integrate the reusing of learning objects with the VLE.

Singh and Singh in [8] discussed a resource allocation for collaborative learning environments, such as VLEs, to handle resource management issues related to discovery, scheduling, protection and administration. In their paper they proposed a grid-based resource management model consisting of Linux, Apache, MySQL and PHP. The interaction takes place through SOAP over HTTP.

The next section will give a detailed explanation of the proposed resource discovery component that will be integrated within a VLE to facilitate the discovery of learning objects to be reused by course administrators to save time and improve course development.

5 The resource discovery component

In VLEs, courses that have been delivered contains many valuable learning objects such as lecture notes, PowerPoint presentations, assignments, examples, links to external resources and other learning objects. All these objects could be reused by other academics staff while maintaining the copyright and intellectual property issues, creating an open access learning objects repository. The component aims to achieve the reusability of learning objects. Reusability assumes that learning objects are described in a systematic way that facilitates the identification and integration of various learning objects [12] through the use of metadata.

In this model, resource discovery will be based on metadata that will be used to classify the content. All learning objects that are uploaded into the system must be classified with metadata that describe the resources. A search is performed on stored learning objects using metadata in order to locate the appropriate resources. In addition, the component will also offer the option to modify the metadata for uploaded learning by the author of the new learning object giving users more flexibility when sharing resources. Search results will be returned to the user, who would then be able to review and select the suitable resources from those listed results. Then it can be downloaded directly to the course page of the VLE. Furthermore, valuable leaning objects could be found in other universities' resources databases. The component could be used to link these databases, assuming they are using the same platform, in order to maximize the sharing and reusability.

5.1 Role of users

The role of each person who would interact directly with the resource discovery component is identified, as follows:

VLE Administrator

The VLE Administrator has the ability to add or remove the plug-in from the VLE installation to enable or disable the resource discovery component for a particular course. Moreover, she will be in charge of assigning the course administration power to the users.

In addition, the VLE Administrator will be responsible for the creation and classification of the automatically generated metadata for each learning object uploaded to each course in the VLE. The course administrator (tutor) will then be given the chance later to manually modify it.

Course Administrator (tutor)

Once the administrator has enabled the resource discovery component, it will be visible on the tutor view of the course page interface as a button labeled 'Discover resources'. The course administrator then can search, select and retrieve different learning objects. In addition, course administrator will be given the possibility to manually modify the metadata of to the learning object while uploading it to the VLE.

5.2 The component description

In this section a brief overviews will be given describing the component. The component will be developed as a plug-in to be installed into the VLE installation and activated by the VLE administrator. It consists of additional settings to both the course page and the learning object uploading pages. Figure 1 describes the proposed resource discovery component for the VLE.

In Figure 1, the client system is a browser or a terminal of any kind that is capable of sending data over the internet. The client should log on to the VLE system first; the client request should go through the authentication and authorization system of the VLE to check client's authentication and authorization information. Once the client is authorized, she will be allow to access course pages of modules that she got the privilege to access. From each course page, the client (course administrator) will be able to call the resource discovery component. The request is sent to the component that will search in the resources databases of the VLE and any other institutions that join the system (third parties), after that it allocates the resources required and then retrieves them. Results are sent back to the client. Client will interact with the component through a user-friendly interface. To interact with the component, two views are provided, course administrator view and VLE administrator view.

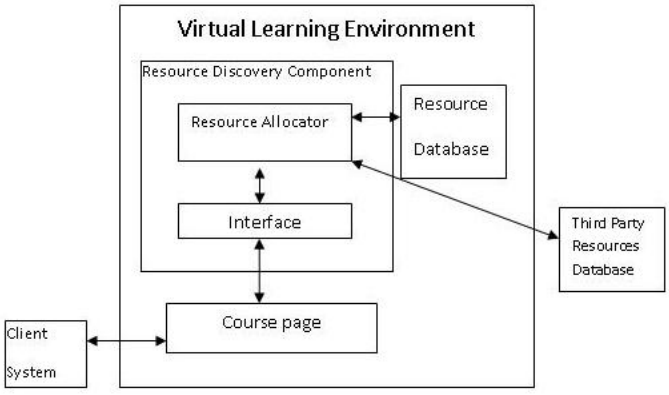

Figure 1: The proposed resource discovery component.

***Course Administrator view*:**

Resource discovery component appears at the tutor's course page as a button labeled 'Discover resources' allowing a tutor to discover learning objects or the button 'Modify' to modify metadata when uploading learning objects. This component will be activated when user select 'discover resources' from the main course page or 'modify metadata' button from the upload page.

The first section of the component is dedicated to searching though the learning objects repositories by the use of metadata. These metadata allow the learning objects to be searched based on different search field and keywords set when uploading the learning object.

There are various headings which a tutor can search under for a specific learning object. In addition, a combination of various heading may lead to more precise resources.

- Learning Object Type: This option will only show content which is specific to the object's content type under the headings of All, Lecture, Lab, Tutorial or Assignment.
- Author: search for content created by a specific author. This will require the entry of a name to be searched by.
- File Type: This option allows the user to specify what file type they are looking for in case the tutor knows the type of the file he/she is looking for such as text document or a presentation in a PowerPoint format. The options available are, All Files, Text Document, Spread Sheet, Presentation, Web Link, PDF file, Sound file, and Movie file.
- Degree: Allow for the search for learning objects designed for postgraduate or undergraduate.
- Course Name: this option allows the search for all content created for a specific course.
- Programme name: this option allows to limit the search for specific degree and audience.
- Key words: this option allows the search for content titles, all content metadata, and content keywords set by the author. All content with similar terms to the search criteria will be displayed.
- Time: search by time stamp which represent the date of creation of the object, in order to search for documents uploaded in specific period of time. For instance, last month, or last year, or between specific years.
- Language: this option allows limiting the search to specific language. It specifies the language of the content of the resource. This option has more value in universities in countries where English is not the native spoken language and resources may be available in more than one language.

Figure 2 shows a visual representation for the search interface of the course administrator view.

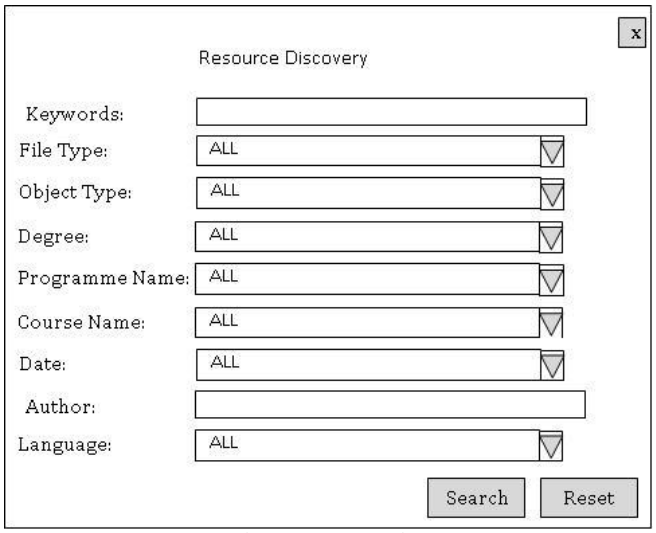

Figure 2: The search for resources interface in the course administrator view

The second section of the component is dedicated for uploading the learning objects to the VLE. Each learning object uploaded should be classified automatically using metadata as classified by VLE administrator. However, the author can also manually modify the metadata to give it more clarification and make it more discoverable to increase the reusability. There are various headings in which a tutor can use to clarify a specific learning object

- Keywords: this option allows adding extra keywords to the object to make the discovery more accurate and concise.
- Title: author can change the title of the object to make it more representative, in case the automatically generated title is not adequate.
- Learning object type: this information should be assigned automatically based on the location it has been uploaded to. However, course administrator can modify the type from a drop down list of a given options which are: Lecture, Lab, Tutorial, Assignment, Test.

Figure 3 shows a visual representation for the Modify interface of the course administrator view.

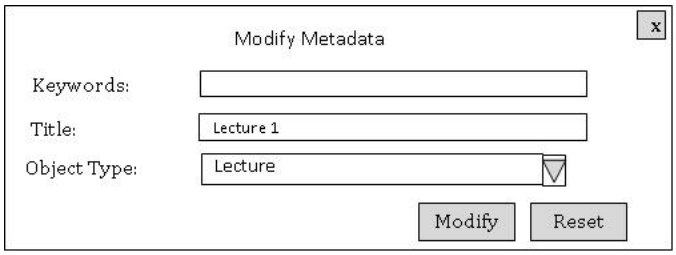

Figure 3: Modify metadata interface when uploading resources to the VLE in the course administrator view.

***VLE administrator view*:**

Once the component is installed, a new set of settings will appear for the VLE administrator in the course settings page. The new settings will allow the administrator to enable and disable the resource discovery component in each VLE course page.

As metadata will be used for resource discovery process, each learning object needs to be categorized, and associated with the relevant metadata elements. Metadata will be generated automatically for each new learning object as set by the VLE administrator for each specific course and can be also modified by the author of the object as described earlier. The administrator will categorize the learning object added to each course page under various headings of metadata elements as described in the next section.

5.3 Metadata elements

In the following table a list of the metadata elements that will be used in this component and their description. They have been selected based on the Dublin Core elements, however, it has been modified and some elements have been removed or replaced by other elements in order to make it compatible with the requirements of this component.

Table 1: The metadata elements that have been used in the model.

Element	Description
Title	Title of the learning object, i.e., the name given to the resource.
Author	Author of the new uploaded learning object, this will be automatically assigned as the name of the course administrator or as given by the VLE administrator. However, this could be extended to include an organization or a service.
Date	Automatically given the date of the availability of the resource in the VLE. Recommended practice for encoding the value of the date is as defined in a profile of ISO 8601, and follows the YYYY-MM-DD format [17].
File type	Text file, Word Document, Spread Sheet, pdf, PowerPoint presentation, link, HTML page, image, video…etc. this is automatically assigned based on the file extension.
Learning object type	Lecture, tutorial, lab, test, assignment, or extra resources. This is should be assigned based on what area in the course page it has been uploaded to, nonetheless, it could be modified by the course administrator later.
Degree type	Undergraduate or postgraduate. Automatically assigned based on the degree registered for that course, in order to specify the target audience.

Programme Name	The name of the awarded degree. Automatically assigned based on the degree registered for that course.
Course Name	Automatically assigned based on the registered course name.
Keywords	Phrases and keywords entered manually by the course administrator to describe the topic of the resource.
Rights Management	Automatically assigned by the VLE administrator. A Rights management element will contain a rights management statement for the resource, or reference a service providing such information. Rights information often includes Copyright, Intellectual Property Rights, and various property rights [17].
Rights Holder	Automatically assigned by the VLE administrator. It includes a person or organization owning or managing rights over the resource [17].
Language	A language of the content of the resource. This is especially important in universities in countries where English is not the native spoken language.

6 Implementation suggestions

The implantation of the proposed component is suggested to be built using MySQL and PHP; as Singh and Singh in [8] mentioned that MySQL and PHP have the advantages of being open source, mature, compatible with many applications and well tested.

The proposed component is planned to be installed as a plug-in to the locally developed VLE or to an open source software VLE like Moodle. One possibility is to develop it as a patch code to add the component capabilities to the installation of the VLE. However, Goslin et al. in [7] mentioned some complexities that are associated with code patching such as that it may lead to difficulties if any rollbacks need to be performed on the code in the future and also if an update occurs, difficulties may also arise because core code updates may overwrite the changes that have been made after applying the patches.

7 Future work

The first issue is the addition of relevance ranking of results of the search. It will need a specific algorithm to classify the relevance to search criteria and should cluster similar results together. Moreover, the current discovery technique is based on only the metadata of the learning object. An extension could be applied to the tool to search through the body of the learning object especially that most objects are text based.

Furthermore, the resource discovery component could be enhanced to support the linkage to other platforms in order to cover more institutions and third parties.

8 Conclusion

During the last two decades many higher education institutions have installed VLEs to allow students to access course material and tools from a remote location in order to facilitate course delivery and enhance communication. In addition, VLEs have offered tutors the advantage of sharing and reusability when creating course content. Preparing course materials is a complicated process and a time consuming activity. Many of the valuable resources that have been created and uploaded to the VLE remain undiscovered and unused although they could improve the development of other course materials. Modern e-learning systems focus on promoting the sharing and reusability of learning objects.

The content of VLE's materials are called learning objects which may include a document, image, lab/tutorial, PowerPoint presentation or a link to a web resource. Each learning object could be classified by the use of metadata which give a description and a categorization for each object.

This paper proposed a resource discovery component which when implemented gives the academic staff a greater flexibility and advantages when creating learning materials. It allows for learning objects discovery and extraction for reusing. It discovers all related resources that have been uploaded to the VLEs resource databases based on a search criteria that will be used to match the metadata of each learning object. The component will appear on the tutor course page of the VLE to allow her to find related resources; and when approved by the tutor, it will be added to the course page while maintaining the original author copyrights. The object's author can also modify the metadata in order to make it more discoverable and reachable.

The resource discovery provides a useful tool to help tutors to produce course content more efficiently and effectively and assist in creating an open access learning objects repository.

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A framework for OLTP Solution - Software Subsystem "*Java Based Enterprise Application*": Scientific Approach

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5 topical keywords: OLTP, Universities, Record Management, Online, System components

Abstract:

"This research paper presents a framework, which simplifies the task of developing, deploying, and managing complex, integrated, and standards-compliant OLTP solution. The framework enables development, configuration, integration, and management of solution at a higher semantic level. It also provides commonly used services such as access to university resources, access control and authentication through bio metrics, public key infrastructure, and support for digital signatures. The ability to manage solution at a higher semantic level enables administrators who are not proficient in programming to customize solution in order to address specific needs of the different stack holders. This includes the ability to customize interfaces for multiple local languages used in university transactions and to customize workflows to conform to the organizational structure and policies to manage access to and retention of university records."

I. 1. Introduction

The university, as an institution, is in crisis. The demand for higher education, from both governments and citizens, appears to be set for an extraordinary increase. One might therefore think that universities, as the prime, if not the only, suppliers of that service, might be in robust health, confidently facing a rosy future. What is more, the much heralded arrival of a knowledge based economy might be thought to play directly into the hands of institutions which are centrally concerned with, among other things, the creation, maintenance and diffusion of knowledge. Surely, the university's time has come. Yet the one clear message, perhaps the only clear message, that can be derived from a perusal of the contemporary literature on the university its role, goals and future is that the university is in crisis. The university is variously described as: a 'ruined institution' , reduced to pursuit of a hollow and illusory 'excellence'; it is an 'attenuated' institution struggling to deal with an 'age of super complexity'; it is perhaps even a 'dinosaur' in a new networked environment which favors other, more recently evolved and more agile creatures. In all such accounts of the contemporary university and its future trajectories, one feature is common: that **information and communication technologies**, and above all the Internet, are a significant element of the current condition.

This apparent consensus about the significance of the digital technologies for the university masks a much wider set of arguments about why they are so important. The new technologies appear variously as the principal threat to the future of the university, as its potential savior and, increasingly frequently, as both at the same time. If the university is to survive in a wired and networked world, then it too must 'get with the program' and move online. Through this paper I am proposing a **universal framework for putting university on line** (known as **OLTP** framework/solution) to save the university from this crisis.

II. *2. Requirements of an OLTP solution*

The Learning Technology Systems Architecture (LTSA) IEEE P1484.1, describes high-level system architecture and layering for learning technology systems, and identifies the objectives of human activities and computer processes and their involved categories of knowledge. These are all encompassed into the 5 layers, where each layer is a refinement of the concepts in the above layer:

a) Learner and surroundings Interactions
b) Human-Centered and persistent Features
c) System Components
d) Stakeholder perception and precedence
e) And Operational Components and Interoperability-coding, APIs, protocols.

To understand how the OLTP framework simplifies the task of developing OLTP solutions comprising above layers, it is instructive to acquire a perspective on what constitutes an OLTP solution and the aspects in which OLTP solutions differ from enterprise solutions. Over the last few years, OLTP has been implemented as isolated applications for specific university departments, creating a complex web of interactions among departments that deliver similar services to customers. Counter to this

trend, today's need is for university to present a single face (OLTP FACES) to all university stack holders. To address these forces, university must transform its isolated, fragmented framework into a collaborative, externally focused; segment-centric operating model. Some representative requirements of typical OLTP solutions are presented below.

- *Security and privacy*
- *Electronic receipts and payments*
- *Record management*
- *Intuitive graphical/conversational interfaces*
- *Record Virtualization*
- *Service Integration*
- *Solution Customizability*

3. OLTP solution components and the OLTP framework

The OLTP solution components can be organized in three tiers, as shown in Table-1

Table 1: OLTP framework: Solution components and technology

Components	Information Service	Transactional Service	Data Mining
Solution Environment	Single, unified portal for information access to all university stack holders,	Messaging between heterogeneous systems Collaboration across various departments Workflow spanning multiple agencies	Change management
Services	Content management Management Authentication and privacy Multidevice access management	Data models and university record Services Commonly used process Patterns Payment services	Data integration Data analysis
Tools	Content authoring and management User role and account creation Multiple device authoring	Record management policies specification Business object creation Legacy wrapper development	Data attribute mapping for record virtualization

4. Simplifying OLTP solution development, deployment, and management:

By having following points OLTP framework can be applied to an end to end solution and application can be simplified:

a) Solution development: The solution components encapsulate standards and best practices, leading to the development of high-quality, interoperable applications. Moreover, the framework implementation is based on the open extensible Eclipse/ IBM's RAD platform, which provides an integrated development environment with a uniform look and feel. This allows the developers to seamlessly use multiple application development tools from various vendors.

b) Solution deployment: This section describes how the framework simplifies the task of deploying a solution. As discussed earlier, an OLTP application typically has to be integrated with a diverse set of other applications to create a solution. To keep the deployment complexity to a minimum, it is important that the applications being developed adhere to certain standards WSDL, SOAP standards for Web services, data exchange, business processes, messaging and connectivity standards, etc. This allows for easy integration with other components and applications in the deployment environment.

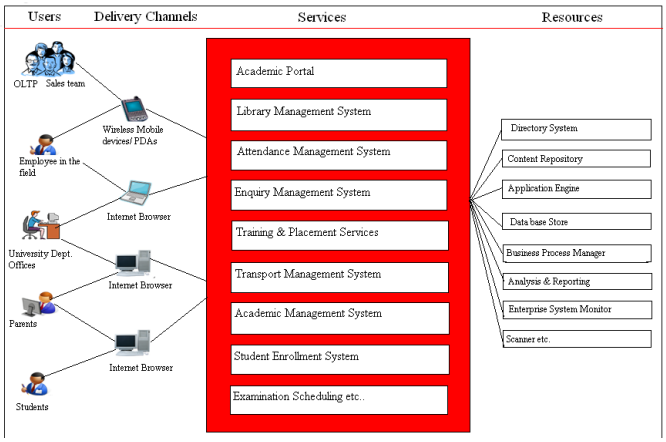
c) Solution management: Next, let us look at the complexity of managing the OLTP solutions. The need to make changes in solutions arises from changes in the policies, laws, business processes, and even standards as and when they are upgraded. For example, the university might stipulate at a later time that the registration will be renewed only if the applicant has a cleared all the back logs record in completion of their semester. This verification requirement adds more fields to the forms [for example, the consistent result by the students as a consistency counter (CC)], to be added to the workflow as well. It is important that university applications be flexible enough to incorporate these changes without substantial reprogramming effort and with as little downtime as possible. Change management in applications developed using the framework requires little effort, since the building blocks allow the reuse of earlier development effort to the maximal extent possible.

d) Implementation approach: The approach described above reuses several existing tools and products to build the framework. The framework may be developing on the open source Eclipse/ IBM RAD platform. Both are built on a methodology for discovering, integrating, and running modules called *plug-ins.* Each tool provider develops its tool as a separate plug-in and exposes its tool-specific user interface (UI) in the respective platform. When the platform is launched, the user is presented with an integrated development environment (IDE) composed of the set of available plug-ins. A simple tool can be a single plug-in, while more complex tools may consist of many separate plug-ins. The NetBeans/Eclipse component architecture allows developers to easily integrate tools developed by multiple vendors like iReport is a reporting plug in for NetBeans.

5. Framework architecture

At the top of the OLTP application's components architecture there are few components such as student enrollment, ICT devices registration and management, Examination conduction, Courses scheduling etc. The process modeling and development tool provides the capabilities for integrating all stack holders, employees, and applications across OLTP solution environment layer. It allows the solution developers or administrators to either create a new process flow or choose one from an existing set of OLTP patterns which capture the typical high-level semantic process flow.

Figure-1 OLTP architecture



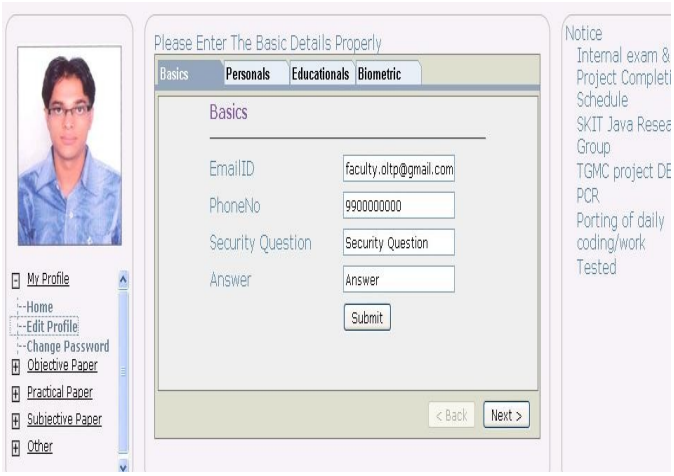
At a high level, it is a 4 tier architecture: **User Layer**- All stack holders of the university, **Delivery Channels**: Different types of the channels to offer university solution, **Services:** Core services of any university solution (OLTP), and **Resources:** Backend programming and integration APIs

Underlying the high-level semantic modeling of OLTP solution using the assets is the support provided by the enablers—the development tools to build the reusable assets and customize these to suit the needs of a particular solution. The customization of an asset may be done manually using the edit tools provided in the framework, or an accompanying wizard may guide it. Guided customization works only for configurable assets. The framework provides tools to facilitate the creation of configurable assets and their accompanying wizards.

6. User interface and sample scenarios

This section describes the user interface of the OLTP framework using a sample scenario. The starting point for rapid application development using the framework is the selection of the domain. The framework has been described for the OLTP domain; however, it can be generalized to other domains such as banking, insurance, retail, and telecommunications. Each reusable component is associated with one or more domains. The selection of the domain by the developer creates an IDE that is customized for the selected domain. In user interfaces, we have an approach of base console for various OLTP use cases. In specific components of OLTP this base console (Faculty Console) is being extended and customized as per the use case requirements. Below is one of the consoles for faculty details, which has been developed by JEE components i.e. Java server faces, Managed Bean, EJB3.O with Java Persistence API for back end data base integration.

Figure-2: User Interface model



7. Related work

The development, deployment, and management of complex, integrated solutions (OLTP) respectively require highly skilled developers, experienced administrators, and IT-knowledgeable business users, primarily because of the complexity involved in working at a low level of abstraction and dealing with multiple proprietary

technologies. I propose an approach to handling electronic service lifecycles that balances responsibilities between domain experts and IT professionals. This approach enables a more holistic management of the electronic service lifecycle by employing modeling and representation in high levels of abstraction and incorporating tools for automatically generating operative service instances from these high-level descriptions.

As far as the involvement of software engineering to the proposed architecting process is concerned, I have chosen to adopt the Rational Unified Process (RUP), an architecture-centric, use case-driven, iterative and incremental process. The RUP incorporates four process areas for end to end project delivery: Inception, Elaboration, Construction and Transition and the views, i.e. the most significant modeling elements, of five different models: the use-case model, the analysis model, the design model, the deployment model, and the implementation model. The architecture also contains some non-functional requirements, platform decisions, architecture patterns contained and other generic features.

Another concept that we adopt from the software engineering discipline is the component-based nature of the architecting process. A software component can be deployed independently and is subject to composition by third parties. Components can be plugged together, according to certain rules, and constitute greater components, also referred to as component frameworks.

8. Conclusions and future directions

This abstract has described the OLTP framework, an OLTP solution development platform that will lower the cost of developing, deploying, and managing OLTP solutions. The framework provides repositories of solution components such as security handlers, record management components, and user interface components. It also provides data models for entities such as students, businesses, and establishments, and repositories for actual data corresponding to these entities so that all OLTP applications can share them. The solution components are customizable for each solution independently through a wizard like interface. The framework also enables sharing of development effort across applications developed by multiple vendors through reuse of assets.

An architecture that is built with the aid of the Rational Unified Process helps all concerned stakeholders (e.g. developers, managers, customers) to understand the system through a common language; organizes the development effort, eliminating the communications overhead; fosters reuse of system components; and helps the maintenance and evolvement of the system through development iterations and product lifecycles, thus making the system change-tolerant. Moreover, Software Engineering is unique in that it is heavily driven by risk, and architecture-based development is the primary successful approach in risk driven engineering.

Last but not least, as far as the enforced component-based architectures are inherently modular and as such have significant software engineering advantages: good modular architectures make dependencies explicit and help to reduce and control these dependencies; are naturally layered, leading to a natural distribution of responsibilities; and it is easier to migrate part of a system by adopting relevant component interface standards.

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Application of Lean-Six Sigma to Improve Quality in Healthcare Industry

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1. Abstract

Using Lean-Six Sigma is one of the best solutions to tackle weaknesses in the U.S. health system. General manufacturing companies have used Lean management & Six Sigma successfully for the last few decades. Lean methodology focuses on removing all waste throughout a given process, so that output efficiency, quality and profit all increase. The main steps in Lean manufacturing involve identifying value-added and non-value-added processes. In order to use this Lean thinking in organizations, all leaders must start thinking in terms of cutting waste and developing an ongoing culture to sustain such habits. In addition, all employees in the targeted organization must be involved in developing and redesigning significant processes to reduce waste and improve quality. This paper will discuss the current challenges being faced by health care industry and ways to tackle them using Lean-Six Sigma. It will give information about Lean-Six Sigma, its implementation and challenges faced during its use.

2. Introduction:

The USA spends more than any other country on health care: $7,500 per person per year. Even so, USA ranks lower than 49 other countries in average life expectancy.[15] In 2004, the United States ranked 29th in the world in infant mortality, tied with Poland and Slovakia. USA has an infant mortality rate of around 6.71. [16]The main reason for our country's health care issues is a considerable shortage of primary care physicians. Many other deficiencies also exist in the U.S. health sector.

Primary care is provided by family physicians, general internists, general pediatricians, nurse practitioners, physician assistants, and others who work in the primary care sector.[35] These clinicians are responsible for delivering accessible first-contact care; providing continuity of care through ongoing relationships; comprehensively addressing the majority of patient needs, whether they are urgent care problems, chronic care needs, preventive care needs, or psychosocial needs; and integrating specialty referrals and ancillary services to provide patient-centered, whole-person care.

Over the past decades, the number of U.S. allopathic medical school graduates entering family medicine residencies has dropped by 50 percent.[36] A decade ago, half of all residents in internal medicine residency programs planned to practice primary care general internal medicine, but today only 20 percent plan to go into primary care. [20]The same trends are apparent when you look at the nurse practitioner workforce and the physician assistant workforce: Fewer and fewer graduates are going into primary care fields.

Our most conservative estimates say that by 2020 USA will be short about 340,000 nurses. The Bureau of Labor Statistics thinks that the number will be as large as 1.4 million. But even if it is 340,000, that shortage number is three times greater than what USA have experienced to date[18].

This health care issue is bigger in Louisiana State. When compared to other states, Louisiana spends a great deal of money on health care with a very low return. Louisiana has ranked 50 in health care for 15 of the last 17 years, according to the United Health Foundation. [19] The state's challenge to improve health and health care delivery has only intensified due to the impact of the 2005 hurricanes. The storms caused substantial damage to the private and public health care infrastructure and intensified chronic shortages of health care workers. The migration of people in need of health care compromised access to care for the insured, underinsured and uninsured in those locations.

3. What is Lean?

Lean focuses on reducing waste and increasing customer value. It provides more value to customer using fewer resources. To implement Lean into organization it must understand customer value and focus on to increase it. [14]Using Lean a perfect value can be delivered to customer by developing a perfect value creation. Ideally processes will have zero waste after implementing Lean into them

To accomplish this, lean thinking gives focus on optimizing flow of products and services rather than focusing on technologies, assets and departments. [22,23]As waste is eliminated from entire value streams it produces processes which require less effort, resources, less cost and less delivery time. .[8,9]Due to lean thinking companies can keep up to changing customer expectations with high quality, less cost and less time. The workflow in lean process is defined as follows:

3.1 Just-In-Time: In this method product is developed when ever necessary and how much is necessary. This reduces non value added inventory time in a product cycle.

3.2 Kanban: Limited number stock of each product is kept in a specific area of market. When a particular product stock is sold a card will be shown indicating which product has been sold.

3.3 Production leveling: Balance production over a period of time.

3.4 Setup time reduction: Reducing the time to adjust between different processes.

3.5 Standardized work: Having documentation of every process followed so that all processes are followed every time.

3.6 Multi-skilled workers: Workers will be trained in multiple areas so that different jobs can be assigned to each worker.

4. What is six sigma?

Six Sigma is measure of quality near perfection. It is method of eliminating defects using disciplined, data driven approach. In Six Sigma all processes are driven towards six standard deviations between the mean and the nearest specification limit, in any process related to any industry like manufacturing, services, health care.

Six Sigma shows the statistical representation of a process and how it is performing. To achieve Six Sigma, a process must not produce more than 3.4 defects per million opportunities. Anything outside customer expectations is called as six sigma defect. [12]Total quantity of chances for a defect is called as six sigma opportunity.

The main objective of the Six Sigma methodology is the implementation of a measurement-based strategy which focuses on process improvement and variation reduction. This is achieved by implanting Six Sigma improvement projects.[13] There are two main sub methods of six sigma

The Six Sigma DMAIC process (define measure, analyze, improve, control) is used for existing processes in an organization.

- Define: the Customer, their quality issues and project goals.
- Measure: the performance of the processes involved
- Analyze: the data collected and process map. Identify root cause of defect and find solution to improve it.
- Improve: the target process by designing creative solutions to fix and prevent problems.
- Control: the processes to keep it improved.

The Six Sigma DMADV process (define, measure, analyze, design, verify) is used to develop new processes in the organization which sticks to six sigma level.

- Define: the Customer, their quality issues and project goals.
- Measure: the performance of the processes involved.
- Analyze: the data collected and process map. Identify process options to meet customer needs.
- Design: Design the process to meet customer needs.
- Verification: Verify the performance and quality of design.

5. Importance of Lean-Six Sigma:

Lean-Six Sigma is the integration of Lean and Six Sigma process improvement methodologies. Six Sigma and Lean are both business improvement methodologies, more specifically business process improvement methodologies [21]

- Six Sigma: Methodology to focus on the key factors that drive the performance of a process, optimizes them, and sustains improvement.
- Lean: Methodology to reduce complexity and streamline a process by eliminating sources of waste in the process.

In simple terms, Lean looks at what should not be done and aims to remove it; Six Sigma looks at what should be done and aims to get it right first time and every time, for all time.[7] Lean-Six Sigma is all about linkage of tools, and not using tools individually. In fact, none of the tools are new. The strength of the approach is in the sequence of tools.

There are many versions of the Six Sigma Roadmap, but not so many that fully incorporate Lean in a truly integrated Lean-Six Sigma form. The roadmap follows the basic tried and tested DMAIC (Define, Measure, Analyze, Improve and Control) approach from Six Sigma, but with Lean flow tools as well as Six Sigma statistical tools threaded together throughout. [10]

Lean-Six Sigma approaches sustainable continuous improvement with the goal of improving patient care, safety, and satisfaction while simultaneously reducing costs and increasing revenues. [2]Using Six Sigma, Columbus Regional Hospital analyzes variation and determines the root causes of that variation. Through Lean, participants eliminate no value added activities and design new processes around steps that add value. [1]Lean-Six Sigma puts controls in place to sustain the gains and ensure continued success.

6. Importance of Lean-Six Sigma in Healthcare Industry:

In health care industry patients are considered as customers. So keeping customer satisfied is high priority in health care industry .[34]Traditional concept of health care was that people need health care and will continue to use same health care services out of necessity ,though they are not happy with services ,are changing rapidly now. Nowadays patients have lots of choices between different health care providers. [4, 32]So quality has become very important in health care industry.

At the same time many hospital administrators have already started using the views and perceptions of their patients to organize their service and staff and for continuous improvement in the overall organizational performance.[3]

Health care industry is different from manufacturing industry. But still there is lot of similarities. If an organization wants to develop a machine or give good treatment to patients, it has to develop good processes. Waste of money, time, supplies, or good will decreases

value in every sector. This can be achieved by using Lean-Six Sigma into Health Care industry.

7. Approaches to improve patient satisfaction using Six Sigma

To implement Six Sigma in an organization there should be commitment from management level towards six sigma quality goals. Then a particular area where six sigma needs to be implemented should be selected and all data regarding that should be gathered. This helps to find deficiencies in the processes and measurement of quality.

Six sigma requires huge amount of organizational change and management should be supportive and encouraging for this. [12]Various training program for all employees should be held. After identifying defects, solutions can be found regarding them by changing processes.[6] This implementation should be aimed at continuous improvement of an organization so that best quality can be achieved.

7.1 Six Sigma tools used in healthcare-Pareto Chart:

A pareto chart is used to summarize and display the relative importance of the differences between groups of data. A pareto chart can be constructed by segmenting the range of the data into groups. The left-side vertical axis of the pareto chart is labeled Frequency (the number of counts for each category), the right-side vertical axis of the pareto chart is the cumulative percentage, and the horizontal axis of the pareto chart is labeled with the group names of your response variables. Following figure gives an example of use of pareto chart in health care industry. The pareto chart helps us realize most important factor which is causing defects.In the figure shown below it can be found that wrong weight conversion is causing highest defects.

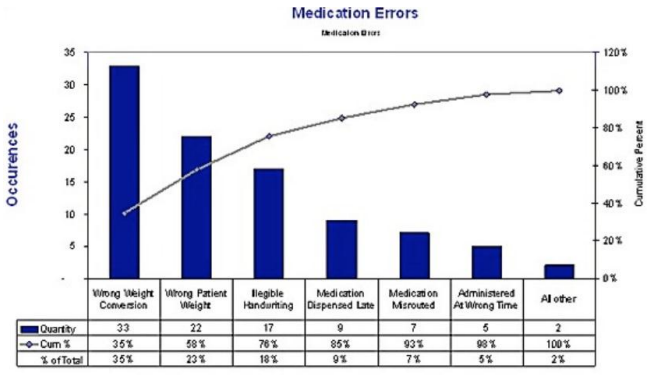


Fig 4: Pareto Chart in Health Care [37]

7.2 Six Sigma tools used in healthcare-FMEA:

Failure modes and effects analysis (FMEA) is a step-by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service. "Failure modes" means the ways, or modes, in which something might fail. Failures are any errors or defects, especially ones that affect the customer, and can be potential or actual. "Effects analysis" refers to studying the consequences of those failures.

Failures are prioritized according to how serious their consequences are, how frequently they occur and how easily they can be detected. The purpose of the FMEA is to take actions to eliminate or reduce failures, starting with the highest-priority ones. The following figure shows FMEA application into health care. From the FMEA sheet it can be seen that misreading of medication name is most important defect and it should be given highest priority to fix.

FMEA

Process Name: Prescription Preparation
Process Number: PPP 445
Date: 1/1/2006

PROCESS STEP	FAILURE MODE	A) SEVERITY Rate 1-10 10=Most Severe	B) OCCURRENCE Probability Rate 1-10 10=Highest Probability	C) DETECTION Probability Rate 1-10 10=Lowest Probability	RISK PRIORITY NUMBER RPN AxBxC	ACTION TO IMPROVE	REVISED RPN
1) Calculate dosage	1) Incorrect dosage prepared	5	3	2	30		
2) Select medication	2) Medication name misread	9	2	8	144		
3) Check interactions	3) Interactivity analysis not performed	7	2	3	42		

Fig 5: FMEA Analysis in Health Care [37]

7.3 Six Sigma tools used in healthcare-Fishbone Diagram:

A fishbone diagram, also known as an Ishikawa or "cause-effect" diagram is used to explore and display the possible causes of a certain event. When causes group naturally under the categories of Materials, Methods, Equipment, Environment, and People then classic fishbone diagram is used. While when we have to show causes of problems at each step in the process then a process-type cause and effect diagram is used. The following figure shows fishbone diagram used in healthcare industry.

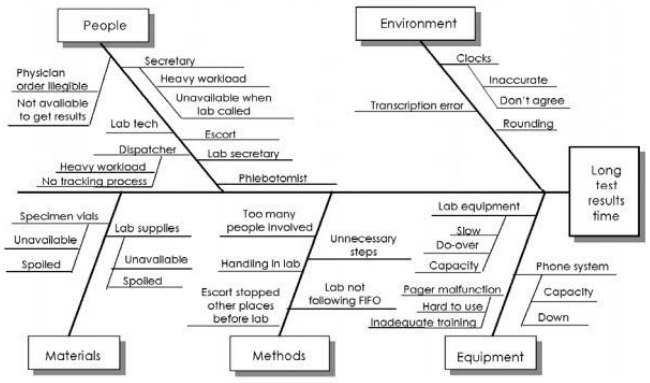


Fig 6: Fishbone diagram used in Healthcare [38]

8. Approaches to increase patient satisfaction using Lean:

The main aim of Lean methodology is to eliminate waste. Waste can be of time, resource or many other factors. Any kind of waste in the process or organization should be identified and removed. In addition all the resources should be used in a way that they provide some value to customers. After identifying waste in process redesign of the process flow should be done such that it should be maintained continuous. All the non-value added processes should be removed here. As it results in more resource utilization and less waste, quality is improved.Then standardization of best practices identified and these should be followed by all employees in organization.Expertise of Lean-Six Sigma professional should be utilized at various stages of implementation.

8.1 Application of Value Stream Mapping of Lean in Emergency Department:

In emergency department of hospitals patients are treated according to the severity of their problems. Walk in patients are treated least emergent and patient coming through ambulance are given most importance. [28,29]. Patients requiring immediate attention are directly treated by physicians while others are treated according to waiting list. In general it takes around 1 hour waiting time for these patients.ED serves patients on Let average annual ED visits is 40000 which is equivalent to 110 visits per day.24/7 basis in shifts.ED care activities can be categorized as following main activities and their Takt time is also calculated:

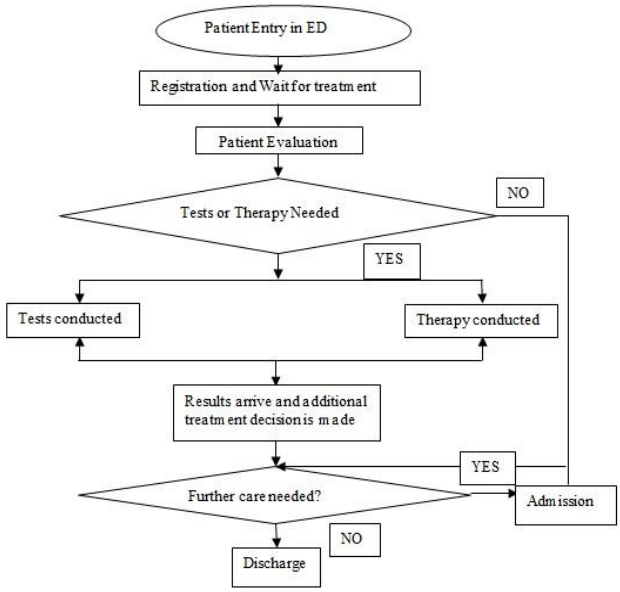
- Registration = 86000/110 = 782 sec per patient
- Evaluation = 86000/110 = 782 sec per patient
- Diagnostic tests = 86000/110 = 782 sec per patient
- Therapy = 86000/110 = 782 sec per patient
- Results evaluation = 86000/110 = 782 sec per patient

After collecting the information needed with regard to the patient and information flow, it is easy now to draw the value stream map VSM for the current state. A value stream is defined as all the actions (both value added and none value added) required to bring a specific product, service or a combination of products and services, to a customer. The normal ED work flow is shown by figure below:

Data collected from ED operations is given in below table:

Table 1: ED Department-Time Data

No	Description	Cycle Time(sec)	Available time
1	Registration	300	86400
2	Evaluation	900	86400
3	Diagnostic Tests	1200	86400
4	Therapy	1800	86400
5	Results evaluation	600	86400
Total		4800	345600



The current state map for ED department is as given follows:

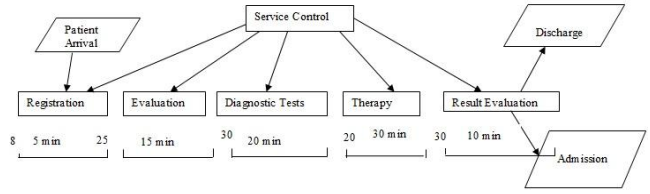


Figure 7: Current State Map for ED

Here,
Lead time = 130 min
Value added time =80min

Proposed improvement plan:

In proposed plan patient evaluation operation is combined with diagnostic testing and therapy so that same staff doing the diagnostic testing or therapy can read the reports and make the decision for admission or discharge. Also one new physician will be added to therapy and diagnostic operations. The future state map for this is given as follows:

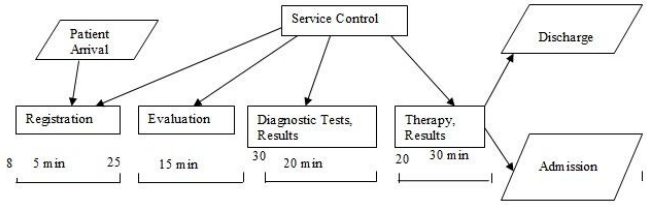


Figure 8: Future State Map for ED

By this proposed approach Lead time = 153 min and Value added time = 70 min

By utilizing this approach ED of a hospital can gain lot of benefits. Table below shows comparison between current state map output and proposed future state map output:

Item	Current State	Future State	Improvement %
Capacity	48	72	50
Idle Time	201600 sec	129600 sec	36
Utilized Time	230400 sec	302400 sec	31
Number of Operations	5	4	20

Table 2: Comparison of current state and future state performance

8.2 Wastage in Healthcare Sector according to Lean:

Anything which does not add value to customer is defined as waste by Lean Manufacturing.[30]

In general following type of wastage occur in health care industry which should be eliminated.

Waste	Definition	Example in Healthcare
Over production	Producing more than the customer needs right now	Pills given early to suit staff schedules, Testing ahead of time to suit lab schedule
Transportation	Movement of product that does not add value	Moving samples, Moving patients for testing, Moving patients for treatment
Motion	Movement of people that does not add value	Searching for patients, physicians, documentation, supplies, equipments, etc.
Waiting	Idle time created when material, information, people or equipment is not ready	Patients waiting for bed assignments, admission to Emergency Dept., testing & treatment, discharge, lab test results
Over processing	Effort that adds no value from the customer's viewpoint	Retesting, Excessive paperwork, Unnecessary procedures
Inventory	More materials, parts, or products on hand than the customer needs right now	Bed assignments, Pharmacy stock, Lab supplies, Specimens waiting analysis
Defects	Work that contains errors, rework, mistakes or lacks something necessary	Medication error, Wrong patient, Wrong procedure, Missing information, Poor clinical outcomes

Table 3: Examples of Waste in Healthcare industry

8.3 Improvement of Insurance Claim Processing in Health Care by using Lean Manufacturing:

An example of current state map for processing an insurance claim is shown in Figure 7. The map depicts the current process containing nine steps (as indicated in the lower left corner), with the actual required work time and elapsed process time indicated below each step in the process.[31] Note in the lower right corner that, because of excessive delays between steps, the 19 minutes of actual work required to complete the process takes place over a 28-day period.

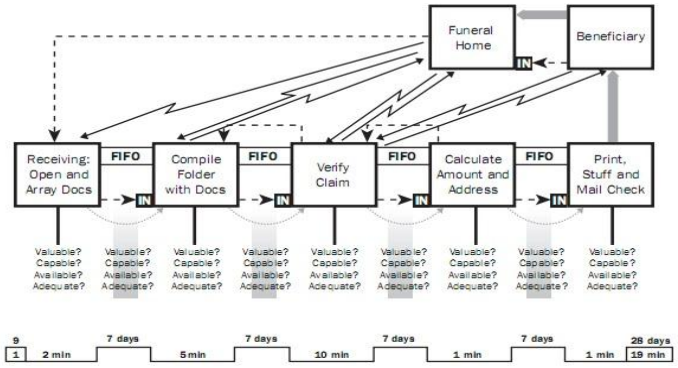


Figure 9: Current State Map for Insurance Claim Process in Healthcare [36]

Using the future state value stream map(Figure 8), the group reorganizes staff if necessary to match the requirements of the process. Notice that most processes flow horizontally, while most organizations are organized vertically. This is a fundamental challenge, because the process must flow across organizational impediments and boundaries.

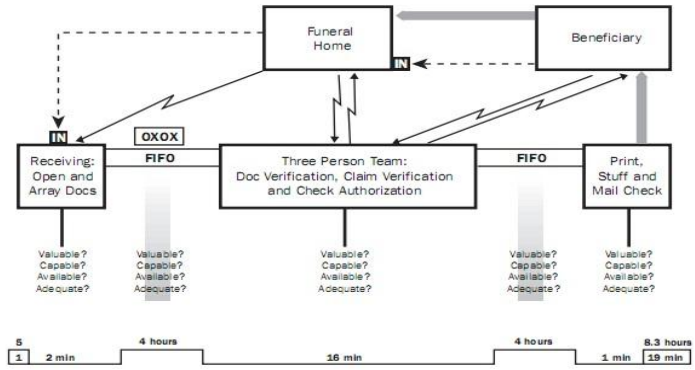


Figure 10: Future State Map for Insurance Claim Process in Healthcare [36]

8.4 5-S Implementation in medical storage room

5-S is one of the most important tool in application of Lean Manufacturing. It can be applied to keep minimal wastage at medical rooms.The explanation for each step in 5-S is as follows:

1) Seiri :
   It refers to the practice of going through all the tools, materials, etc., in the work area and keeping only essential items. Everything else is stored or discarded. This leads to fewer hazards and less clutter to interfere with productive work.
2) Seiton :
   This step focuses on the need for an orderly workplace. “Orderly" means arranging the tools and equipment in an order that promotes work flow. The tools and equipment should be kept where they will be used, and the process should be ordered in a manner that eliminates extra motion.
3) Seison :
   It indicates the need to keep the workplace clean as well as neat. This step makes it easy to know what goes where and to know when everything is where it should be are essential here.The key point is that maintaining cleanliness should be part of the daily work - not an occasional activity.
4) Seiketsu :
   This refers to standardized work practices. Everyone knows exactly what his or her responsibilities. Workplace should reflect the process of work, these imply standardized work practice and workstation layout.
5) Shitsuke :
   This refers to maintaining and reviewing standards. Maintain the focus on this new way of operating, and do not allow a gradual decline back to the old ways of operating.
   However, when an issue arises such as a suggested improvement or a new way of working, or a new tool, or a new output requirement then a review of the first 4S's is appropriate.

9. Challenges in implementation of Lean-Six Sigma in Health Care:

Implementing Lean-Six Sigma in Health Care industry can encounter many challenges as health care industry work differently than other manufacturing industries [27]. Main challenges which can be faced are discussed here.

9.1 Customer satisfaction

Implementing Lean-Six Sigma principles requires different mindset from management as well as employees of organization. Customer satisfaction is of very high importance in health care industry as it involves focus on various customer requirements and the services provided. Many times there is lack of resources or lack of time due to which poor service may be delivered to customers.

9.2 Changing customer numbers

There are lots of changes in customers who want to receive any kind of health care service. These numbers are not predictable and tend to change according to situation. For implementing Lean-Six Sigma getting this data is very important as implementation will be based on previous data.

9.3 Wide number of services

Health care industry offers wide number of services to customers and they vary from customer to customer. It becomes highly difficult to track record and deficiencies in these many services.

9.4 Lack of information

In manufacturing sector data between different processes can be recorded easily. This data does not change much and can be used for similar kind of different process. But health care industry has different information management challenges. Most of these challenges arise from:

1. Less attention to quality
2. Highly variable customer needs
3. Less attention towards data management
4. Lack of resources

10. Conclusion:

Health care industry is becoming very competitive now and implementing Lean-Six Sigma is very important to improve the quality of health care services. Lean-Six Sigma can be used to identify and rectify many wastes and errors in patient care and improve patient satisfaction.

This method can be applied in various departments of health care facility like emergency, primary care, radiology, information management, prescription errors etc. Also Lean-Six Sigma uses a data driven approach to fix problems and it creates continuous improvement in industry.

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Analyzing the Security Mechanisms of Online Banking Services in Saudi Arabia (Case study)

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Abstract - *Online banking is a new aspect of traditional banking for managing finances more quickly and efficiently based on internet technology. Securing funds and customer information are a key factor in online banking. This paper outlines the security problems in online banking then investigates the current security mechanisms and their corresponding security services. The paper aims to derive a defined set of security requirements to provide secure online banking services. As a case study, the paper analyzes electronic services of several major banks in Saudi Arabia and compares them with other international online banking services. Finally, this research aims to propose some improvements toward secure online banking services and discusses the impact of using advanced security mechanisms.*

Keywords: online banking, security, security mechanism

1 Introduction

Due to the advent of the internet technology and popularity of electronic services, online banking has flourish and became widespread. Since traditional banking is time consuming and paper based, developing online banking provides a new communication channel between banks and customers. It allows customers to access financial services from anywhere, any time, and with relative ease. Thousands or millions of banking transactions are conducted instantly and precisely.

Online banking provides several services; some are transactional like funds transfers and bill and loan payments, investments and loan. The other is non transactional like opening new accounts, viewing recent transactions and requesting a bank. Considering both types of services, online banking websites contain a wealth of sensitive information that can be quite tempting to attackers. Hackers have hence turned their attention to online banking. [3]

Developing fully secure online services is critical. Security services like authentication, access control, data integrity and confidentiality are extremely important. It helps banks to protect funds and personal information and to establish trust; thus gain and retain more customers. Security mechanisms are used to implement security services by protecting sensitive information from various security threats by detecting, preventing or even recovering from attacks. In particular, each specific security mechanism used to correspond to a security concern. For instance, encryption is used to achieve confidentiality, whereas digital signature is used to provide authenticity. [2] This paper is organized as the following: section 2 presents the background of online banking. Section 3 addresses the problem statement and section 4 summarized the research findings.

2 Background

Developing fully secure online services is critical. Security services like authentication, access control, data integrity and confidentiality are extremely important. It helps banks to protect funds and personal information and to establish trust; thus gain and retain more customers. Security mechanisms are used to implement security services by protecting sensitive information from various security threats by detecting, preventing or even recovering from attacks. In particular, each specific security mechanism used to correspond to a security concern. For instance, encryption is used to achieve confidentiality, whereas digital signature is used to provide authenticity. [2]

Many countries take advantage of online banking to accelerate their economic development [1], [2]. Saudi Arabia has witnessed rapid development in using communication technologies in general and the Internet in particular. Therefore, the environment is quite favorable for conducting online banking [9]. Indeed, most or approximately all banks in Saudi Arabia provide banking services electronically and allow customers to do financial transactions via the internet. AlMubasher Retail, Alahli Online, Samba Tadawul Online are some examples of the official names of Internet banking services. These services include retail banking, corporate banking, investment services, treasury services, and many others. Moreover, Saudi banks utilize the Internet as an information delivery channel to improve relationship with customers. [5], [6], [7]

3 Problem Statement

Implementing adequate security mechanisms are a key success factor that protects online banking services. Online banking in Saudi Arabia applied some security mechanisms to encounter security threats like two-factor authentication, cryptography, digital certification and firewalls. Nevertheless, security in Saudi online banking has much to improve! Several security breaches occurred in some online banking

services. For instance, unauthorized intruders compromised certain customers' login information by executing malicious code, or by exploiting backdoor vulnerabilities. Additionally, Saudi online banking has suffered from multiple security breaches like phishing and malicious software attacks. Also, the absence of non technical security mechanisms like customer awareness, poses real security threats to online banks in Saudi Arabia. [10]

As a case study, this research considers a set of popular online banks in Saudi Arabia from security perspective and outlines associated security problems. It investigates the online services as well as the current security mechanisms and addresses their limitations. In addition, the research uses an online survey to analyze customer trust and satisfaction on online banking services. For comparison purpose, the study will be extended to review several international online banks as well.

4 Research Findings

The study has utilized the survey method to measure customers' awareness and to determine the common security problems and the exposure area. The online survey has been sent to respondents randomly through the internet by email and different social networking websites for the online survey. The result showed that 4.5% of the participants had security problems related to their online accounts. Phishing was the most frequent security problems with the percentage of 62.5%. In addition, 15.7% of the customers had received an email, claimed to be from their bank, with a request to update their personal and account information. In contrast, 83% of the participants follow the security practices in dealing with their online accounts like running antivirus and firewall on their computers, accessing the online banking services through the official bank website and memorizing their login information.

The analysis of electronic banking services in Saudi Arabia revealed that banks use a considerable number of the security mechanisms to protect customers' information and funds in a certain extent. On the other hand, international banks use almost the same set of protection measure with some variations. [9], [10]. The Saudi Arabian Monetary Agency (SAMA) plays an important role in building a secure infrastructure for online banking services. It issues the e-banking rules and enacts legislations that provide guidance to banks on implementation of security controls in their e-banking products and services. Based on these rules, all banks in Saudi Arabia adopt the second factors for identity authentication as well as transactioal authintictaion . They use a secure messaging system when communicating with customers through SSL. Furthermore, sevral non technical security mesures have been used while conducting online banking servcies.

5 Conclusion

With the gradual usage of the online banking services, several improvements in the related security mechanisms are continually introduced. However, attacks are becoming more sophisticated and the mobile computing introduces new ways for attackers to get unauthorized access to sensitive data like personal and financial information. Thus, advanced security solutions must be used to defend against new attacks. Biometrics and PKI are the promise toward securing online banking in Saudi Arabia. [11]

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Success of E-Travel Services among Saudi Arabian Travelers

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Abstract *In the past decade, information and communication technologies (ICT) have led to an increasing impact on tourism industry. This industry is ranked now as the prime sector in e-commerce, where the Internet has changed the traditional way of providing travel services by developing e-travel services and enabling consumers to interact directly with tourism providers. Nowadays, more travelers prefer to make their travel plans and use travel services via the Internet due to its' convenience, low prices, simplicity of looking for information as well as its ability to save time. This research intends to investigate the level of success of online travel services among Saudi Arabian travelers.*

Keywords: e-travel, e-commerce, consumer behavior

Introduction

The online consumer behavior towards the technology includes three main elements: Intention, Adoption, and Continuance (figure 1).

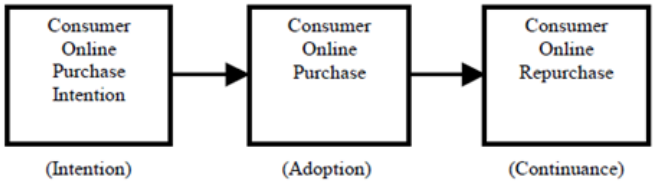

Fig1. Model of Intention, Adaption and Continuance[1]

The topic of online tourist behavior in terms of Internet use for travel planning has been examined under various contexts. Hongxiu [2] determined the factors influencing user's continuance intention to use e-travel services. The results of his study highlighted the importance of satisfaction in predicting the continuance intention to use e-travel services. Another study is conducted to examine the relationship between consumer's perception of e-shopping characteristics and their intention to adopt e-travel shopping [3]. Additionally, some studies addressed the tourist behavior in particular countries. Kamarulzaman [4] studied the Internet shopping adoption for travel services in UK, he identified the profile of Internet shoppers and the antecedents of Internet shopping adoption for UK travelers. Garín-Muñoz et al. [5] examined the Internet usage for travel information and shopping in Spain. They emphasized the factors that influence the use of e-travel services. Moreover, Vincent [6] has studied the international travelers' behavior in using the Internet, and applied his study to travelers from many countries. He concluded that time savings and convenience are the two main considerations of Internet users.

This study will also examine the online consumer behavior but in the context of Saudi Arabian travelers. It will assess the level of success of e-travel services by applying the DeLone & McLean Information Systems Success Model [7]. The level of success will be assessed using two factors: satisfaction toward e-travel services and the intention to use these services in the future. The key objective is to identify the current usage of the Internet for searching travel information and shopping. It will also study the impact of services quality on the adoption of e-travel services as well as the main factors impacting the success of e-travel services among Saudi travelers. The findings will help generate an understanding of the factors that are associated with the success of e-travel services, thus enabling policy makers and retailers to develop better strategies that will improve e-travel services for future users while keeping existing customers.

Finally, we plan as a continuation of this research to use an online survey questionnaire that will be conducted on existing travelers in Saudi Arabia. The questionnaire is designed to collect quantitative data that includes some questions based on background study while others based on secondary research. After collecting respondents inputs, a data analysis tool will be used to analyze the collected data.

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An Smart System for Future Strategic Exploration Focusing on Refinement of Keys, Contexts, and Results

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Abstract— *The remarkable development of browsing environments on the Internet and increase in Web pages has brought about a rich diversity of Web explorations. Continuous and strategic explorations such as those for surveys administered in research are especially important but pose difficult problems. This research proposes a novel system to support Web exploration focusing on refinements made to contexts. We obtained the main guidelines for this system from a relaxed scenario of information management around a personal desk. This paper mainly describes the outline of the system. Experiments using the experimental system are also described. Finally, the basic effectiveness and features of the proposed methods are discussed based on the results.*

Keywords: Refinement of search intention, exploration context, management of exploration result, information visualization

1. Introduction

Web exploration has become more popular due to the spread of the Internet and the rapid increase in the number of Web pages. Continuous and strategic explorations such as those on surveys administered in research are especially important but pose difficult problems. These types of Web explorations generally consist of searches using plural keys, reviews of search intentions, and management of the results obtained from explorations. It is difficult for users to skillfully implement these three together.

There have been several research projects on providing support for exploration to solve these problems. However, almost all existing research projects have only examined one of three important factors (i.e., examining clues for searches, understanding and improving search intentions, and managing exploration results) individually. Consequently, these methods have still not been effective enough.

The goal of this research was therefore to improve the efficiency of continuous and strategic Web explorations in practice. To achieve this goal, this paper proposes a smart system that cooperatively supports examining clues for searches, understanding and improving search intentions, and managing exploration results.

2. Problems and Support Policy

2.1 Continuous and Strategic Explorations

This research mainly targeted strategic explorations that are repeatedly carried out with a purpose such as surveys undertaken in research. Users start searches based on their ideas. Then, results obtained through searches are accumulated. The results in the process of searches and experiences obtained through past searches are often reflected in further explorations. Here, users may generally use search engines and chase hyperlinks as a means of discovering rewarding Web pages. They actually repeatedly carry out explorations using keywords and focus on Web documents. Such inputs and clues to searches are called *keys* in this research.

Exploration is gradually developed through trial and error. When users try various keywords, combinations of the keywords and their order of use may include their search intentions. Intentions in searches and their transitions are called *contexts* in this research. Users bookmark interesting Web pages in addition to beneficial pages that include target information. They often place annotations next to pages that have attracted their attention. They accumulate these bookmarks and annotations since they are also as important as advantageous pages. Moreover, these results occasionally become excellent keys to be utilized in further explorations. Such results that are represented by beneficial pages and annotations obtained in exploration processes are called *results* in this research.

It is extremely important to cooperatively manage keys, contexts, and results together and to skillfully utilize them to successfully accomplish continuous and strategic explorations. It is essential for users to understand progress in explorations and search intentions themselves and to refine these. It is also important for them to clarify unnecessary documents in addition to discovering useful documents.

2.2 Existing Research

There has been support for search navigation that has focused on the structure of Web as one kind of support for information searches [3]. This visually presented information in the surroundings of the page at which was currently being looked based on link structures and achieved navigation. However, the contexts until a user reached the page currently being focused were not reflected since this method targeted only one focused page. Moreover, there has been support that has paid attention to accumulation and the management of search keys [1] [4] [7]. These have supported selection of search keywords by extracting a user's tendencies in choosing keywords and relationships between keywords from search histories and presenting them to users. However, management of search results and their use were

not considered in this method. In addition, there have been support methods for reviewing search intentions and for reflecting the context to further exploration [6] [8]. These methods are interesting in that they targeted continuous exploration and changes in the intention of retrievals were considered. However, the management of retrieval results and their use was not sufficiently considered.

On the other hand, there has been support for management of retrieval results by using enhanced bookmarks [2]. This research aimed at enabling the past situation to be understood easily when bookmarks were recycled by preserving them and the situations in which they occurred together. This research is interesting in that it considered management of search results and their secondary use. However, this method did not directly support the discovery of profitable pages.

Thus, these existing methods targeted only one of the key issues in information exploration. Therefore, the effect of support on continuous and strategic exploration is limited at present.

2.3 Support Policy

Based on these considerations, the three main problems with continuous and strategic exploration are as follows.

(Problem 1) The difficulty of understanding and refining search intentions and circumstances.

(Problem 2) The difficulty of discovering rewarding documents.

(Problem 3) The difficulty of identifying unnecessary documents.

This research aims to solve these problems by development of methods for supporting practical exploration based on the total consideration of main issues. Our final goal is to implement a smart system that enables refinement of key, contexts and results. To realize the system, we develop the following algorithms.

- Algorithms to recommend advantageous documents.
- Algorithms to identify unnecessary documents.

We initially design an experiment system for careful investigation to develop algorithms based on experiments. This system provides serviceable space for user's refinement of search intentions.

3. Smart System for Strategic Exploration Focusing on Refinement of Keys, Contexts, and Results

3.1 Design

Figure 1 shows an overview of an environment where a user conducts information exploration using books and its management. After a user explored information by trying many books, there have been traces remained around the personal desk. Generally, only the explorer can understand the meanings of traces by him/herself. For instance, a user generally arranges books as being comprehensible for reuse. A user often underlines the important parts in those books and writes sticky notes. Although the room seems cluttered at first glance, such a space is convenient for the owner.

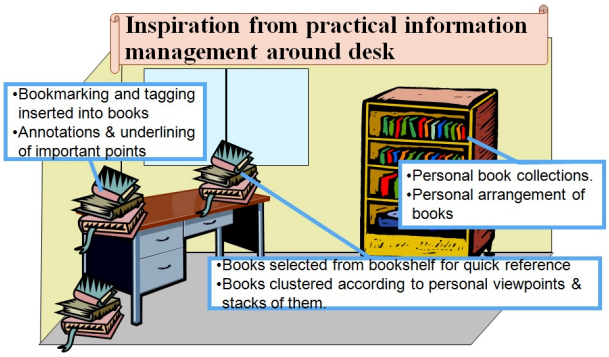


Fig. 1: Comfortable personal space for exploration

This research has been inspired by this scene and aims to develop a smart software system specialized for Web exploration and refinement of key, context and result in it.

A system for conducting experiments was developed that preceded a study on algorithms for recommendations of documents based on analyses of user behaviors in that environment. Figure 2 has a screenshot of the interface for the experimental system, which is composed of a support area for Web searches with keywords and a support area to manage exploration contexts. First, a user conducts Web searches using the search area. Results are presented in a form that resembles those obtained from existing search engines. This function was implemented using a Web services provided by the Yahoo! Developer Network. Pages that he/she discovers are registered in the database when he/she presses a button located on each page. Next, he/she moves to the management area. Here, he/she refer to registered data presented in list form as shown in Figure 3. A user can arrange them as icons by dragging information from the list.

Thus, this system enables user to manage keys and results obtained in Web exploration considering its contexts by freely arranging them as icons.

3.2 Recommendations for benificial documents

A user has always some ideas such as the aim when conducting the explorations and can arrange keys and results as icons on the experimental system. Then, it is though that icon clusters composed by a user through exploration express the contexts which include his/her intentions and passages in searches with trials and errors. Therefore, it is possible to extract tendencies in keywords selection and transitions in what a user wanted by analyzing the arrangements of icons.

In this research, we aim to develop algorithms so that the system recommends profitable documents to a user based on such analyses. For instance, it is possible to generate the candidates of search keywords by comparing the characteristic words extracted from each documents belonging to a cluster and footprints of keywords used when an explorer discovered those documents with. As a result, the system can promote the discovery of new documents that a user has not found by presenting the candidates of keywords. Moreover, we can analyze the relationships between the clusters by observing how they have been used. It is expected that such

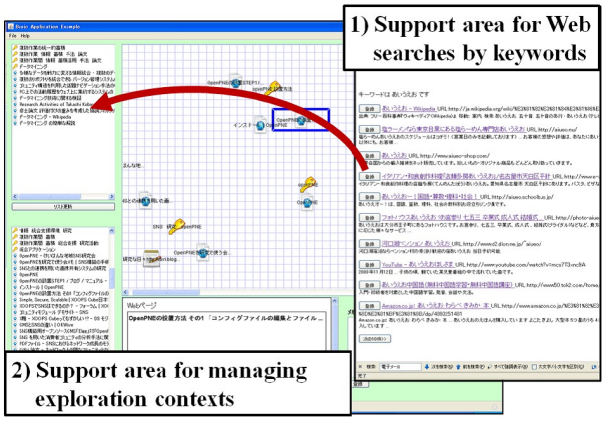


Fig. 2: User interface for experimental system

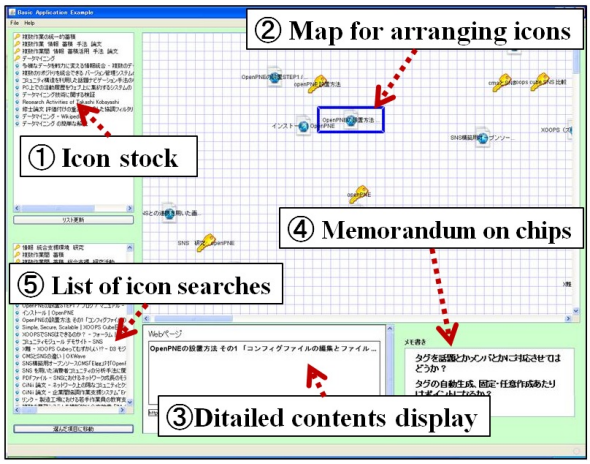


Fig. 3: Support area for managing exploration contexts

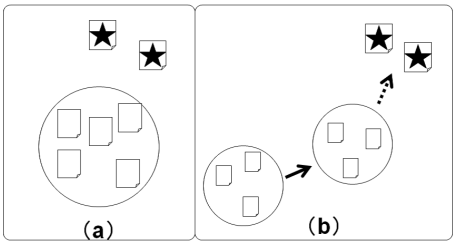
analyses enable to estimate beneficial documents considering the connections between topics.

4. Experiments and Discussion

4.1 Overview

The aim of the experiments was to assess the basic effectiveness of the algorithms, extract the features of the prototype system, and identify problems. After receiving the explanation how to use the system, he used the system for the purpose of administering a survey for his own research. We asked him to conduct Web explorations using the system until obtains about 100 pages that he wants to keep. We also asked him to arrange their results and keys as icons using the functions of the system while explorations. We observed the flow of works and features of icon clusters. We then generated the candidates of cluster for assist of manual arrangement and conducted recommendation of profitable pages. Finally, we examined the validities by his manual checks whether our estimations matched to his thinking.

[Experiment 1] Icon clusters was generated based on the analysis of the distance between icons. On the other hand, after exploration using system we asked the subject to write down the clusters based on his own thinking on an icon map that he arranged while exploration. Figure 5 shows the overview of clusters drawn by subject. Finally, we examined



(a)Recommendation of similar document to content of cluster
(b)Recommendation of document that considers use passage

Fig. 4: Recommendation of useful documents based on analyses of arrangements of exploration contexts

the validities of our estimation by comparing our clusters with those of the subject's.

[Experiment 2] Beneficial documents were recommended to the subject based on the analyses of clusters and histories of their use. Keywords were estimated by comparing the characteristic words extracted from each documents belonging to a cluster and footprints of keywords used when the subject discovered those documents. Then, promising documents were obtained via search engine using the estimated keywords and presented to the subject.

Three clusters with numerous elements were chosen as target clusters for analyses and two kinds (2A and 2B) of recommendations were conducted. Figure 4 shows how valuable documents were recommended. Experiment 2A focused on a single cluster as a target of analyses to estimate better keywords. Experiment 2B took into account the transitions in the use of clusters. The subject assessed for each case whether the recommended document was beneficial.

4.2 Results and Discussion

[Experiment1] Table 1 summarizes the results from experiment 1. The results for precision and recall were excellent. These accuracy levels are nearly enough to implement the support function to automatically estimate the cluster so that a user can easily arrange the icons using the suggestion by the system. However, these results seem to include any luckiness that the subject's arrangements of icons considering passages were well conceived by chance. It is sometimes difficult to estimate the clusters fit to each user since people tend to arrange passages differently depending on who they are. For instance, when one collectively manages what they found while at the work, this is not necessarily the same topic that is nearby. Therefore, it is necessary to further investigate clustering method from various aspects along with positioning of the services provided by the system for the whole work done by the user.

[Experiment2A] Table 2 summarizes the results from experiment 2. Precision was reasonable. More concretely, the first had a high degree of precision for the three target clusters in the experiment and the other two had a low degree of precision. We carefully examined the actual situation and understood that keywords the subject had chosen by himself were included in the extracted characteristic words

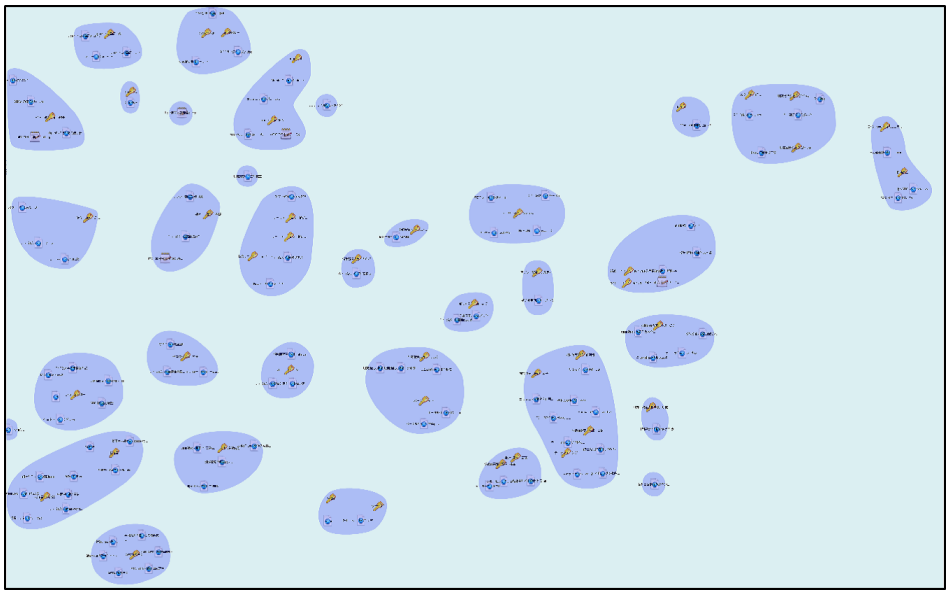


Fig. 5: Overview of clusters for exploration results drawn by subject in experiment

Table 1: Precision, recall, and F value of experiment 1

Precision	Recall	F value
0.91	0.94	0.93

Table 2: Precision of experiments 2A and 2B

2A	2B
0.53	0.43

when examining clusters that had low degrees of precision. There may not have been many really new documents in the recommendations from this reason. Moreover, there were some irregular cases that sentences had been extracted as keywords. These facts suggested that more detailed settings on keyword extraction will be important to improve accuracy.

[Experiment2B] Precision was lower in experiment 2B than in experiment 2A. However, there is a room to improve accuracy because this experiment was conducted only with simple methods. This result was meaningful enough as an initial step and is worth further investigations considering that it was an advanced recommendation. There was fairly much difference between the precisions depending on pair of clusters. We carefully examined the actual situation and understood that the reasons similar to those of experiment 2A had caused this phenomenon. Moreover, it was currently not possible to satisfactorily detect the connections between clusters in complex situation since this experiment estimated the connection based on the analyses only of the history of arrangement of icons and distance between clusters. For example, there was a peculiar situation that the subject suddenly changed the topic in search but arrange the both results of old and new search nearby each other as icons. Such a situation is clearly out of scope for current method. It is important to further investigate methods for detecting the connections between clusters considering some clues such as user's behavior in reviewing and moving icons.

On the other hand, various opinions were able to be obtained. For instance, "the whole map was not easily understood," "the information hold by each icon was not easily understood," and "key words should have been left even if the page was not saved." These opinions are valuable to improve the system.

5. Summary

This paper mainly described the outline of the smart system for strategic exploration and its aims. Experiments on the estimation of icon clusters and on recommendations of useful documents based on analyses of user arrangements of exploration contexts using an experimental system were also described. The results of experiments have shown the basic effectiveness of algorithms and features of the system. Future works include development of algorithms that consider the factors from various aspects to obtain better precision, investigation on timing in providing supports, and careful experiments through practical use.

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Group Profiling in E-Service Portals

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Abstract - *Nowadays Service activities are social and involve different types of individuals that should be considered. Thus, group profiling can be used to connect similar customers together and recommend providers based on group evaluation. Accordingly, this paper proposes a new approach that recommends providers, based on group profiling and ranking, to be used in e-service portals. This approach focuses on group profiling and cluster users based on Ant Colony Clustering (ACC) method. In addition, the approach has been tested and three measures have been recorded including speed, aggregation precision, and result accuracy. The result of such test has shown that this approach is promising and has a high quality result.*

Keywords: Group profiling, search recommender, e-service portal, Ant Colony Clustering, Evolutionary Algorithm

1 Introduction

Nowadays most of the existing e-service portals focus on individuals rather than shared circumstances in which searching is affected. Service activities are social and involve different types of individuals that have not been considered. Consequently, customers face a major problem when accessing an e-service portal; which is selecting the best provider for their needs, especially if more than one provider offers the same services. A customer must search for all providers, compare their prices, check older customers' reviews, and many other characteristics. Such process consumes a lot of time and energy in addition to the possibility of not choosing the most suitable provider. Thus, a recommender system has been proposed to solve such a problem.

It has been found that most of the available researches in recommender systems concentrate mostly on the filtering process. Behavior and characteristics of users were not considered when recommending similar searching results. They only considered the users' searching key words while characteristics, such as age and religion, and behavior, such as spending habits, have been neglected. Moreover, even if profiling is used, they usually profile an individual, and then during the filtering stage grouping are applied. Such process wastes a lot of time because grouping will be conducted every time the user sends a query. It also causes some privacy concerns since all individual profiles must be maintained. Thus, this study suggests a new approach that recommends providers based on group profiling and ranking, to be used in e-service portals. For each group of people one profile will exist to contain similar individual property and then when a new user sends a query his profile will be built and compared to the group's profile instead of all individuals.

The suggested approach is mainly divided into two steps. First, it generates the group profiles. Then, whenever a user tries to search for a provider, a different result will be recommended depending on the collected data; such that when a new customer that shares the same characteristic of a certain group searches for a service provider, then, based on his/her group ranking, a recommended result will be returned. Thus, customers would most likely find the appropriate provider more accurately and in a shorter time period. The behavior, characteristics, and context of users have been considered as profile content in addition to the users' feedback and ranking of the used providers. Thus, purchasing behavior, time, and location of customers is used in addition to other characteristics of users, such as age and gender.

This study focuses on group profiling and clusters users based on the Ant Colony Clustering (ACC) method [1], which is a new type of clustering that is based on an Artificial Intelligence algorithm called Ant Colony Optimization. Such method optimizes the clustering process by working in a similar manner to how ants look for the best road of food; however, it looks for the most appropriate cluster instead. Ultimately, it can be said that the proposed approach will contribute in reducing the time of profile matching, improve accuracy of searching e-services, and increase the security.

This paper is organized as follow. First, general background will be presented and the main aspects of the topic will be discussed. Then, the details of the proposed approach will be explained. Afterwards, the materials and methods used to evaluate the approach will be identified and explained. After that, the result of such an evaluation will be presented and clarified. Finally, this paper will be concluded and its contribution will be summarized.

2 Background

Due to the growth of internet usage e-services have been increasingly popular. E-service has been defined as "*an entity available via the Internet that completes tasks, solves problems, or conducts transactions"* [2]. It has been stated, in [3], that the number of customers communicating with organizations and their transactions through e-services is increasing dramatically every year. As a result, portals have been used to facilitate customers' need through e-services. Portals have been defined as one single point access or gateway for different services through the web [4]. Consequently, an e-service portal is a gateway for services that is available online. Such gateway hosts different service providers that offer different, or even similar, services.

Portals offer different service categories for different providers [4]. It has been found that portals must respect customer demands for personalization services to improve the market [5]. Thus, a major problem that customers face when accessing an e-service portal is selecting the best provider for their need, especially if more than one provider offers the same service. A customer must search for all providers, compare their prices, check older customers' reviews, and many other characteristics. Such process consumes a lot of time and energy in addition to the possibility of not choosing the most suitable provider. To solve such problem a method called profiling can be used. Profiles have been defined as a representation of user behavior that is organized and managed in a way that is suitable for the required domain; such that, it is a knowledge that is formed as a reason of turning data into information, to distinguish between relevant and irrelevant behavior [6].

Profiling has been divided into different types, depending on the output requirement. However, since the motive of using profiles in e-service portal is to find common features between customers and categorize them, then group profiling method should be used. A group profile *"identifies and represents a group (community or category), of which it describes a set of attributes"* [6].

Besides that, recommendation is considered as a typical personalization technique, which consider different users' preferences and needs [7]. Personalize recommendation is a key tool in website services. It have been stated in [8] that personal services are significant to the success of the current business field; thus, recommendation improve the growth of e-commerce marketing activities. In addition, since e-service portal recommendation will present different providers depending on different tastes, it will reduce searching for interesting providers and also enhance e-commerce by increasing cross-sell, converting browsers to buyers, and increasing customers loyalty [8].

Using profiling in recommendation will grant general overview of the massive data available. It will facilitate information retrieval and simplify the searching process, and, thus, personalization. Moreover, using profiles will ensure achieving the required goal efficiently and easily [9]. In addition, group profile content usually anonymous and, thus, its individual's information is protected more than individual profiles.

3 Proposed Approach

In order to improve the quality of e-service portals an unsupervised approach, which works without previous examples, has been developed and applied. Such an approach guarantee that any behavior can be considered and simplify the process of profiling because there is no need for samples to be collected or expert users to be hired. The proposed approach is mainly divided into two steps, first group profiles must be generated then, whenever a user tries to search for a provider, a result will be recommended depending on the data collected.

In first step, in order to profile users, different kinds of data are acquired and refined explicitly and implicitly. Then, users' profiles are clustered based on Ant Colony Clustering method in order to aggregate their characteristic later on. Finally, group profiles will be generated in XML files to be used later on in the matching process when a user sends a query. However, the second step, which recommends providers, is activated when ever a user send a query to match his characteristics with the aggregated profile and, thus, return the providers ranked list. The Details of such an approach is illustrated in Figure 1.

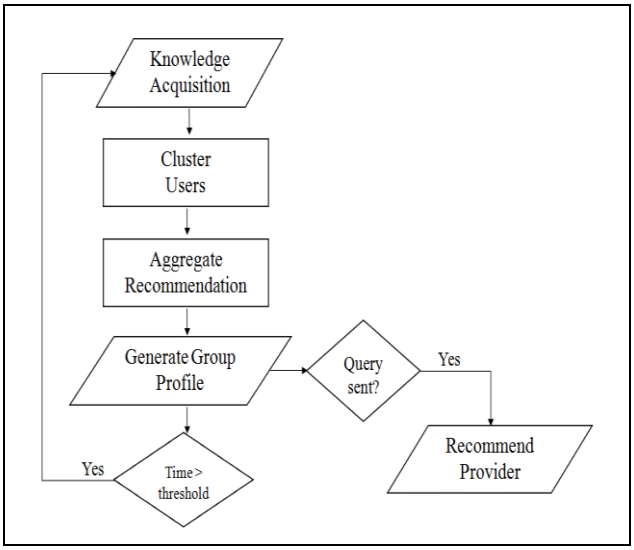

Figure 1 : Proposed approach

It must be noted that this paper focus more on group profiling because recommendation and filtering have a rich background and different improvement have been made in that area while, on the other hand, group profiling is still emerging and not a lot of works have been done in that area.

Such an approach has contributed in the area of e-service portals in many ways. It has considered the long and short term interest; such that it does not always update and re-execute the whole process. Only the matching step is repeated with every query; however, the rest is done once and updated every period of time while its result is stored in XML files. Such decision reduced the time tremendously without affecting the accuracy and, also, improved the scalability and accuracy of the recommendation. In addition, the use of XML files has simplified and speedup the process of matching because XML files structure is based on tree representation; thus, group profiles are easily searched and, thus, information can be quickly fetched.

In addition, when the knowledge is acquired to buildup groups' profile, three different types of customers' data have been considered: characteristic, behavior, and demographic. This would increase the matching accuracy and improve the results' satisfaction. On the other hand, available works did not consider the behavior and characteristics of customers, only key words matching of customers log files have been used.

Moreover, even though collaborative filtering is mostly used in recommendation process, however, it suffers from the problem of cold start, reduces the security, and increase the time needed to match all customers. In the proposed approach, however, group profiling was used instead, such that aggregation is used instead of collaborative filtering. This will guarantee customer privacy, and reduce matching time. In addition, to further improve the result and avoid the cold start and due to possibility of preference conflict, all providers are viewed to the customers. However, the ranking of the providers is different depending on the customer's criteria. As a result, personalization is considered with the possibility for customers to choose other than what the portal recommends. Thus, such process is decision support for the customer rather than decision making on behalf of the customer.

4 Materials and Methods

In this study, the quality of the proposed approach has been evaluated and tested. It was implemented with Java language in JBuilder environment. The experiment was conducted on a PC with Intel®Core™ i7 CPU, 2.67 GHz processes, and 6GB RAM. In addition, a synthetic database has been used with the experiment. Such database contained the customers' information, their rankings of providers, provider and service information, in addition to the default ranking of each provider. During the experiment all the parameters were unchanged, except for the stop condition. In addition, two types of queries have been used. The first one is for a registered customer, i.e. full characteristics are available, while the second is for a new customer, i.e. only time and place are identified. Additionally, ten trial runs have been recorded, to measure the performance of the proposed approach; each trial has a different stop condition starting from 1000 to 2000.

5 Results

In order to evaluate the result of the experiment three types of measures have been calculated. The first measure is the matching speed, which records the time of fetching the query result. The second measure, however, records the precision of the profile aggregation to assess the percentage of profile aggregation precision in term of characteristic match. The third measure, on the other hand, assesses the result accuracy compared to the target user profile.

In Figure 2, the time taken to execute the matching step is illustrated. As it can be noticed the algorithm usually takes a few milliseconds (less than half a second) to retrieve the required result, either when the customer is registered or not. Such result is required because when customers are searching they do not like to wait for few seconds to see the result.

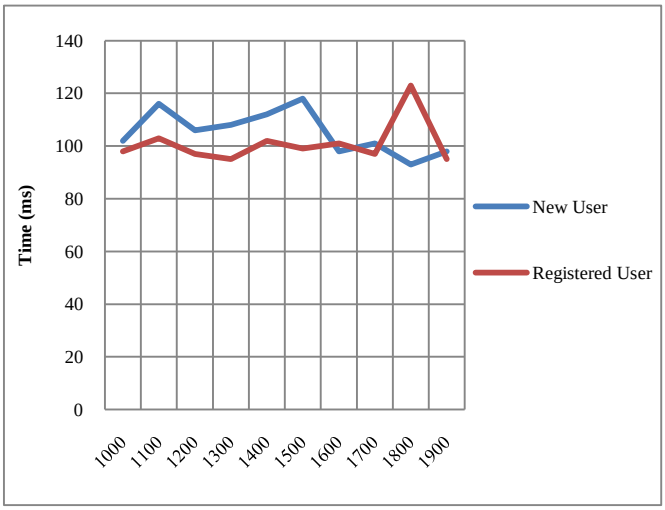

Figure 2: Matching speed

Additionally, the aggregation precision between the cluster profile and its customers is illustrated in Figure 3. As it can be noted from resulting clusters that such algorithm is very accurate; such that the aggregation precision ranges between 98% and 99% which is a very good percentage.

Finally, the resulting cluster profile has been matched with the target customer profile in each trial, as illustrated in Figure 4. As it can be noticed there is a difference between the result of the registered, and that of the new customer. Such difference is resulting from the lack of information when the customer is new (only two characteristics can be used in the matching process). As a result, it is recommended to get the customer information before the query execution in order to achieve a more accurate result.

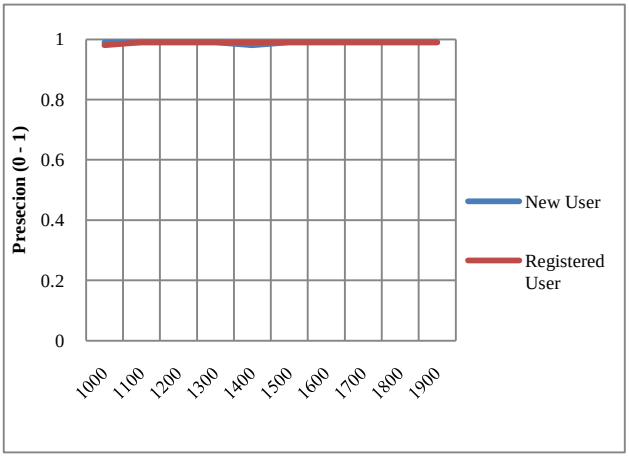

Figure 3: Aggregation precision

Moreover, as it can be noticed from Figure 4, the accuracy of the result, when the customer is registered, is very high (100%), i.e. a matching profile has been found and extracted.

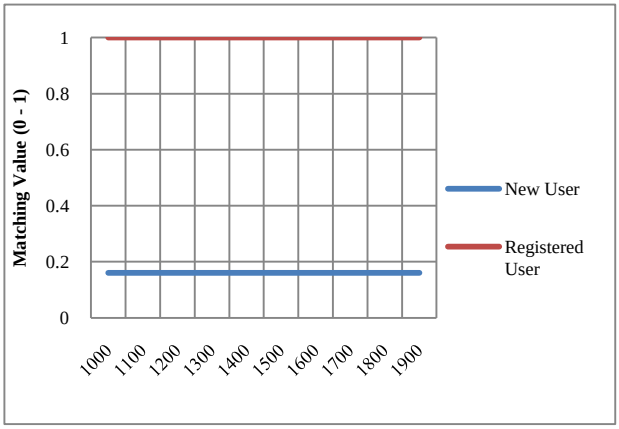

Figure 4: Result accuracy

6 Conclusions

Since existing e-service portals focus on individuals rather than shared circumstances, this study has proposed a new approach that considers the group behavior in which searching is affected. The proposed approach has contributed in reducing the time of profile matching, improving accuracy of searching e-services, and increased privacy preservation since specific details of individuals will not be preserved. Consequently, profiles have been dynamically constructed with a hybrid profiling technique and a mixed type of content without the user intervention. In addition, as a result of implementing the proposed approach, it have been found that, for either unregistered or registered customers, the matching speed and aggregation precision result is very good. Such that, the matching process only takes less than half a second while the aggregation precision is, on average, 99% accurate. On the other hand, the result of accuracy test has shown that, in contrast to registered customers, unregistered customers may get inaccurate results due to the lack of information. Thus, it is recommended to urge the customers to enter their information or register in order to improve their search results. However, in general such approach has shown promising enhancements and it would be interesting to apply it on real customers with real data.

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APPLICATION OF LEAN AND ROBUST DESIGN IN ENERGY

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***Abstract*— Energy and Environmental issues are worldwide concerns. Energy saving is, without a doubt, the most effective strategy for environmental protection. A number of energy programs are being conducted everywhere, their sole purpose being to seek reduction in energy wastage and increase energy efficiency. As the field of energy management matures, so must the tools and practices available to ensure the energy required by an organization is used in the most efficient way possible. In the past, energy management practices consisted primarily of replacing inefficient equipment, then using various methods to estimate the savings gained. Now industries are coming up with various new ideas for process improvement, as well as inculcating them through practice.**

In recent years industries have been more inclined toward effective "Lean Manufacturing Systems". Many have been highly successful at increasing efficiency, reducing costs, and improving customer response time. This has also contributed to improving quality, profitability, and public image; some companies have committed to reducing negative impacts of their operations on the environment. These practices have resulted in "Energy Efficient" Systems. These systems have caused incredible reduction in energy consumption, waste generation, hazardous materials utilization, and have bolstered the companies' images as socially responsible organizations.

This paper will observe the present energy scenario in different sectors, as well as state some facts regarding energy. Then it will progress with a discussion on where we are now in terms of energy and the progress in renewable energy. This paper will focus on how lean tools are helpful in energy waste reduction, and how they eventually improve energy efficiency. Various Lean manufacturing concepts and their applications in the Energy sector will be discussed, as well as the relationship between industry processes and energy, and how to reduce energy consumption by applying Lean Manufacturing concepts currently used in other industries.

***Keywords*— Lean**

I. INTRODUCTION

The process of creating and making statues has been around since the starting age of humankind. It was implemented first for survival: weapons, shelters, clothing and farming. These implements were improved upon with the appearance of such invention as fire, the wheel, and steel and as time went on they became more substantial and more suave. As evolution of mankind and societies happed from being local one to regional ones, parallel transforming their local economies in to regional ones. In the starting, these transformations took hundreds to thousands of years. Since the start of industrial revolution about 300 years ago, since then human being striving for energy and development of energy efficient tools even weapons [1].

Time has come to develop new alternative energy source, energy industries are on the verge of need of alternative energy source for their present and future [6]. In the year 2008-2009 world crises made government to think over the cost cutting and budget analysis in different sectors. Government try to stimulate their economics with the projects available and indemnify money [7-8].Usually, this stimulus money is made to spend soon and also made to boost up this industry so that it will full fill America's future as energy independent state with minimum green houses gases generation[10].

There are several obstacles; those should be eradicating to dominate U.S as an energy independent nation. The most and primary sources of green house gases generation in the U.S is electricity generation industry and transportation. The success is of nation is highly depends upon to move these industries towards efficient use of energy.

The primary source of energy in U.S is fossil fuel. Historically, over 70% of U.S. electric generation has relied on fossil fuels [11]. Of course, the infrastructure in place to obtain the raw fuel sources, produce, and distribute this electricity represents enormous investment by utilities and government over many decades. Many more services have to remove and remediate after they went out of service. And the electric generating capacity removed will have to be replaced with investments in new alternative energy sources such as hydroelectric, solar, wind, or geothermal power facilities. Obviously, this involves a huge commitment of funds over a very long period of time. The automobile industry is infamous for developing and marketing high efficient vehicles and American geo-social development is on biggest assumption that they can move about with cheap auto transportation .Hence, mass transit system in the major area of U.S is not available or lack of getting them. If we get some portion of mass transit in cities like others, than they are either out of state or less efficient. Pressure is now growing on the U.S. automotive industry to develop higher-mileage fleets and

to bring to the market alternative-fuel trucks and automobiles [2-12].These developments are also supported by the Obama Administration's stimulus package.

Companies are also now shifting new technology towards energy efficient; products developed by them are also green in nature. Development of more effective and efficient technologies requires great investment in research and development efforts and time for these efforts to result in usable products. Without more efficient products, the costs of alternative energies will remain high relative to the costs of traditional, high-polluting, existing technologies. Alternative energy source product producer must improve their cost to benefit ratio. Research may result in improved efficiencies of photovoltaic solar panels that reduce the KWH costs of electricity produced on solar systems. Research may result in improved battery storage systems that help bring down the cost of electric cars. Research may lead to breakthroughs in hydrogen fuel production that can lead to reasonably priced fuel cell cars. These researches and other research based will prove great help to develop U.S nation economy and environmental sustainability.

A different approach to improving cost to benefit ratio of alternative energy includes changing manufacturing techniques of worldly engrossed industries that do not take care of energy as a part of daily living. The enhancement by any mean either energy improvement tools or any methodology will be proven very helpful for future of nation. Over the past two decades, programs designed to reduce the costs of manufacturing have been implemented by many world-class manufacturers, including Toyota, Boeing, and Bausch and Lomb, to name but a few. Collectively, these programs are called Lean and Green Manufacturing Systems and are intended to remove wasted materials, labour and energy from the production system and, thereby, foster reduced total cost of production and being environ friendly.

Other companies are tracking their reports and impact to the environ due to operations. These companies are implementing what has been called Green Operations Systems in order to reduce or eliminate the wastes produced by their operations [5].

The right time has come to for manufacturer to implement tools to save energy and environ from the disaster. Application of Lean system and Lean energy system is become must for these reasons. The synergy of both will give maximum cost –benefit by taking care of environment as a part of daily living. Nothing less than company survival and long-term sustainability of the U.S. economy rests on these efforts.

II. LEAN

Lean word originated from Japanese word and means reduction of waste from the in the given system. If lean is combine to the manufacturing called lean manufacturing, there is means reduction of wastes from the manufacturing methods, processes and operations. If lean combines with energy then there it means reduction in wastage of energy, it can be from any of the source. It can be apply even in day today life. It is found that energy used in the manufacturing industries increased by 9.85 % by year 2006[3]. Government try to incorporate new system which can reduce the energy substantially.

Lean basically comprise of various tools which are were and will be used like Given below:

1) Lean six sigma: This is very good tool for the process improvement.
2) TPM: It is knows as total productive maintenance. This tool is very good to sustain standard and remove randomness from the system.
3) MUDA: It is Japanese term and means waste. This is to target on the wastages particularly in the manufacturing process.
4) TQM: This is knows as Total Quality Management. It is very good to sustain standard of quality. It has basic tools like Quality Function Deployment (QFD) and Voice of Customer (VOC) to collect the information related to Quality.
5) Kanban : Japanese term used generally in JIT approach.
6) JIT: Just in time approach .This is used in the manufacturing concept.

III. LEAN PRODUCTION SYSTEM

It is found [13] that most advance model related to Lean system exist in Shingo Prize model [14]. Shingo Prize is based on manufacturing excellence model and such name is given based on Japanese industrial engineer Shigeo Shingo, who distinguished himself as one of the world's leading experts in improving manufacturing processes. The Shingo Prize, was found in 1988, promotes awareness of Lean manufacturing concepts and recognizes Companies in the United States, Canada, and Mexico that Achieve world-class manufacturing status [15].

Singho Prize model is based on principle to find world class techniques from world class companies to achieve world class results. Factors and Criteria used by the Prize Committee evaluators are based on leadership, organizational culture, empowerment, manufacturing strategies, system integration, quality, cost, delivery, and customer satisfaction. There are three rounds of passing this prize. The highest score group will be getting chance to visit one or five expert group of examiners All applicants who receive a site visit will be publicly recognized as Finalists. Recipients of the annual Shingo prize itself are selected from this prestigious group [13, 14].

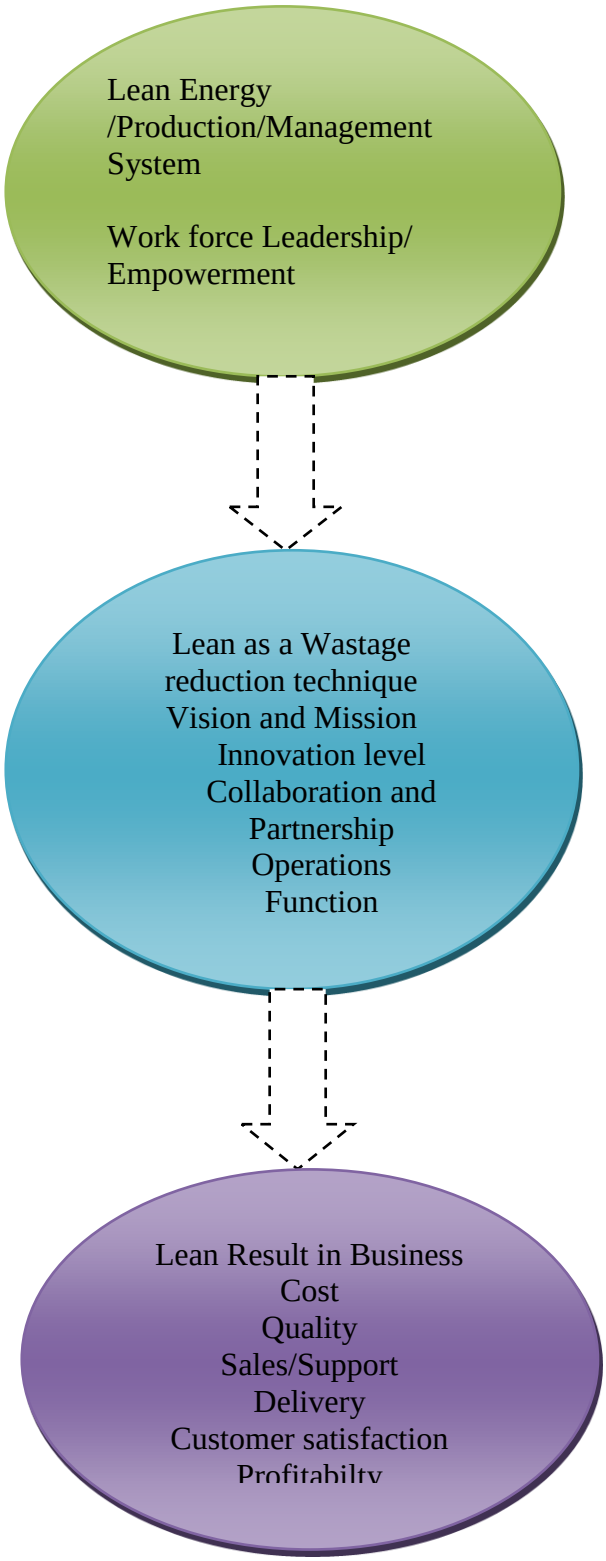


Fig 1[2].Lean Model

The advance lean system shows in figure.1 synopsizes illation of different sources and theories in to one model. Each category associated with Lean for one or different purpose. Lean wastage reduction techniques which contains operational techniques like Total Productive Maintenance (TPM), 5S, Lean Six Sigma, Total Quality Management, Kanban etc. This kind of model can be applied to anywhere it may be to supplier, manufacturer (in house) or even to reduce wastage in the energy that might be consumed by machines or plant. The advance lean model shows that company should deploy their vision and mission to the down level. If man power is self motivated then they will give maximum out put and minimum loss of energy and material.

The Lean as wastage reduction techniques:

Main techniques are

1) Product Redesign
2) Process Redesign
3) Assembly Dismantle
4) Substitution Reduce
5) Recycling
6) Alliances
7) Remanufacturing
8) Waste Segregation
9) Consume Internally
10) Creating Markets
11) Prolong Use
12) Spreading Risks
13) Returnable Packaging

Business feedback will be in term of quality, waste reduction and customer satisfaction when lean is applied to the system.

IV LEAN IN ENERGY

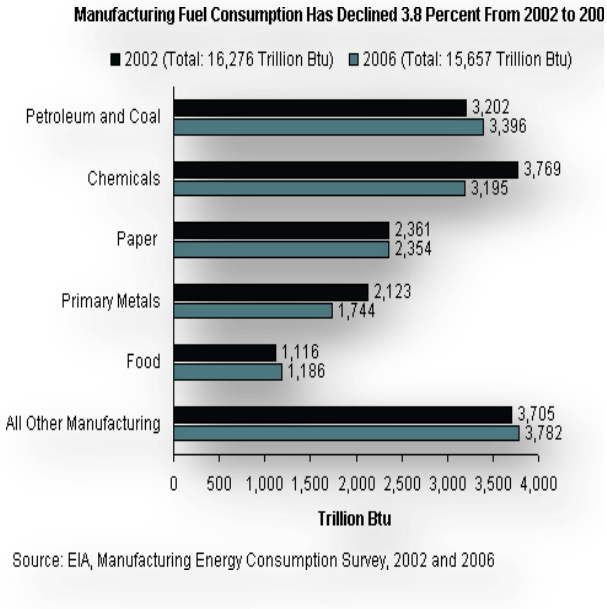
In order to reduce the amount of energy usage and wastage one must apply lean strategy to the concern field of application. Many companies have applied lean strategy and inculcating this practice in to their production system and reducing wastage of energy.

A Baxter International facility saved $300,000 in energy costs in one year[3]

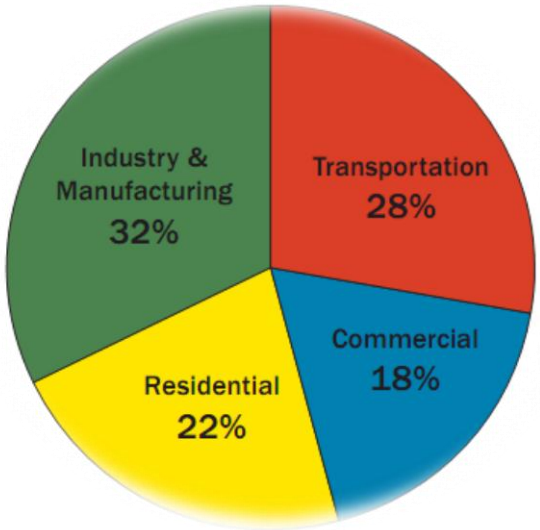
General Electric has reduced greenhouse gas emissions by 250,000 [3] metric tons and saved $70 million in energy costs since 2005 at facilities worldwide. [3]

Toyota Motor Manufacturing North America reduced facility energy use and greenhouse gas emissions by 30 percent per vehicle since 2000 [3].

Fig (2) shows the energy consumption in various fields it has decreased from past 2002 and reduced to 15,657 Trillion Btu in year 2006. This is because of consciousness of companies for energy usage for upcoming future. It has been found approx 3% of energy usage reduction in the year of 2006 compares to past year 2002. Though total energy consumption is decreased, energy demand in manufacturing, petroleum and coal and food are still on the hike and demand.



Fig(2)[4]: Energy consumptions in various fields



Fig(3)[4]Source: U.S. Energy Information Administration, Annual Energy Review 2005, Washington, DC, July 2006. www.eia.doe.gov.

Fig (3) shows that out of 100% of usage of energy, maximum energy usage is in the industry and manufacturing and if we target these industries then we can reduce the energy demand in this area which can be compensated for others.

LEAN ENERGY ASSESSMENT STRATEGIES

It is very important that we use particular assessment technique for tracking of energy loss in the various fields. Lean and energy assessment strategies involve observing shopfloor activities to identify signs of energy waste, measuring actual energy use and costs over time, and implementing energy savings Type of strategy can be,

a) *Energy Treasure Hunts:* This kind of energy assessment technique performed by using cross functional teams in entire plant of industry to find energy losses. This can be tow to three days.

b) *Value and Energy Stream Mapping:* Integrate energy-use analysis into the Lean value stream mapping process to identify improvement opportunities within the context of the entire "value stream" of a product or service.

c) *Six Sigma:* Using Statistical tool to control processes and hence energy usage.

d) *Energy Kaizen Events:* It has been done using plant employee .In this event number of ideas generated to capture energy losses irrespective of object, process or anything which deals with or without energy fields.

LEAN AND ENERGY REDUCTION STRATEGIES

Lean is basically is the tool by which losses have been captured. This tool has further broad classification such as different strategies discussed below.

a) *Total Productive Maintenance (TPM):* Autonomous maintenance is the best practice to maintain any of the machines on the shopfloor. It is must to have good maintenance of machines in order to make sure reduction in wastage of energy.

b) *Right-Sized Equipment:* Replacement of unnecessary sized equipment effects usage of energy most hence try to reduce size from bigger to smaller.

c) *Plant Layout and Flow:* Product flow is necessary in any of the manufacturing unit. It is necessary to have good plant layout hence it will be reduction in the wastage of energy indirectly.

d) *Standard Work, Visual Controls, and Mistake-Proofing:* Sustain and support additional Lean and energy performance gains through standardized work procedures and visual signals that encourage energy conservation, and by making it easy or "mistake-proof" to be energy efficient.

In addition there are most effective factors which are indirectly part of energy usage and wastage called "deadly waste". We need to compensate and reduce the overall effect of these factors. These factors are

1. *Overproduction*: This is very common in any of the manufacturing industries. This will cause wastage of resources such as man, money and machine. Moreover, this will also serve directly or indirectly as a part of energy wastage.
2. *Inventory:* This is very second stage of overproduction .If we have overproduction, it is natural tendency to have more inventory hence again wastage of resources.
3. *Over processing:* This is something which effects directly to the energy.
4. *Transportation:* If industry is not conscious enough and not efficient enough in transportation then it will effect energy wastage in terms of fuel and hence money.
5. *Waiting :* This will effect most of the time to overall production system.

6. Motion: Unnecessary motion will be inturn of wastage of human energy as well as time and hence money.
7. Defects : Number of rework and defects are directly proportional to usage of machine and energy hence it should be avoided .

V. ROBUST DESIGN

The goal of experimentation in manufacturing is to devise ways to minimize the deviation of quality characteristics from some target value. This can only be done by identifying those factors which affect the quality characteristics in question and changing the appropriate factor levels so that the deviations are minimized. In other words, from a quality perspective, experimentation seeks to find what the best material is, what is the best pressure, what is the best temperature, or chemical formulation, or cycle time, etc. Which will operate in concert with our process to produce a desired. or width, or durability, etc., taking cost into account. With this, robust design classical definition can be defined as "*Design of a product so that its functionality varies minimally despite of disturbing factor influences"*[16].

Dr.Taguchi's approach to design of experiments utilized techniques that are cost effective and directly applicable to the problems and requirements of modern industry in product design , to find a combination of factors that gives the most stable and reliable performance at the lowest manufacturing cost. The Taguchi approach is an engineering tool. With Taguchi methods many of the statistical design efforts are simplified or eliminated. It introduces a very direct way to examine many factors at a time in an economical manner. Taguchi starts with a new definition of Quality" *Quality is related to the total loss to society due to functional and environmental variance of a given product*

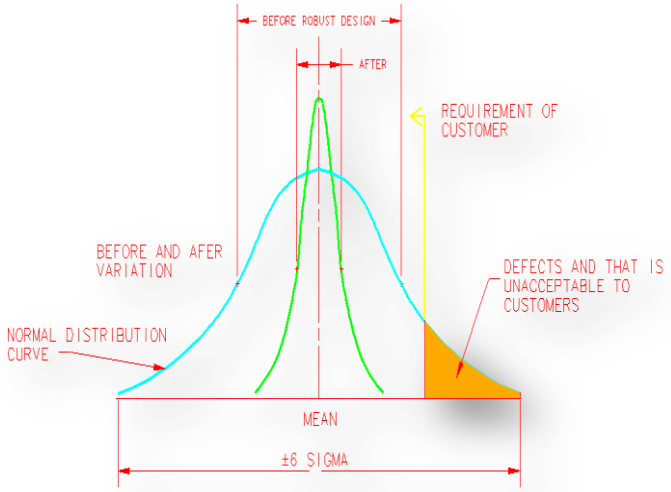
Quality is related to the total loss to society due to functional and environmental variance of a given product.

Taguchi's method focuses on Robust Design through use of:

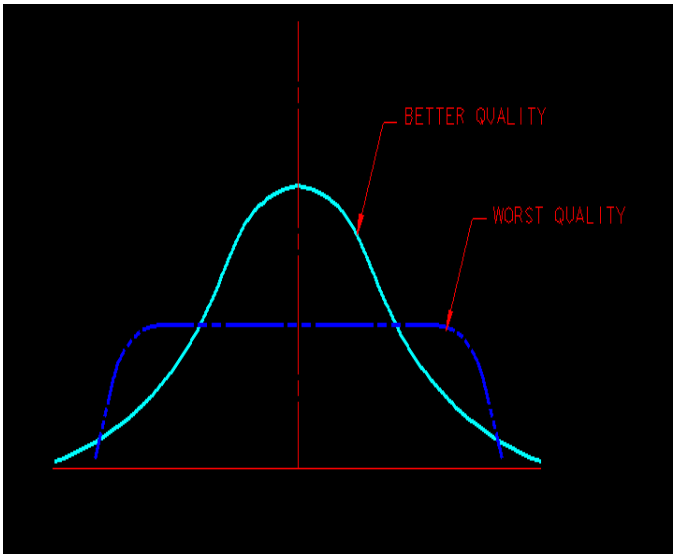
- S/N Ratio to quantify quality
- Orthogonal Arrays to investigate quality

Meeting the specs vs. hitting the target

Fig (4) has common terminology associated with normal distribution and the robust design.
1) Mean: It is the middle of normal distribution and shows the good characteristic of any product . One should design the process approaching to the mean.
2) Normal distribution: It is Gaussian curve which shows the distribution range of product and is generally $\pm 6\sigma$
3) Deviation: It is inherent quality of the product which is introduced and followed by the different kinds of errors.
4) Out of range product: If products go out of the normal distribution range then it is called out of range product. In



Fig(4): Normal Distribution and Terminology



Fig(5): Quality explanation in statistical terminology

the curve area with yellow colour shows the out of the range product.

Fig (5) showing the characteristic of better quality and worst quality. Both distributions are Gaussian one but the curve in blue shows the worst quality because of its nature to fall out side the range specified by the cyan colour. Curve specified in the cyan colour is the standard Gaussian curve which will serve as a replica to find

product whether they are under the specific limits or beyond the specific limits.

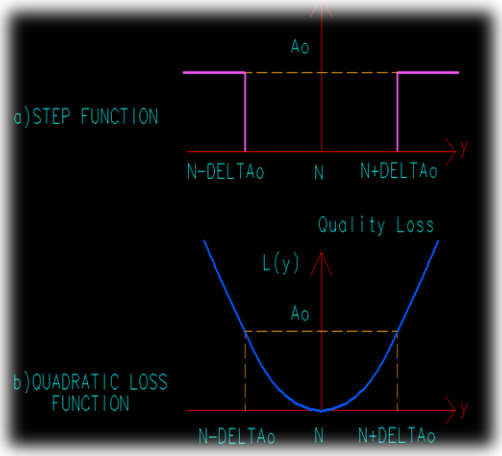
VI. Quality and Functions

a) Quadratic loss function: fig (6) shows the quadratic loss function. The Taguchi loss function is a way to show how each non-perfect part produced, results in a loss for the company. The loss function is varying according to quadratic equation form. It is represent-ed by

$$L(y) = k(MSD)$$

Where $k=Ao/y^2$

$$MSD=y_1^2+y_2^2+\ldots\ldots\ldots+y_n^2/n$$



Fig(6): Quadratic Loss Function

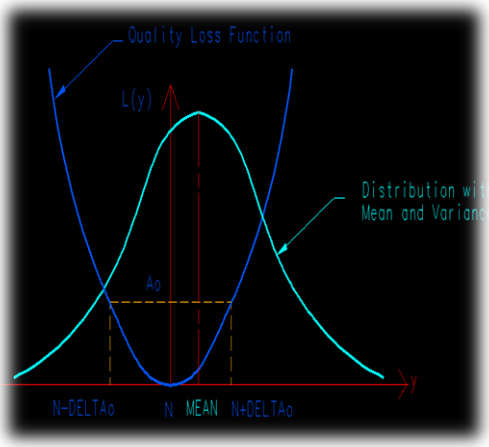


Fig (7): Quadratic Loss Function on Normal Distribution

b) Quadratic Loss Function on Normal Distribution: Fig(7) shows the quadratic function on normal distribution. This standard representation of the loss function demonstrates a few of the key attributes of loss. For example, the target value and the bottom of the parabolic function intersect, implying that as parts are produced at the nominal value, little or no loss occurs. Also, the curve flattens as it approaches and departs from the target value. (This shows that as products approach the nominal value, the loss incurred is less than when it departs from the target.) Any departure from the nominal value results in a loss!

Loss can be measured per part. Measuring loss encourages a focus on achieving less variation. As we understand how even a little variation from the nominal results in a loss, the tendency would be to try and keep product and process as close to the nominal value as possible. This is what is so beneficial about the Taguchi loss. It always keeps our focus on the need to continually improve.

c) Parameters classification by Function: Fig(8) shows the function classification controlled by attributes. These attributes are Noise factors, Signal factors, Responses and Control factors.

S/N ratio is used to evaluating the quality of the product. The signal to noise ratio measures the level of performance and the effect of noise factors on performance. The form of the S/N ratio is tied directly to the loss function. The S/N ratio if an evaluation of

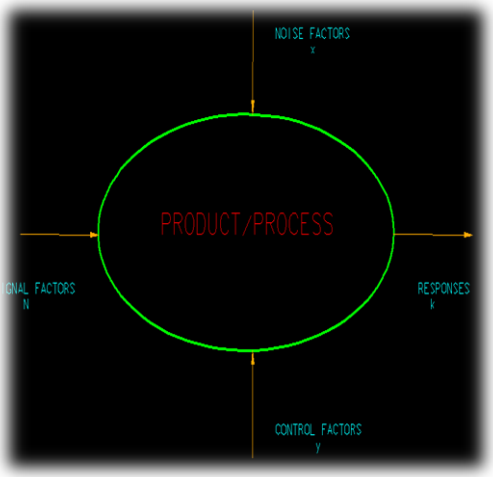


Fig (8) : Function Classification of Parameters

the stability of performance of an output characteristic. The loss function allows one to evaluate the effect of that stability in terms of monetary unit. Higher performance as measured by a high S/N ratio implies a smaller loss as measured by corresponding loss function.

It is defined by

$$S/N = -10 \log (MSD)$$

Control factors are the factors which can be controlled and it is fully defined and control by user in accordance with conditions. Noise factors are the inherent characteristic which is not in control of user e.g. weather condition. Response is nothing but optimized output controlled by three factors or inputs to the product or process.

VII. ORTHOGONAL ARRAY IN ENERGY IMPEMENTATION

Taguchi's orthogonal arrays are highly fractional orthogonal designs proposed by Dr. Genichi Taguchi, a Japanese industrialist. These designs can be used to estimate main effects using only a few experimental runs. These designs are not only applicable to two level factorial experiments, but also can investigate main effects when factors have more than two levels. Designs are also available to investigate main effects for certain *mixed level* experiments where the factors included do not have the same number of levels.

If we talked about the orthogonal array in energy field implementation then factors in that defined as ,
The case study will be discussed on any machine working in any industry

a) Control factors can be η %(efficiency) of motor, Correct tool type, Usage cycle time, Material and Maintenance.

b)Noise factors can be Human factor, Aging (depreciation of machine) and surrounding condition.

With this information one can develop orthogonal array matrix which is given below,
We have seven control factors hence it is L_8 experiment.

L_8 No	Control Factors							Noise N1	Noise N2
	A1	B2	C3	D4	E5	F6	G7		
1	1	1	1	1	1	1	1	a	b
2	1	1	1	2	2	2	2	c	d
3	1	2	2	1	1	2	2	e	f
4	1	2	2	2	2	1	1	g	h
5	2	1	2	1	2	1	2	i	j
6	2	1	2	2	1	2	1	k	l
7	2	2	1	1	2	2	1	m	n
8	2	2	1	2	1	1	2	o	p

Table (1): Orthogonal array for particular machine in the Industry

If we have the noise factors N1 and N2 for particular machine we can calculate loss function and S/N ratio.
S/N is larger the better. We also can plot interaction between two or more factors and can plot a curve for the same. Moreover, we can also draw a response curve for given factors.

VIII. RESULT AND CONCLUSION

Implementation of the lean and robust design on energy field can save millions of btu energy.
Robust design implementation on not only industries but also domestic field can save energy, money and hence environment. Japanese principal lean can bring great revolution in terms of money and environment in the era of scarcity of energy. Where countries are fighting against the energy usage

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L-GENEAF, a Generic Business-Driven EA Framework

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Abstract -*An increasing number of business organizations are supporting business-driven Enterprise Architecture (EA) efforts but most of these projects mix multiple EA frameworks leading to in-house developments. It seems that, based on Gartner survey, the upcoming EA frameworks will take advantage of the already existing different sets of reference frameworks and methodologies to develop pragmatic and generic business-driven ones. In this paper, we propose a roadmap that offers a mature business-driven EA framework by combining the structure of our previously developed Lausanne EA Framework (LEAF), with the business-oriented artifacts of an existing Systemic Enterprise Architecture Methodology called SEAM. This combination, relying on an articulated synergy of both the LEAF and SEAM, results in a novel EA framework, baptized L-GENEAF.*

Keywords: L-GENEAF (Lausanne GENeric EA Framework); SEAM (Systemic Enterprise Architecture Methodology); LEAF (Lausanne EA Framework); Business-driven framework

1 Introduction

Because Enterprise Architecture (EA) features a coherent set of principles, methods and models it has become an important instrument to address the issue of a company-wide integration. This set can be used in the design and construction of the enterprise organizational structure, business processes, information systems, and infrastructure [1, 9]. It also provides a systematic documentation depicting the integration between the different architectural layers [12].

Zachman's framework, an Information Systems Architecture framework, was the first one as a basis for formalizing *reference EA frameworks* such as TOGAF, DoDAF, FEAF, TEAF, etc. Thereafter, a number of EA frameworks *derived* by these reference frameworks were proposed, such as the TOGAF-based comprehensive architecture framework [18] or the VECCF (Virtual Enterprise Chain Collaboration Framework) [3]. [25] proposed different integrations between some of the well-known EA frameworks (Zachman, Four-domain, TOGAF and RM-ODP) dealing with the following architectural layers: enterprise environment, enterprise, enterprise systems and infrastructure. PERDAF, an ISO 9126-based enterprise architecture meta-model, consists of classes and related attributes that can be used to create quality-based enterprise architecture models [11]. [2] developed a layered EA framework that includes not only the strategy, the organizational, the application and the software component layers but their interdependencies as well. Finally, [13] developed a basis for information architecture for public administration.

All of these frameworks, derived from reference frameworks, are mainly conceptual and/or area-specific meaning that they contain no practical nor step-by-step guidance for real world projects. Their applicability in different type of organizations and the possibility of focusing on business requirements are debatable.

On the other hand, based upon the "Hype Cycle for EA 2010" developed by Gartner [5], it appears that:

- Most organizations leverage a combination of frameworks by picking and choosing the elements, artifacts and practices that best reflect and suit their business, IT and cultural needs. According to this survey, approximately 80% of Gartner's clients are using *multiple EA frameworks*;
- To prepare for 2015, EA practitioners should ensure that EA practices are driven based on a clear and contextually pertinent business vision, articulating business strategy and requirements, as well as ensuring a business-driven enterprise architecture effort thus supporting a more *business-vision-focused EA effort*.

We advocate that a *pragmatic* EA framework should take into consideration contextual project management issues - as the vital part of each project - and determine the project activities step-by-step so as to cover all the framework's components and artifacts. The applicability of such a framework, in any kind of organizations (e.g. public sectors, manufacturing companies, etc.), is an important caveat that leads to developing a *generic* framework.

In this paper, we propose a business-driven EA framework (L-GENEAF for Lausanne GENeric EA Framework) born from integrating (1) the *SEAM* modeling techniques that contribute to the business-driven notations and artifacts as well as to business analysis techniques within the structure of (2) *LEAF* (our previously developed EA framework) that sets universal EA project phases, steps and activities by including the project management considerations of the Project Management Body of Knowledge (PMBOK) into the FEAF. Because the LEAF has a very well organized structure and the SEAM offers very good techniques to investigate the business layers of an enterprise, the resulting framework allows meeting the requirements of the future EA projects.

After describing SEAM and LEAF, the building blocks of our proposed L-GENEAF, we then show how by using the SEAM artifacts and notations in the structure of LEAF, it is possible to get the best of both worlds achieving the necessary synergy to enrich the business analysis of LEAF

and consequently meet the requirements of future EA projects. Before concluding, we will illustrate the use of L-GENEAF with a small business-case.

2 Building blocks of the L-GENEAF framework

L-GENEAF utilizes the principles, artifacts and notations of SEAM for following the phases, steps and activities of LEAF.

2.1 LEAF

Our previously developed framework [6, 7, 8] finds its roots in the FEAF, the PMBOK, and the authors' experiences in EA projects (more than 10 EA projects in manufacturing and service organizations).

The *Federal Enterprise Architecture Framework* (version 1.1, 1999) [4] is a government framework designed for public-sector consumption. FEAF is a conceptual framework that begins by defining a documented and coordinated structure for cross-cutting businesses and design developments in the Government. The main components of this framework are: architecture drivers, strategic direction, current architecture, target architecture, transitional processes, architectural segments, architectural models and standards.

The FEAF has a very well-organized structure that is well-adapted to the logic of EA. This is why its main structure (as-is architecture, to-be architecture and, migration plan) has been utilized for developing the meta-model of LEAF. But it does not contain a detailed description of how to generate the EA deliverables [10] and does not provide business-related artifacts [24]. Moreover, it does not encompass a project management solution for following its components in the real projects.

As a reference framework, *Project Management Body of Knowledge (PMBOK)* is a guideline describing the project management processes, tools, and techniques that are needed to lead a project towards a successful outcome. Based upon the PMBOK framework, project management contains nine Knowledge Areas namely Project Integration, Scope, Time, Cost, Quality, Human Resource, Communication, Risk and, Procurement Management [15].

As the preferred mechanism for ensuring that the EA roadmap is executed, we claim that project management is a critical element of the EA process. The EA roadmap and the implementation plan must continually be communicated on an enterprise-wide scale. It appears that an EA project management solution provides the ability to facilitate continual communication between IT and Business and to trace the actual changes in the enterprise scale [14].

2.1.1 LEAF's contribution on FEAF

As mentioned, FEAF is a conceptual EA reference framework for the public sector and governmental organizations. LEAF contributes to FEAF by:

- Distributing EA artifacts into the different phases of a real project to bring in a *sense of practicality*. LEAF defines the phases of the EA project and determines how to utilize the EA artifacts for investigating the *as-is architecture*, developing the *to-be architecture* as well as proposing an action plan for *migration*;
- Modifying FEAF for developing a more generic framework that is *applicable in any kind of organizations* (e.g. public sector, manufacturing, etc.). It has been developed during an incremental process which included real projects in different type of organization;
- Adding *project management considerations* as one of the critical success factors of EA projects by using PMBOK guideline [7].

Since LEAF is based on a practical approach, in addition to mentioning the different levels of architecture, it also contributes to determine the phases and deliverables covering all the architectural layers of EA projects. Its major characteristics are:

- Coverage of the three architectural layers, namely a) the business architecture b) the information systems architecture and c) the infrastructure architecture. It determines, for each of them, the *as-is* and the *to-be architecture* of an organization;
- Its phases: phase 0, the planning phase, needed for including the PMBOK knowledge areas; phase 1, the as-is architecture; phase 2, the analysis of as-is architecture; phase 3, the to-be architecture and phase 4, the migration plan. Each phase contains some steps, each step consisting of a set of activities and each activity producing a project deliverable.

A pragmatic and generic framework, that includes the phases, steps and activities of a universal EA project, emerges. At this stage, the business analysis notations and artifacts are still missing.

As previously mentioned, prospective EA frameworks should consider business architecture as the vital part of their meta-model in order to meet the requirements of future EA projects. Here SEAM comes into play contributing to a business-driven EA framework.

2.2 The SEAM

SEAM (Systemic Enterprise Architecture Methodology) [19, 20, 21, 22, 23] analyzes the foundations of EA and formalizes them in a systemic paradigm i.e. customized implementation of the systematic paradigm in the field of EA. SEAM systemic paradigm includes the SEAM philosophy, the SEAM theory, the SEAM method and tools [23]. System concepts are at the core of SEAM in so far the modeler considers an enterprise as a complex system. In SEAM a family of methods has been proposed that addresses *business*, *EA* and *software* development. In this paper, we focus on *SEAM for EA*.

In SEAM for EA [22] the organization is considered as a hierarchy of systems that span from business down to the IT system. It consists, typically, of four sets of views:

1) The *Service view* conceptualizes the business context with modeling the overall services provided by a group of companies to the customer value network. It is useful for understanding the overall needs and expectations as well as value exchanged and how these values are exchanged between value networks.

2) The *Value network view* identifies precisely the responsibility and contribution of each company in the value network that is useful for determining outsourcing strategies as well as inter-organizational business processes and services.

3) The *Company view* shows the company as a composite of different business roles and IT systems.

4) The *IT view* considers the relationship between IT components and services.

These views could be shown *as a composite [C]* or *as a whole [W]*. When represented as a whole, the focus is on the provided service; when shown as a composite, focus is set on how the service is implemented.

SEAM includes two main modeling techniques: the behavior model and the goal-belief model. The *goal-belief model* is a Goal-Oriented Requirement Engineering (GORE) method that has been developed by using goal-oriented approach in open system literature. It is a method for identifying the requirements of a system in an ever-changing environment. The building blocks of this method are [16, 17]:

- The Goal, a state a system tries to achieve or maintain;
- The Belief, an interpretation of the system viewed from the observer point of view.

Indeed, goal-belief shows the needs, expectations and value exchanged within the system. The *behavior model* specifies how the exchange is done i.e. it represents the exchanges of messages that support the exchange of values identified in the goal-belief view [22].

In a nutshell, SEAM proposes a hierarchical model in which each level could be analyzed by goal- belief (to understand motivations, norms, etc.) and behavior model.

3 The L-GENEAF

In this section, we follow the logic of EA step-by-step by utilizing LEAF so as to cover the modeling techniques of the SEAM for EA. To achieve this, we have allocated SEAM for EA's artifacts and notations to the phases and steps of LEAF. Table 1 illustrates SEAM for EA artifacts in each phases of the EA project. These artifacts are not applicable for phase 4 (migration plan). To be noted that Phase 0 (project planning) is organized based on PMBOK framework.

In the business side of phase 1, both the goal-belief and the behavior model are used in a hierarchical manner to identify the values exchanged and the way they are exchanged in the system from the service to the company level. From the IT side of phase 1, the goal-belief model is utilized to take a snapshot of the current situation to establish a comparison with the expected IT requirements. In the analysis phase (phase 2), an extended goal-belief model, covering all set of views, helps analyze both business and IT bottlenecks (business-IT requirement engineering). Finally in phase 3, the optimal situation is identified in detail by utilizing the behavior model at each hierarchical level of the system. This approach leads to a business-driven requirement engineering of the IT system by taking into account the requirements of each level of the system.

Table 1: Mapping between SEAM and EA framework

Project phases and steps		Deliverables	SEAM for EA			
			Service	*Value network*	*Company*	*IT*
Phase 1: As-Is Architecture	Business As-Is Architecture	• Business conceptual model • IT and business strategy components • Business function model, process model and data model • As-Is business services	G.B & B	G.B & B	G.B & B	...
	IT As-Is Architecture	• Information systems, applications, integration, security and infrastructure • IT human resources and management structure	...			G.B
Phase 2: Analysis of As-Is Architecture		• analysis of Business and IT As-Is Architecture	G.B			
Phase 3: To-Be Architecture	Business To-Be Architecture	• To-Be business services (core, non-core and external services)	B	B	B	...
	IT To-Be Architecture	• Application architecture • Infrastructure architecture	...			B

G.B: Goal-Belief model
B: Behavior model

3.1 Phase 0: Project planning

This preliminary phase of any EA project analyzes the project goal and defines the project scope. It determines the roles involved, the methodologies and tools that could be used and the deliverables to be produced and yields to develop EA Project Charter. The project management documents are described based on the PMBOK framework Knowledge Areas and processes. The main activities deployed in this phase are:

Defining the scope of the project: Correctly defining the EA project scope is the most important success factor. At the end of this phase, implementer and employer should have fully agreed upon the outputs of the project and must have the same understanding and expectations. Its PMBOK counterpart is the Project Scope Management Knowledge Area (collect requirements based on project applicant's RFP as well as list of services section of contract; define scope, including project scope description, deliverables, exclusions, constraints and, assumptions; create WBS, verify scope and, control scope).

Organizing the project team: Because the enterprise is investigated from its business layer to its IT infrastructure layer, the project is multidisciplinary and cross-functional. All concerned fields of expertise need to be listed and the project manager must organize the team ensuring all are involved at the right time in the pertinent different project groups. This activity corresponds to the PMBOK Project HR Management Knowledge Area that deals with the development of a human resource *plan* (organization chart, roles and responsibilities, position description and, staffing management plan), as well as *acquire*, *develop* and *manage* project team.

Developing EA project charter: This activity serves as reference plan in all subsequent negotiations and project meetings. It is one of the processes of PMBOK Project

Integration Management Knowledge Area but additionally includes an executive summary of all the Knowledge Areas.

In developing the nine Knowledge Areas and processes of PMBOK framework, the project manager will be able to design a well-organized structure considerably enhancing the project chances for success.

3.2 Phase 1: as-is architecture

This phase is meant to provide a snapshot of what is really happening in the organization in order to have a good understanding of the situation and identify the requirements of the IT systems.

3.2.1 Business as-is architecture

The analyst should carefully depict the situation be all along the production chain be it externally (market, customers, competitors, etc.) or internally (business functions, business processes, stakeholders, etc.). The main activities to be conducted are:

Identifying the overall business structure: in order to have an overall view of the organization's business structure, the structure of the market in which the organization is acting as well as its relationship with all stakeholders i.e. organization's macro and micro environment should be examined. This activity calls for *identifying the market structure and actors*. Here the "service" and "value network" views of SAEM for EA can greatly help. The service view of the company has to be analyzed in order to determine the flow of services between the company and the customer value networks. The value network view has to be developed for identifying, within the value network, the existing relationships between the partners and their respective roles. For that purpose the company value network, as well as the main competitors and the main customers' value networks should be assessed. The "goal-belief" model and "behavior" model of SEAM are mobilized to display the strategic relationships between the organization – as a system - with its stakeholders as well as exchanged messages.

Extracting organization's business strategy components: after having determined the market structure, the project team should examine the strategic components of the organization so as to clarify the long-term business objectives. The business strategic plan is the reference document for this activity.

Identifying detail business structure: the internal business structure of the organization is investigated in detail. The organizational structure, the departmental (divisional or business-unit) functions, the organizational business process (primary and support business processes) and the data entities undergo a meticulous screening. This activity calls up the "company" view of SEAM as well as its "goal-belief" model to highlight, amongst others, the relationships existing between the different internal business units of the company. By the same token, the "behavior" model is a useful technique to develop the detail exchanged data entities.

Extracting as-is business services: by using the output of the previous activity as an input, the implementer determines the main business services.

3.2.2 IT as-is architecture

The state of the IT systems should be digged into and tidily reported. The "IT" view of SEAM for EA, as well as its "goal-belief" model, is very useful to get an overall view of the IT systems in the connection with the organization's business goals. This activity consists in:

Identifying the technical IT resources, such as information systems, applications, services, databases, security, hardware, network, etc. in order to have a snapshot of information systems and infrastructure layers.

Identifying the non-technical IT resources, such as the organizational structure of the IT management department (group, team, etc.), the decision making structure for IT investment, the IT human and financial resources allocation and human resources' fields of experience and expertise.

3.3 Phase 2: analysis of as-is architecture

This phase encompasses the analysis of both business and IT *as-is architecture*. From the business perspective, the compatibility of company's mission, strategies and business functions with the current business processes, information flow and services should be looked upon. The main analysis points consist of coverage level of strategic components and business functions with current business processes, conflicts and overlap between business processes, business process bottlenecks, data flow and data format problems, as well as business process areas and data areas subject to change (improvement or reengineering).

From the IT point of view, the compatibility, the adequacy and alignment of company's technical and non-technical resources with business requirements should be investigated e.g. adequateness of current information systems to support all data subjects and business processes.

The main goal of this activity being determining the requirements of the company's IT systems as well as identifying the improvement and/or re-engineering areas for the business functions, the "goal-belief" model of SEAM for analyzing the current situation and identifying the requirements of the to-be business and IT architecture can be used.

3.4 Phase 3: to-be architecture

The *to-be architecture* is a backed-up description of the optimal situation the organization should move to. By using the results of the previous phases as input, the implementer will document in this phase the to-be architecture of the business and IT systems. The main inputs to identify optimal situation consist of strategic business and IT components, the results of phase 2 (analysis of as-is architecture) as well as lessons learned by best practices and reference models (e.g. business reference model, data reference model, technical reference model, etc.).

3.4.1 Business to-be architecture

Based on the results of the business as-is architecture analysis, both the *to-be business processes* and *business services* will be attended to here. Three types of business services can be expected:

- Core business services that are related to the primary business processes (front office);
- Non-core business services that refer to the support business processes (back-office);
- External services that consider the stakeholders and the organization environment.

In this phase, the "service", "value network" and "company" views of SEAM for EA need to be reshaped for representing the optimal situation. A justification of how the proposed *to-be business architecture* will support all the identified requirements (ref. "goal-belief" model developed in phase 2) is needed. The "behavior" model is used to represent the optimal data exchange between business entities in different hierarchical levels.

3.4.2 IT to-be architecture

Depending on the previous results of identifying the IT systems requirements and according to the specifications of *to-be business architecture*, the *to-be IT services* will be developed. The "IT" view of SEAM for EA is used for determining the information systems and the IT infrastructure.

This step consists in documenting the application and the infrastructure architectures. The application architecture will be first identified based on the business services, then the infrastructure architecture can be determined so as to support the application architecture.

3.5 Phase 4: Migration plan

A plan to migrate from the *as-is architecture* to the *to-be architecture* must be devised. The proposed steps that need to be performed to reach this goal are:

Gap analysis: if gaps between the *as-is* and the *to-be architectures* are detected, the implementer should determine the basic fields of gaps from both the business and the IT perspectives and propose a remedial plan. Obviously differences between the *as-is* and the *to-be architectures* should be clarified before establishing any migration plan.

Identifying projects and prioritizing: according to the gaps detected, the implementer will define the projects, their sequence and prioritization, the estimated time and resources to be allocated, etc.

Developing evaluation and updating plan (Performance Reference Model): in this activity, the implementer proposes performance indicators in order to evaluate the progress of the overall plan as well as an updating plan in order to be able to modify the overall plan according to business and/or technology changes.

Proposing IT management structure (a Project Management Office- PMO): A team, group or department, is needed for managing the proposed projects (outsourced projects and or in-house projects) and evaluating the progress and updating the overall plan. Most of the times, IT department plays the role of the PMO. Therefore, in this activity, an IT management structure with detailed functions, job descriptions, required training and resources should be proposed. In this activity, standards such as ITIL and/or COBIT are helpful to suggest the main services and functions of the PMO.

4 Illustrations

In order to illustrate how the L-GENEAF can be used we will explain, by means of a simple example, how by using the SEAM modeling techniques (set of views, goal-belief and behavior model) we obtain the desired added-value into LEAF.

Let us suppose a business organization called BestPipe Inc. (BP) that manufactures large and small diameter steel pipes for oil and gas (sour and sweet) transfer; it also produces the pipes internal and external coating.

The main actors in the supply chain of BP are:

- Plates and raw material suppliers;
- National Oil and Gas Company (O&G Co.) as the main customer of BP;
- Shipping company that is in charge of in(out)bound logistics for delivering raw material to BP as well as shipping pipes to customers.

BP is organized into 4 primary and some support departments. The primary departments are the *Engineering and Development* Dpt. that deals with controlling the manufacturing process, the *Marketing and Sales* Dpt. in charge of sale and after sale services as well as taking part in tenders in the national and international market, the *Procurement* Dpt. preparing plates and raw material, and the *Manufacturing* Dpt. producing the pipes and coating.

Figure 1 shows the overall strategic relationships between business partners in the supply chain of BP. This diagram, presenting a bottom-up aggregation and a top-down decomposition, is one of the results obtained after complying with the first phase of LEAF. It belongs to the "identifying the overall business structure" activity of phase 1 (cf. 3.2.1).

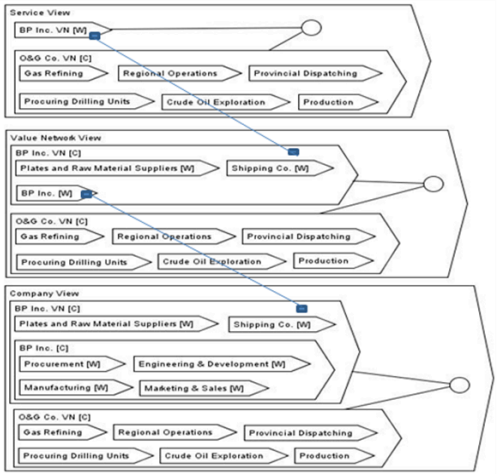

Figure 1. Set of views for BP Inc.

The BP *as-is architecture*, is examined as a **set of views**, that can in turn be decomposed in service view, value network view and company view.

- The *service view* contains the value network of BP *as a whole* and O&G Co. value network *as a composite*. The O&G Co. has two main business lines for producing natural gas and crude oil: (i) the gas business line, comprises refineries that refine and purify gas. Gas dispatch is performed through spread-around-the-country regional companies that distribute through provincial entities and (ii) the oil business line for purchasing and reconstructing drilling units as well as exploring for and producing crude oil.
- The *value network view* contains BP value network *as a composite*. BP value network in turn encompasses plates and raw material suppliers, shipping companies as well as BP itself, all 3 of them shown *as a whole*.
- The *company view* breaks down BP into its 4 primary departments, BP being shown here *as a composite* of those 4. In this view we only showed the primary departments.

These sets of views are useful for analyzing the strategic relationships BP has developed with its business partners. The added-value it brings to LEAF relates to representing the situation of the company within its market and value chain. Based on a systematic approach that consists into taking into account the strategic business requirements, it contributes to identifying the overall business structure for developing IT solutions.

Figure 2 shows an example of the **goal-belief modeling** technique for *analyzing* BP *business as-is architecture* describing the relationship between BP and its main partners. This very high level analysis depicts the goals of each of the four actors in BP value network and O&G Co. value network as well as the observer's beliefs related to each goal. It also shows the relationships between the goals and beliefs of each actor as well as the relationships between the actors. It will serve as one of the deliverables of the second phase of LEAF (cf. 3.3).

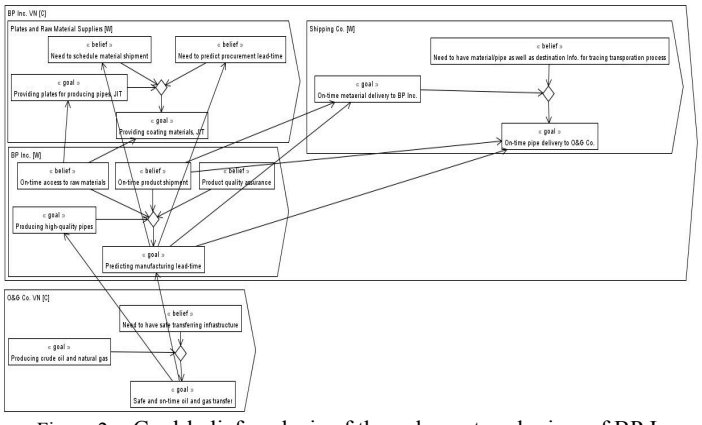

Figure 2. Goal-belief analysis of the value network view of BP Inc.

If we assume that one of the main goals of BP is "predicting manufacturing lead-time" (a goal related to "producing high-quality pipes"), it could be met by satisfying:

- The 2 beliefs of plates and raw material suppliers respectively the "need to schedule material shipment" and the "need to predict procurement lead-time", and
- The 2 goals of the shipping companies, respectively "on-time material delivery to BP" and "on-time pipe delivery to O&G Co.".

Let us suppose now that "on-time access to raw material" is one of the main beliefs of BP, a belief related to the goals of the plates and raw material suppliers. This "on-time access to raw material" belief is derived from the BP "predicting manufacturing lead-time" and "producing high-quality pipes" goals. It requires meeting the plates and raw material suppliers' goals namely "providing plates for producing pipes, JIT" and "providing coating material, JIT".

This technique adds a Goal-Oriented Requirement Engineering approach to the business and IT analysis activity in LEAF. The analyst is hence able to compare the business objectives with the actual performance. It also provides a goal-to-goal and belief-to-belief analysis technique to understand how the company regulates its relationship with its business partners.

Figure 3 illustrates, as an example, the BP *to-be business processes* for the "manufacturing control" business process. It serves as one of the deliverable of the phase 3 of LEAF (cf. 3.4.1).

It shows the BP company *as a composite*, from the aforementioned process point of view, using the **behavior modeling** technique that represents the data entities exchanged between actors.

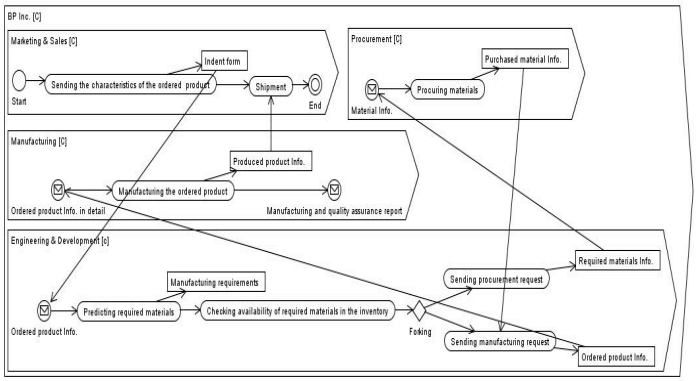

Figure 3. To-be "manufacturing control" business process in the company view of BP Inc.

The aim of this process is to monitor the manufacturing process. Whereas the main customer of BP is O&G Co., BP takes part in national and international tenders in order to produce pipes for other customers. Once BP wins a tender, the Marketing and Sales Dpt. sends "indent form" to the Engineering and Development Dpt. The Engineering and Development Dpt. predicts the required material for Manufacturing and checks their availability in the inventory. If materials (plates and coating materials) are available they will be sent to the Manufacturing Dpt. for producing the ordered pipes. Else, it sends a purchasing request to the Procurement Dpt. Finally, the Manufacturing Dpt. sends the products to Marketing and Sales Dpt. for shipping.

Behavior modeling technique represents the exchange of messages supporting the exchange of values that are identified in the goal-belief view. It enriches the *enterprise data modeling* activities of LEAF by explicitly representing data generation and data consumption by each activity of business processes.

5 Conclusions

Organizations are looking for IT solutions to meet the needs of an overly competitive and fast-changing business environment. Enterprise Architecture (EA), being a well-suited approach for aligning the requirements of the IT systems with the ever-changing business needs, appears to be a good solution.

Up to now, different reference frameworks have been developed but most of the EA projects are utilizing multiple frameworks to develop their own meta-model.

In this paper, we first showed how by introducing the PMBOK guideline as well as a step-by-step roadmap into FEAF we could improve it and palliate to its lack of considerations of the real-world project management issues, which led to introduce Lausanne EA Framework (LEAF). We then described how by using the modeling techniques of SEAM for EA onto the LEAF the requirements of the future EA projects could be met. The building blocks of this new framework, baptized, L-GENEAF are:

1. SEAM for EA that analyzes the foundations of EA and formalizes them in a systemic paradigm. It addresses business requirements by taking advantage of some modeling techniques that are the *set of views*, the *goal-belief model* and the *behavior model*. These techniques contribute a goal-oriented and business-driven EA.
2. The LEAF, with the Federal Enterprise Architecture Framework (FEAF) as backbone, allocates EA artifacts to the phases of a real project to come to a practical framework. It modifies FEAF for developing a more generic framework that is applicable in any kind of organizations; also adds project management considerations by utilizing PMBOK guideline.

In a nutshell, our proposed framework integrates the modeling techniques of SEAM for EA into the phase of the LEAF that has given yield to develop a step-by-step business-driven framework. The contribution of this work on SEAM is to give a practical structure (a step-by-step roadmap) in order to formalize different modeling techniques in the different steps of an EA project. Also, its contribution on LEAF is to introduce a business-driven framework.

As a next step, we will test the proposed framework either in real EA projects or by gathering EA experts' viewpoints to come to an expert judgment on the framework.

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Identification of Major Factors for Successful Online Marketing through Social Networking in Saudi Arabia

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Keywords: E-Commerce, E-Marketing, Social Networks, Saudi Arabia

Many new techniques have emerged with the Internet and have established the foundation of new business models, which are mostly encompassed by the term e-commerce. Using these techniques to develop a business is becoming a must to survive in a world that is increasing in need for electronic information [1]. Online marketing for an e-commerce is an essential step of the overall strategy for e-commerce. Online marketing is a form of Internet marketing which can be done by employing techniques such as e-newsletters, e-mail, and, paid advertisements for keyword searches, banner advertisements, etc.

With the emergence of Web 2.0, online marketing through social networking sites have started gaining the marketers' attention [2]. The data available on these sites has made it possible to target consumers based on age, gender, region, and income level among other factors. However, to make use of these data, a careful selection of the marketing mechanism is required [3]. Studies and analysis have been done by researches in Europe and the US to suggest mechanisms that derive profit. However, a mechanism that drives profit in Europe and the US might drive losses in the Middle East. Middle East consumers have different cultures, different needs, and consequently require different marketing mechanisms. The motivation of this research arises from the lack of such studies in the Middle East, especially Saudi Arabia. Thus, this research aims to examine the major factors that influence the success of online marketing through social networking in Saudi Arabia.

According to [4], social networking is the number one growth area in online marketing. It is extremely obvious how these social networks play an effective role for many companies these days, from global powerhouses to home-grown businesses [5]. They attract the marketers for many reasons:

First, there are so many users and information on social networks. A survey according to [6], which ranked websites based on average time spent by a user, identified Facebook and MySpace among the top 10 websites in the world. Facebook has more than 500 million active users and on average a user has 130 friends as of May 2011. Moreover, Facebook has claimed that people spend over 700 billion minutes per month on their website [7]. Social networks are becoming a storehouse of rich personal data [8]. Companies now can build long relationships with their consumers.

Second, social networking has the potential to drive companies' profit through their fans and followers. On June 2009, computer maker Dell announced it had earned $3 Million in revenue from using Twitter [9]. Social networking is built on relationships; thus, the trust tends to be higher between consumers and other consumers. Recommendations help drive product sales. A study conducted by [10] pointed out that 68% of Facebook fans would likely recommend a product and 38% of respondents stated that they would likely become a fan of a brand if other family member or friend do so.

Third, companies' fans or followers on a social network have a value. Syncapse [10], has conducted an interesting study on June 2010, which claimed that there is a value of a company's fan on social networks. According to their study which included twenty brands, the average value of a Facebook fan was $136.38. These twenty brands were: Nokia, BlackBerry, Motorola, Secret, Gillette, Axe, Dove, Victoria's Secret, Adidas, Nike, Coca-Cola, Oreo, Skittles, Nutella, Red Bull, Pringles, Playstation, Xbox, Starbucks, and McDonald's.

Finally, social networking can improve companies' customer service and relationship management. Social networking users are responsive and tending to chatting and prompting feedback which means that companies can build relationships directly with consumers to better understand their needs [3].

As mentioned previously, Saudi Arabia is the motivation of this study, especially given its emphasis on size, culture and market. There are many reasons for choosing Saudi Arabia for this research as a case study:

First, Saudi Arabia is a large country with a multi-cultural society. According to the Saudi Central Department of Statistics and Information [11], the Saudi Arabian population exceeded twenty seven million in April 2010. The statistical data shows that 31% of the populations are none-Saudis. This presents the opportunity to study the needs and desires of a variety of consumers from different countries and backgrounds, and thus, will give a wider view, and a chance to consider various cultures in one study [12].

Second, Saudi Arabia is one of the fastest growing Internet markets. Although it has been connected to the Internet for several years, public access to it commenced in January 1999[13]. According to Internet World Statistics Saudi Arabia [14], Internet users in Saudi Arabia have grown from 4.7 to 7.7 million between years 2007 to 2009. By 2010 the number of Internet users had grown to 9,800,000 [14].

Third, online business has a very promising future in Saudi Arabia. With the vast growth rate in Internet connectivity, Saudi Arabia has realized the importance of using the Internet to conduct business. According to [15], a survey showed that Saudi Arabian consumers spent $ 3.28 Billion online in 2007. The survey revealed enormous opportunities for B2C e-commerce in the country. A recent online survey in 2010 by the Saudi Communication and Information Technology Commission (CITC) [16] indicated that 35% of the survey respondents buy products over the internet and 8.1% are spending more than 1,001 to 3,000 SAR per year. The survey respondents were around 2870 and mostly males between the ages of 20-39.

Finally, Saudi Arabian usage for social networking is growing. The website information company Alexa [17], has named the top 3 sites visited by consumers in Saudi Arabia as Google, YouTube and Facebook as of April 2011. For instance, according to [7], the users of Facebook in Saudi Arabia are 3,856,920 as of May 17, 2011 whilst they were 2,267,060 users as of May 2010.

The proposed research methodology will include a quantitative online survey, designed for the purpose of the study, and qualitative interviews. The quantitative online survey will be carried out amongst users of Facebook and Twitter to examine their experience and satisfaction. The qualitative research will take the form of interviews with managing directors and business owners who had established an e-commerce site and had used Facebook or Twitter in an attempt to market their business and to engage with their consumers.

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Integrated techniques for Automatic Short Answer Marking through Information Extraction and Decision Tree Learning

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Abstract - *E-assessment is a key element in any e-learning system, needed to evaluate the learning process. It can be successfully and easily carried out on Multiple Choice Questions. However, e-assessment of essay questions is much harder than that of Multiple Choice questions. Consequently, it is a growing area of research. This paper presents an approach to assess short answer questions automatically, through integrating Information Extraction (IE) technique, and Machine learning (ML) technique that uses Decision Tree Learning (DTL). The IE employs Natural Language Processing (NLP) tools such as parsers and lexicon. Additionally, the Machine Learning techniques automate the free-text using the classification rules that are extracted from DTL and used to assess the student's answer.*

Keywords*: E-assessment; E-learning; NLP; IE; DTL.*

1 Introduction

Technology today presents many novel opportunities for innovation in the student's answers assessment through new assessment tasks and potentially powerful scoring and reporting mechanisms. E-assessment has grown exponentially in the last few years, due to an increasing number of online students and the orientation towards learning environments based on Information and Communication Technology (ICT). Electronic assessment is defined as: "the use of computer to set, deliver and often mark tests of student skill, understanding and knowledge of subject" [14]. Most learning management systems provide assessment templates for Multiple-Choice Questions (MCQs). However, essay questions marking is limited in these systems. The students in many cases respond to the MCQs through guessing. Furthermore, MCQs that assess the higher-order thinking skills are hard to build, and time consuming. Hence, essay questions can be a good alternative to evaluate such skills. In fact, exceeding the limitations of technology in automatic grading of these types of questions benefit the learning process [5, 8].

The essay questions can be divided into two categories: long answer and short answer questions. The long answer is a free text where the students talk about a certain subject. This type is graded by evaluating the writing style and the contents. The short answer questions typically request that students write one or two sentences [2]. This type graded by evaluating the content where the style is not necessary [10]. We focus in this paper on automatic short answer grading which is needed in scientific disciplines and still a challenge in e-assessment. Several approaches have been proposed to automate assessment. They can be grouped into four main categories: NLP, IE, classification, and, integrated methods.

C-rater is a NLP system which is developed by ETS technologies. This application evaluates the understanding of content materials by mapping the answers onto a model and then determining the correctness or incorrectness of the student's answer [7]. The Intelligent Assessment Technologies in the UK [15] developed an automatic assessor called AutoMark. AutoMark uses Information Extraction (IE) techniques to provide automatic marking. This system searches for specific content in the student's response. The content determined in the form of a set of templates. Each template represents a correct or incorrect answer. Student answers are first parsed, and then intelligently matched against the template, and a mark for each answer is computed [3, 4]. Furthermore, various studies have examined the ML approaches. For example, the use of classification techniques such as DTL and Naive Bayesian learning (Nbayes) in marking problems [1]. BETSY which is a program developed at the University of Maryland classifies text based on trained material. This system determines the most appropriate classification using a large set of features. Each text is viewed as a particular case of all the calibrated features. The probability of each score for a certain text is calculated as the product of the probabilities of the features that are contained in the text. Then, the conditional probability of existence of each feature is predicated by the proportion of texts within each category that includes the feature [11,13]. Finally, CarmelTC, is a hybrid text classification approach for analyzing essay answers of qualitative physics questions. It classifies pieces of text based on the extracted features from a syntactic analysis, as well as on a Nbayes classification of the same text [12].

2 Proposed Approach

As mention above, several techniques exist for dealing with e-assessment. We propose a method that integrates Information Extraction (IE), and Decision Tree Learning (DTL), a ML technique. IE enables the use of NLP tools (parsers, lexicon, etc.) [3]. However, ML techniques can automate free text marking without having to develop systems that totally understand the student response [1].

The proposed approach is mainly composed of four steps: parsing, training set building, learning, and classifying steps. First, the examiner writes the model answer for the question. Multiple templates of model answers may be written. The model answers are preprocessed to normalize the input in terms of spelling and grammar. The result is fed into the parser such as the Stanford Parser. The tagging headers are used as attributes, for example NN, VBZ, NNS, IN, which are, respectively, tags for a singular noun, singular present verb, plural noun, and preposition. The tagged words from a model answer are used as an instance for the attributes. The student's answer also follows the same process as the model answers.

Second, different synonyms for each tagged word are generated to build different training sets. Additional words are added to each group of synonyms. For example, the value "X" can be used to build incorrect training sets. Each set containing "X" in any attribute is classified as "Incorrect", otherwise it is classified as "Correct". If there is more than one template of the model answer, then the same process is applied to each template. Third, One decision tree is built for each template of model answers. All decision trees will be used to extract classification rules. Fourth, The tagged words from the student's response are compared with the set of rules. During comparison, a counter is used to count the number of matched words in each rule. The large number should be kept at the counter. When finished, if the counter equals the token (number of tagged words) of the model answer, then the student is given the full-mark, otherwise, the student will get a mark equal to the counter/token*full-mark. If the answer contains more than one sentence, then the procedure is applied to each sentence and the mark is divided between the sentences.

3 Discussion

We suppose that the approach which obtains a prediction result based on the integration of two techniques would give better results than either of these techniques alone. Our approach aims to take advantage of both IE, as well as classification techniques. The required resources of this approach are easy to assemble. It includes a parser and a dictionary of synonyms joined with a decision tree builder. All these resources need to be integrated in a stand-alone system. Additionally, this method can be applied to many sentences by processing an individual sentence and comparing the student's response with the resultant rules. Furthermore, the marking scheme assigns a mark depending on the percentage of correctness in the student's response not just classifying the resultant mark as correct or incorrect.

In addition, determining the wrong words in the student's answer will help to provide a meaningful feedback, which is prepared in advance by the examiner. The use of various templates for each question increases the possibility to meet different writing styles that may be used by students, as well as using a spelling and grammar checker in the preprocessing stage, will help to avoid parsing errors. Returning verbs and nouns to their base and discarding the determiners, articles, and other words which have extremely less discrimination power helps to build simple decision trees and reduce the variation between the model answer and student's response.

On another hand, some limitation may accompany this approach in the case of bad-formed structures resulting from the writing styles of students. In addition, the use of shifting role, such as shifting of subject and object when using the passive voice. The last problem can be avoided by using additional templates of model answers for passive form when writing templates. In general, this approach targets the scientific disciplines where the sentences are explicit, such that there is no need for inference to understand the concepts.

4 Conclusions and Future Works

This research proposes the combination of different techniques to produce an approach for automatic short answer marking. In particular we have presented an integrated method using Information Extraction(IE) and Machine Learning techniques. The IE enables the use of NLP tools such as parsers and lexicon. In addition, the Machine Learning techniques automate the free-text using DTL. The classification rules are extracted from DTL and used to assess the student's answer. Finally, we plan as a continuation of this research to present an algorithm for the proposed method and apply it to a set of examples to proof the concept.

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A Content-Based Analysis of Travellers' Social Media Websites

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Abstract - *This paper describes a content-based analysis of Web-based travellers' social media Websites. The proposed methodology is based on three levels of computer-mediated analysis, namely the lexical analysis, statistical analysis and semantic analysis. It is found that the use of systematic analysis of naturally occurring discussions in social media sites can lead to much stronger information about travellers' destination choices. Web-based social media provides a perspective on travel services and facilities that is deemed more realistic than that provided by firm owners. Monitoring user-generated Web content is a cost-effective method for destination marketers to assess their service quality and improve the overall experience of travellers. In terms of methodological implications, a Web content analysis approach is based on what actually happened and thus has no respondent bias. With both quantitative and qualitative in nature, the methodology is able to identify emergent concepts in grounded research.*

Keywords: Content Analysis, Websites, Web Analysis, Social Media, Destination Images

1 Introduction

The travel industry is an information-intensive and at times bewildering experience, with multiple options and intangible products complicating the selection and purchase process. Hence, the role of word-of-mouth in the decision-making process is inevitable, and has been a constant, significant factor in travel marketing and planning. With the advent of Web-based technologies, this influence is magnified. When previously information was passed from person to person, today—although nominal information exchange may still occur between just two people or a small group—hundreds or even thousands of free riders can gain access to information by viewing an online conversation. Search engines and conversation archiving may even spread this influence even farther.

The increasing number of travellers seeking online travel communities to perform travel-related endeavours, including obtaining travel information and tips, finalizing travel transactions, connecting with people from other places, searching for travel companions, or simply engaging in online activities for entertainment purposes at their leisure, has transformed the Web into a collective "travel square" [1]. This paper presents a content-based analysis of the conversations and stories of travellers on the Web.

1.1 Web-based social media for travellers

One particularly powerful Web-based application for travel and tourism is social media. Social media is defined as 'a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user-generated content' [2]. It uses Internet-based and web-based technologies to transform broadcast media monologues (i.e., one-to-many) into social media dialogues (i.e., many-to-many).

There are a variety of different types of social media available to Web users seeking information about travel. These sites can be grouped along two axes, including directionality (primarily one-way or interactive) and specificity to travel. Virtual community sites, like Lonely Planet and IgoUgo, offer travel-specific interaction between users, including general and specific recommendations and allowing users to ask for advice from other users. One-way travel-specific sites include consumer review sites such as TripAdvisor. On these sites, users offer reviews of specific travel-related businesses, which are then accessed by information seekers. Two-way interactive generalist sites such as Facebook are also sometimes used for discussing travel, although they are not specific to travellers. The use of these sites varies depending on the overall level of interest on the part of individual users. Finally, sites such as Blogger offer one-way social media sites that can be (although they are not always) targeted to travel.

Social media sites are commonly used by travellers and potential travellers to access information and ask questions. The exact number of users worldwide is not known, but one of the largest review sites, TripAdvisor, counts over 50 million unique visitors monthly, with over 20 million members, across its main site and subsidiary sites [3]. Social media sites make up a large percentage of search engine hits for travel-related topics as well [4]. Evidence indicates that social media is now a major part of online travel planning for the majority of users [5].

1.2 Web content analysis

There is no clear approach for study of Internet-based Web tourism topics that has been defined within the literature; however, a grounded approach is needed given the vast amount of immediate information available to the researcher on the Web. The study approach selected is that of web content analysis, which meets the needs of being able to analyze large amounts of information as well as provide a clear grounded approach. Web content analysis is an expansion of the paradigm of content analysis, "a systematic technique for coding symbolic content (text, images, etc.) found in communication, especially structural features … and semantic themes [6]." This approach is believed to be the most effective at extracting information from the rapidly changing Web environment.

There is limited availability of information about the use of Web content analysis available, as it is a relatively

new expansion of the content analysis technique. However, it has been used in some travel-related research effectively, such as [7]'s content analysis of Macao tourism Web sites. Most of the studies surveyed used standard content analysis techniques on Web-based content. Standard content analysis is exploratory, theoretically grounded, and qualitative in nature [8].

Traditional content analysis follows a series of stages including sampling, coding, and analysis and interpretation [8]. However, these stages may be insufficient for Web content analysis, and several modifications to the traditional technique including non-random sampling and the use of emergent coding rather than standardized pre-data collection coding are used in practice [6]. Other modifications include consideration of link and message content patterns. Two emergent techniques include computer-mediated discourse analysis (an extension of traditional discourse analysis) and social network analysis [6]. These techniques rely on computer-based mediation in order to perform the intensive computations required.

1.2.1 Methodological grounds of Web content analysis Length

Reliability and validity of Web content analysis will vary depending on the method selected, but are also derived from the content analysis approach. Using a traditional approach, inter-coder reliability can be determined using Scott's pi or Krippendorf's alpha, depending on the technique used (Herring, 2010). However, this may not be appropriate in conditions where emergent coding is used. The majority of content analysis studies rely on face validity, or validity that is offered by the adherence of the study to its stated protocol and based on specific categorizations [9]. Construct validity is less commonly used as it is difficult to determine given the goals of the content analysis framework [9].

In addition to the specific reliability and validity issues associated with Web content analysis, the nature of the research as qualitative does imply that the strengths and weaknesses of qualitative data will also apply to this research. One of the strengths of qualitative research generally is that it provides a deep view into a situation that is not limited by existing viewpoints or methodologies, allowing for discovery of new theories and ideas about the topic [10]. Qualitative research is also highly effective in situations where there is no readily applicable model or theory on which a quantitative research project could be based easily, which is the case in this research [10]. A third strength of qualitative research is that it allows the voices of the participants to be heard in ways that are not possible in the generalized view provided by quantitative research [11].

However, the qualitative paradigm does have its limitations as well. One such limitation is the possibility for respondent or researcher bias to be inherent in the findings of the research, which could not easily be eliminated [11]. A second potential weakness is the inability to generalize across broad groups depending on the outcomes of the research [12]. However, using a pluralist view identifies a number of ways that generalization can actually be found in qualitative research, including the most important purpose in this case, pattern recognition [12]. Thus, this is not a weakness for the purpose of this research.

2 An application of the methodology

Web surfing is the most effective approach to studying a Web-based community [13]. Specifically, the increasingly rich text data readily available on the Web has popularized the quantitative assessment of social media content. The studies detailed below represent attempts to investigate the role of Web-based social media in the formation of destination image through the analysis of Web content.

2.1 Background of the study

Established in the 16th century as a Portuguese colony, Macao is currently a Special Administrative Region (SAR) of the People's Republic of China. It is located on China's south-eastern coast to the west of the Pearl River Delta and is 60 km from Hong Kong (HK), the second of China's two SARs. Macao SAR has a population of 559,846 and a land area of 29.5 km2 [14]. Tourism, specifically casino gambling, is the primary driver of Macao's economy. Among all the jurisdictions of China, Macao is the only region where casino gaming is legal. Today, it is the largest casino city in the world, boasting annual gross gaming revenues of US$23.6 billion in 2010 [15]. Compared to other Asian countries, Macao has been considered the richest in the region; in 2010, a per capita gross domestic product of US$49,745 [15] pushed Macao to the top 10 of the world's wealthiest economies [16].

The entry of MGM, Wynn, Melco, Las Vegas Sands, and Galaxy, among other international competitors, into the region improved the service quality in Macao's gaming industry. Furthermore, it exerted a positive influence on Macao's tourism industry. In 2010, 25 million tourists visited Macao—a number 45 times the country's own population [15]. This figure is considerably higher than that of other destinations in the region. To illustrate, tourists visiting Guangdong Province number only 1.1 times the province's population [17] while in HK the ratio of tourists to the overall population is 4.2 [18]. Moreover, since 2001, hotel occupancy rates [15] and non-gambling spending by visitors to Macao [5] have exhibited a clear upward trend.

In recent years, both local and foreign casino entrepreneurs have invested heavily in Macao, acquiring gaming properties and establishing non-gaming tourist infrastructure such as entertainment venues, retail and shopping outlets, hotels, and venues for food, meetings, conventions, and exhibitions, all of which are world class. Additionally, in July 2005, UNESCO designated Macao's historic centre as a World Heritage Site. Thus, Macao SAR has been increasingly challenged to diversify its tourist attractions and to promote the city as a destination beyond its initial gaming enticement. Macao SAR must develop a fresh and competitive destination image for its tourism industry. The current paper analyzed the present online image of Macao SAR and evaluated whether this image corresponds to the city's position as an "international leisure hub and resort destination."

2.2 Web Mining

Tourism entry samples were collected on 10 February 2011 from five popular tourism and social media websites, namely, Tripadvisor.com, Igougo.com, Wayn.com, Virtualtourist.com, and Travelblog.org. The key words used

were "Macau travel," "Macau destination," "Macao travel," and "Macao destination." All the reported websites were browsed to ensure that the contents were about Macao as a tourism destination. A total of 500 user-generated articles were selected and downloaded as plain text documents.

To obtain relevant results from the content analysis, several iterative "data smoothing" operations were performed, including: 1) using a consistent spelling of frequently used words in all files (e.g., Macau vs. Macao); 2) changing multi-word concepts (e.g., Ruins of St. Paul's) into one-word formats; 3) turning plural nouns into the singular form (e.g., casinos into casino); and 4) checking descriptive words (e.g., helpful, nice) are not used in a negative context.

2.3 Computer-mediated content analysis

The articles from the social media websites underwent three levels of computer-mediated content analysis as follows:

1) A lexical analysis (by WordSmith) to identify the key image variables of Macao SAR as presented on the Web;
2) A statistical analysis (by SPSS) to group the identified destination images into factors and themes; and
3) A semantic analysis (by Leximancer) to establish the relationship among the images and themes.

2.4 Lexical analysis - identification of key image variables Tables

Wordsmith, a text-mining software program based on lexical analysis, was used to analyze textual data from the 500 sampled Web articles. First, a wordlist from the text was generated by Wordsmith. The generated wordlist was then compared by the program using a lexical reference, in this case, the British National Corpus, a collection of 100 million commonly used English words. The program identified key words as words whose frequencies were unusually high in comparison with the reference corpus. "Macao" was excluded as a key word because it is the domain the study rather than its variable. Figure 1 presents the top 100 key words in the sampled tourism social media websites. These same words were regarded as the key image variables of Macao SAR as a tourism destination on the Web. Tourists were found to be mainly interested in the accessibility, hospitality, leisure, and cultures of Macao SAR. The keyness of the top image variables were of normal distribution.

2.4.1 Classification of image variables

The top 100 image variables were further studied under the following categories: 1) nouns describing geographical locations (e.g., Hong Kong, Taipa, and Coloane), tourist attractions (e.g., "Sendado Square," "Ruins of St. Paul's," "A Ma Temple," and "Macao Tower"), amenities (e.g., "casino," "hotel," and "museum"), transportation (e.g., "ferry terminals," "shuttle bus," and "bus"), etc.; 2) verbs describing actions or tourism-related activities (e.g., "gaming," "gambling," and "walk"); and 3) adjectives and adverbs expressing feelings and evoking an atmosphere (e.g., "Portuguese," "Chinese," "Macanese," and "cultural"). The percentage distributions of the three types of image attributes are shown in Figure 1.

As shown in Figure 1, stimulus factors such as amenities, attractions, and access comprise 79% of the key values of all variables. Emotional factors (adjectives and adverbs) comprise only 8% while tourism-related activities comprise the remaining 13%. As expected, the tourist activity in Macao is "gambling." The analysis shows that an overwhelming percentage (nearly 79%) of the image attributes of Macao SAR is cognitive in nature, with the affective image being heavily underrepresented. In addition, tourists rarely express their feelings about Macao on social media websites.

2.5 Statistical analysis – grouping images into factors and themes

The second level of analysis is to condense the identified 100 image variables (Figure 1) into groups through statistical factor analysis. Wordsmith was used to count the frequencies of all image variables in every text file. Afterward, the results were transferred into an SPSS database. Employing varimax rotation, data were analyzed by principal component analysis and factors with eigenvalues greater than 1 were retained [19]. Fourteen attributes with factor loadings less than 0.37 were dropped from the list of constitutive attributes. Bartlett's test of sphericity yielded a result of 3655, and the associated level of significance was 0.000. These indicate that the correlation matrix was not an identity matrix. The value of the Kaiser–Meyer–Olkin measure of sampling accuracy was 0.785, higher than the 0.5 cut-off point recommended by [20]. Results indicate that the sample data were suitable for factor analysis.

The 86 image attributes remaining were grouped into 23 factors, which explained 75% of the total variance as a whole. These factors were then combined into seven themes: 1) cultural heritage, 2) casinos and entertainment, 3) hospitality facilities, 4) geographical location, 5) access and transportation, 6) indigenous favours, and 7) attractions and landmarks. The Cronbach's alpha of each theme ranged from 0.601 to 0.822, which indicates the acceptability of the thematic items' internal consistency (Figure 2). The percentage of each theme (in terms of scale mean) in the overall destination image of Macao SAR is shown in Figure 2.

2.6 Semantic analysis – mapping the relationship of images and themes

For the third level of analysis, the sampled social media contents were semantically analyzed by a concept mapping software, the Leximancer. Figure 3 shows a semantic network of the online destination images of Macao SAR as perceived by the tourists. Three clusters of inter-related destination images appear: 1) casino hotels on one side, 2) cultural heritage on the other side, and 3) city basics in the middle. The semantic network is heat-mapped. In terms of network centrality, hot colours (red, orange) denote more important images and cold colours (blue, green) denote the least important. The degree centrality and closeness centrality of each destination image are further compiled and partially shown in Figure 3. Well-connected images are those with high degree centrality such as "city," "hotel," "Chinese," and "Portuguese." The images at the centre of the network, such as "centre," "zhuhai," "cuisine," and "cotai," have high overall closeness centrality.

Figure 1: Key image variables of Macao SAR as a tourism destination (lexical analysis)

Rank	Image Variable	Keyness	Rank	Image Variable	Keyness
1	Casino	6741.26	51	Built	729.75
2	Hong Kong	6045.08	52	Guest	713.99
3	Taipa	4669.62	53	Travel	706.82
4	Portuguese	4616.52	54	Visit	689.24
5	Hotel	4192.66	55	Lisboa	683.08
6	Chinese	3944.77	56	Cotai Strip	661.52
7	Coloane	3001.57	57	Statue	648.03
8	Macanese	2843.73	58	Shop	641.66
9	Senado Square	2732.02	59	Guia Light House	637.02
10	China	2634.89	60	Tour	634.62
11	Tourism	2382.43	61	Architecture	631.12
12	Ferry Terminal	2327.70	62	Exhibition	625.91
13	Visitor	2310.70	63	Resort	623.59
14	Museum	2034.23	64	Open	620.58
15	Gaming	1994.72	65	Bus	616.21
16	Ruins of St Pauls	1947.89	66	Monte Fortress	612.52
17	A Ma Temple	1849.88	67	Zhu Hai	589.48
18	Venetian	1776.84	68	Asia	585.34
19	Temple	1742.53	69	Cantonese	585.25
20	Church	1734.52	70	Offer	582.62
21	Tourist	1647.87	71	Show	577.64
22	Located	1586.88	72	Taxi	541.80
23	Restaurant	1505.81	73	Guang Dong	518.11
24	City	1437.21	74	Dancing Water	502.26
25	City of Dreams	1408.83	75	Portugal	502.21
26	Wynn	1327.09	76	Attraction	494.54
27	Las Vegas	1310.82	77	Natcha Temple	490.01
28	Heritage	1295.58	78	MGM	487.87
29	Macao Tower	1286.32	79	3 D Dragon	483.96
30	Square	1210.20	80	Kun Iam Statue	477.76
31	Island	1178.47	81	Four Seasons	473.94
32	Destination	1169.49	82	Guia Fortress	465.51
33	Entertainment	1140.03	83	Egg Tart	465.51
34	Historic	1088.90	84	Sport	463.15
35	Cultural	1082.03	85	Service	457.90
36	Centre	990.16	86	International	456.93
37	Cotai	980.04	87	Multi-purpose	448.06
38	Building	953.71	88	Facade	439.19
39	Fortress	943.91	89	Baccarat	437.25
40	Facility	913.45	90	World	431.40
41	Grand Prix	893.37	91	Mandarin	419.48
42	Gambling	880.71	92	Fisherman's Wharf	416.51
43	Walk	821.43	93	Jesuit	407.85
44	Room	814.09	94	River Pearl	405.50
45	Cuisine	790.15	95	Traveller	401.07
46	Ferry	784.92	96	Harbour	396.76
47	Mainland	758.74	97	Garden	392.54
48	Ticket	750.80	98	Zaia	392.01
49	Airport	738.65	99	Style	385.56
50	Shuttle Bus	735.03	100	Sands	375.29

Nouns describing attractions, amenities, transportations, etc (79%)
Verbs describing actions or tourism-related activities (13%)
Adjectives and adverbs expressing feelings or evoking an atmosphere (8%)

Figure 2: Holistic images of Macao SAR (statistical analysis)

Theme 1: Cultural Heritage			
Factor	**Variable**	**Loading**	**Alpha**
F2	Guia Light House	.845	0.784
	Guia Fortress	.790	
	Square	.627	
	Fortress	.627	
	Architecture	.571	
	Chinese	.527	
F5	Church	.858	
	Facade	.818	
	Jesuit	.767	
	Built	.653	
	Ruins of St Pauls	.547	
F14	Heritage	.910	
	Cultural	.826	
	Historic	.616	
	Macanese	.540	
	World	.370	
F18	Monte Fortress	.771	

Theme 2: Casinos and Entertainment			
Factor	**Variable**	**Loading**	**Alpha**
F6	Baccarat	.924	0.734
	Casino	.909	
	Hotel	.728	
	Gaming	.676	
	Lisboa	.580	
	Sands	.523	
F11	City of Dreams	.845	
	Dancing Water	.734	
	Entertainment	.726	
	3 D Dragon	.521	
	Asia	.403	
F15	Las Vegas	.737	
	Gambling	.700	
F17	Zaia	.789	
	Show	.705	
	Ticket	.578	
F21	MGM	.624	
	Wynn	.519	
F23	Venetian	.579	
	Attraction	.521	

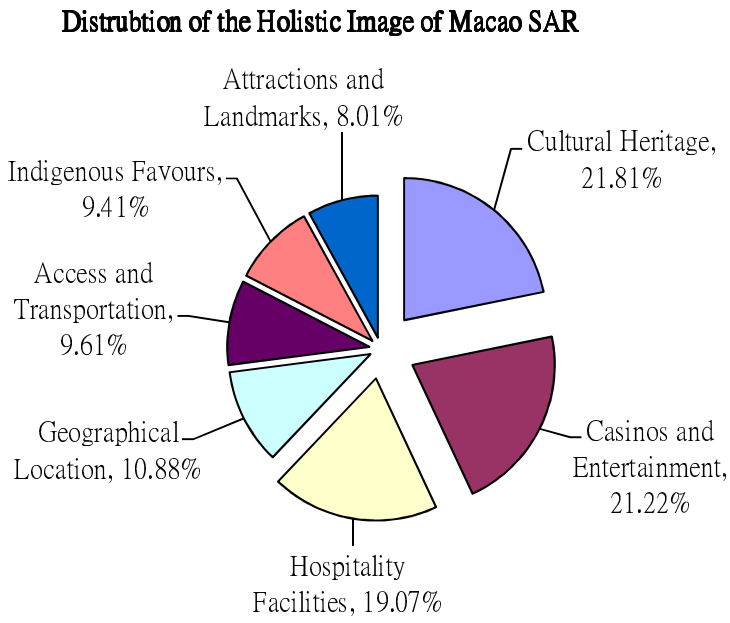
Theme 3: Hospitality Facility			
Factor	**Variable**	**Loading**	**Alpha**
F1	Facility	.947	0.822
	Room	.920	
	Multi-purpose	.904	
	International	.719	
	Guest	.655	
	Centre	.552	
	Service	.522	
F10	Tourism	.810	
	Destination	.720	
	Visitor	.709	
	Tourist	.636	
F20	Fisherman's Wharf	.798	
	Exhibition	.435	
F22	Traveller	.776	
	Resort	.542	

Theme 4: Geographical Location			
Factor	**Variable**	**Loading**	**Alpha**
F3	Coloane	.793	0.811
	Island	.736	
	Pearl River	.682	
	Sport	.674	
	Taipa	.635	
F13	Zhu Hai	.782	
	Mainland	.734	
	Cotai Strip	.534	
	China	.490	

Theme 5: Access and Transportation			
Factor	**Variable**	**Loading**	**Alpha**
F4	Hong Kong	.829	0.786
	Ferry	.821	
	Airport	.662	
	Ferry Terminal	.613	
	Taxi	.550	
F16	Shuttle Bus	.650	
	Walk	.640	
	Bus	.488	

Theme 6: Indigenous Favours			
Factor	**Variable**	**Loading**	**Alpha**
F8	Museum	.848	0.601
	Grand Prix	.763	
	Portugal	.519	
F12	Cuisine	.875	
	Restaurant	.740	
	Egg Tart	.606	
	Portuguese	.522	
	Cantonese	.505	

Theme 7: Attractions and Landmarks			
Factor	**Variable**	**Loading**	**Alpha**
F7	Tour	.825	0.690
	Natcha Temple	.723	
	Macao Tower	.670	
F9	Kun Iam Statue	.940	
	Temple	.873	
	Statue	.680	
	A Ma Temple	.539	
F19	Shop	.842	
	Senado Square	.543	



Theme	Means	%
1	7.43	21.81%
2	7.23	21.22%
3	6.50	19.07%
4	3.71	10.88%
5	3.28	9.61%
6	3.21	9.41%
7	2.73	8.01%
		%100

Factor	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	F21	F22	F23
% of Variance	6.9	5.3	4.7	4.6	4.2	4.2	3.7	3.5	3.3	3.3	3.3	3.2	3.2	3.1	2.8	2.3	2.2	1.9	1.8	1.8	1.8	1.7	1.5
Cumulative %	6.9	12.2	17.0	21.6	25.9	30.1	33.9	37.4	40.7	44.0	47.3	50.5	53.7	56.8	59.6	61.9	64.2	66.1	67.9	69.8	71.6	73.3	74.8

Figure 3: A semantic network of the online destination images of Macao SAR (semantic analysis)

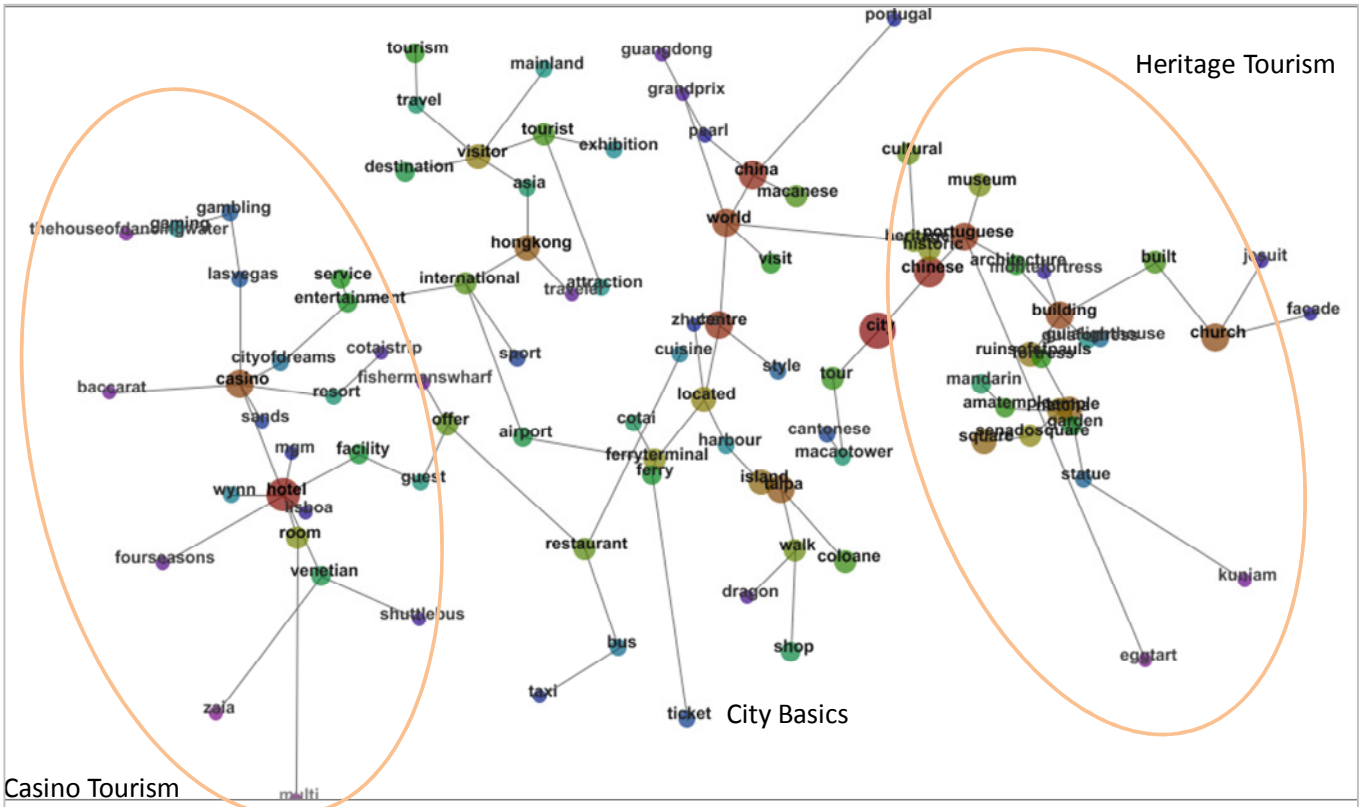


Image Variable	City	Hotel	Chinese	China	Centre	Portuguese	World	Building	Casino	Church	Taipa	HongKong	Temple	Square	Island
Degree Centrality	0.827	0.785	0.689	0.600	0.589	0.575	0.574	0.560	0.559	0.543	0.523	0.473	0.471	0.451	0.437

Image Variable	Cuisine	Zhuhai	Located	Centre	Cotai	Style	Harbour	Attraction	FerryTerminal	Traveller	Ferry	Visit	Tour	Sport	Island
Closeness Centrality	0.208	0.206	0.206	0.206	0.202	0.202	0.200	0.199	0.199	0.196	0.196	0.195	0.194	0.192	0.192

3 Discussion

The findings of this paper have promoted two areas of discussion in context. These areas are related to 1) social media as a marketing tool and 2) Web content analysis as a research methodology.

3.1 Social media as a marketing tool

The travel experience has evolved as the key selling point in travel over the past two decades [21]. Specifically, this includes integration of the experience of travel and the services provided [21]. Tourists must be drawn into the destination offerings such that they feel a sensation of affection. The social media milieu contributes to the travel experience in myriad ways. Users may interact and share personal experience in order to provide a feeling of comradeship as well as a wider knowledge of the potential experience that will be encountered [4]. Social media's strong position in online search for information is shown by the high position of social media results in search engine rankings of travel-related queries [4]. Given that search engine queries associated with searches for cities are largely tourism-driven, this is highly important for formation of image destination and the overall tourism experience [22].

3.2 Web content analysis as a research methodology

The use of social media sites in gauging the visitor's impression or image of a tourism destination can be a useful approach. Previous research has shown that traditional surveys may not be an effective approach to identification of the user's destination image. It was found that those tourists that respond to the surveys are either highly positive or highly negative about the destination [23]. However, the observational research approach discussed in this paper could be more effective given that it is based on naturalistic observation of user interaction in the social media area. The use of systematic analysis of naturally occurring results and discussion of given destinations on sites such as blogs, web forums, and social networks can lead to much stronger information about the location's destination image than the use of a formally constructed survey. This is a cost-effective approach to monitoring destination image and the cognitive and affective components of this image, and can be used to rapidly adjust marketing campaigns and availability of material.

There are other methods that could be used to collect the information needed within this study, such as a survey. However the use of Web content analysis offers a number of advantages over a survey. First, random sampling can be

used [6]; since the participants will already have made the posts used for analysis, there will be no respondent bias. Second, the approach will be able to integrate much more information into the study than a survey would. Third, the Web content analysis approach will identify what people have actually done, while a survey could only identify what they believed they would do. Finally, the Web content analysis will be able to identify emergent theories in grounded research, which would not be possible using a survey [11]. These reasons promote the choice of the Web content analysis approach over a different approach.

4 Conclusions

This research investigated the role of Web-based social media in forming a tourism destination image. Textual information from 500 sampled travel blogs, social networking sites, and Web forums were content-analyzed. The findings suggest that Web-based social media are powerful agents in the formation of a destination image through the sharing of travel experiences and opinions about a destination. A systematic analysis of social media content can thus be an effective means to determine the feelings, perceptions, and impressions of visitors on a tourism destination. Monitoring user-generated Web content is a cost-effective method for destination marketers to assess their service quality and improve the overall experience of travellers. A ground methodology, as discussed in this paper, has been proven to be useful for the collection and analysis of contextual information available in the Internet.

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The Relation Tracking Service of Customs Service based on Semantic Web

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keyword: Relation Tracking, Semantic Web, Customs, Risk Management
conference: EEE'11

Due to the proliferation of trade and travelers, the works of customs service are increasing day after day. Customs service has conducted ongoing efforts to solve the problems of overlapping business information exchange between border management agencies and to improve the efficiency of the administration. The detection and prevention of illegal works such as terrorism, smuggling, trade in hazardous substances is more important than the exposure of illegal works after the fact. To do this, information exchanges and cooperation between relevant institutions are required. In developed countries, the intelligent risk management systems have been developed by using advanced IT technologies.

The relfinder, which is developed by University of Stuttgart, extracts a graph covering relationships between two objects of interest. It shows an interactive visualization of this graph that supports the systematic analysis of the found relationships by providing highlighting, previewing, and filtering features. But there are some constraints on the degree of relationships and speed of finding relationships.

In this study, we propose relation tracking service of customs which is focusing on relationships of objects including suspicious person, institution, customs house broker, item, forwarding agency, and so on. The goal of this service is to provide relation tracking information of objects quickly and enhance accessibility to related information by semantic web technology. Ontology is used for data modeling to unify multiple data sources which contain internal profile information of customs service and external regulations or risk information. Each object is assigned by URI(Uniformed Resource Identifier) and expressed by RDF triples. Reasoner is used for knowledge expansions with user's rules and tracking of indirect relationships of objects. Relation tracking service provides the following features.

- Object's profile browsing: User can access all related information about a specific object within a network by clicking the properties of object.
- Query expanding with thesaurus: Thesaurus is a reference dictionary in which words with

similar, broader and narrow meanings are grouped together. Thesaurus is used to expand user's query.

- Relation tracking: System provides all related routes including direct relations and indirect relations of objects. Indirect relations are generated by reasoner and ontology. In order to find and track routes quickly, we store all possible routes by using ontology schema.

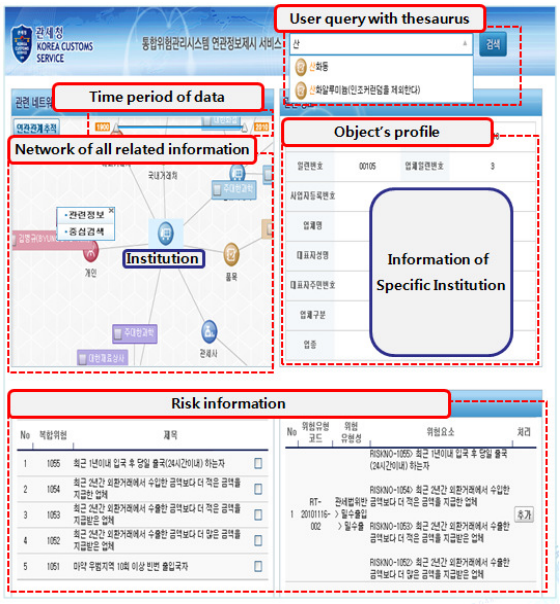

Figure 1. Main page of relation traking service

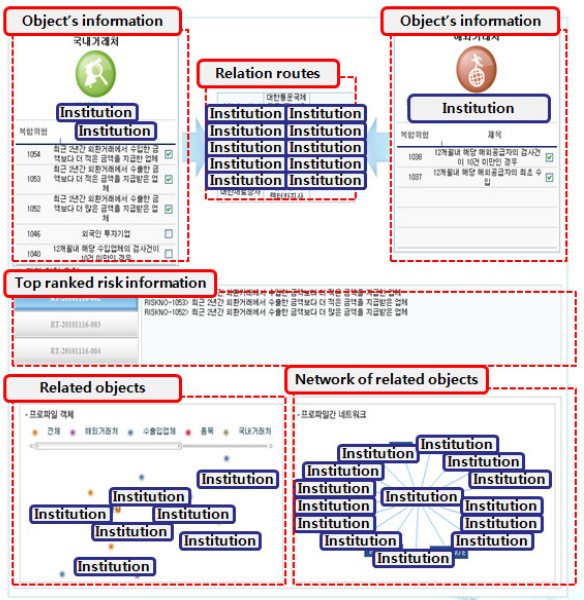

Figure 2. Related routes of two specific objects

Fig.1 shows main page of relation tracking service. User's query is auto completed and expanded by thesaurus. User can search and tracking object information within select time period. Network displays all related information of specific object and user can access object's profile and risk information easily by clicking a node. Fig.2 shows relation routes of two specific objects which are selected by user. This page provides all information of object and multiple routes quickly without constraints on the degree of relationships. The all possible routes between objects are generated in advance and Service tracks quickly all routes of selected objects considering pre-generated possible routes. All related objects are shown in bottom area of fig. 2 and the color of node means object type. User can see all relationships of objects by network at a glance and expand relationships by clicking any node of network.

By applying advanced IT technologies, while respecting the independence of related agencies, it is possible to strength inbound and outbound inspection system for import and export cargo, transportation and travel through international cooperation of risk management, advanced electronic information sharing, through international cooperation. And this relation tracking service of customs service, which is based on semantic web technology, is useful to prevent and detect illegal works in advance. In the future, we will raise the speed of relation tracking and increase the accessibility of various data by improving the visualization of our service.

Proposed Model for E-commerce Distributed Data Mining based on SOAP and Ontology

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Abstract- *The increasing amount of online customer data in many e-commerce applications has resulted in interesting opportunities for data driven knowledge discovery and data mining techniques. The aim of this paper is to propose an e-commerce distributed data mining model (ECDDM model) to get the benefits from this opportunity. The proposed ECDDM model consists of different components that interact with each other to overcome the expected difficulties which are related to these kinds of data. Distributed nature, heterogeneous data, privacy preserving data mining, data learning, and increasing interoperability within secured communications and performance issues are considered by the proposed ECDDM model.*

Keywords*:* E-Commerce, Distributed Data Mining, Ontology, SOAP, PPDM.

1 Introduction

Several important issues need to be addressed to design the ECDDM Model. The first one is the distributed nature and semantically disparate e-commerce customer data. Several approaches have been implemented for distributed data mining (DDM) [1]. One of these approaches is moving all distributed customer data into a central location and then performing mining tasks on the integrated data. Another approach is to perform mining tasks on each set of distributed customer data (for each location) to build local models. Then, local models will be moved to a central location and combined as a global model [2].

The final years of the past decade have seen the rapid development of learning classifiers from a semantically homogeneous relational database in the machine learning literature [3] [4]. In recent years, there has been an increasing interest to extend such approaches for learning classifiers from multiple semantically disparate, geographically distributed, relational data sources on the Semantic Web [5].

Privacy Preserving Data Mining (PPDM) is another important issue that needs to be considered during DDM model design. Most e-commerce providers may not be willing to share their data but they would like to take the benefits from DDM applications. According to [6], PDDM research is still in its infancy and there is no a practical system or development framework for PDDM. In recent years, there has been an increasing interest in data mining privacy methods [7]. Examples of these methods are: sanitation, data distortion, and Secure Multi-party Computation. Sanitation method aims to modify or remove sensitive data from data sources. Removing or modifying process may give a negative impact in the data mining results [8][9]. Distortion method provides privacy for e-commerce data by modifying the original data [2]. Another different method uses Secure Multi-party Computation (SMC) that uses cryptographic techniques to ensure almost optimal privacy [6].

The data learning process itself is a critical issue for this kind of model due to the relational nature of e-customer data. Relational nature of e-commerce customer data basically violates two assumptions made by traditional data mining techniques as stated by [4]: "The instances in relational data are not recorded in a homogeneous structure and are not independent and identical distributed".

In the ECDDM proposed model, we have used the approach that performs mining tasks for each distributed customer data to build local models and then combining them as a global model on the user side (central side). Statistical Relational learning is used as a classification process, and hierarchical ontologies are used to solve the problem of semantically heterogeneous data. There are privacy-based and performance-based components in both distributed customer data and user data. Simple Object Access Protocol (SOAP) is an XML-based protocol that will be used as a communication protocol to enable the user side to communicate with heterogeneous E-commerce applications. In section 2 the proposed model is discussed in more details.

2 ECDDM Proposed Model Structure

2.1 Overall Structure for the Proposed Model

There are two sides for the proposed model. User side as central side and distributed competitor side. Various

components in both sides work together as follows: Mining request is generated from user architectural components at the user side, decomposed to many SOAP requests for each competitor side and SOAP results will be composed to generate integrated results at the user side. Figure 1 shows the overall structure of this DDM model. SOAP adopts SSL encryption to encrypt the information, so it is secure to transfer information [10].

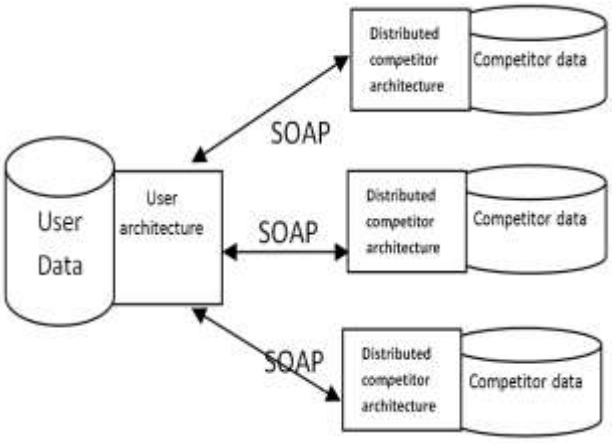

Figure 1: Overall structure for the proposed model

2.2 Distributed Competitor-Side Architectural Components

As indicated in figure 2, there are three types of competitor side components. Physical component, coordination processes, and memory buffers. Physical component includes a local database or any other data source formats and algorithms library. Algorithms library contains all available algorithms for DDM and PPDM.

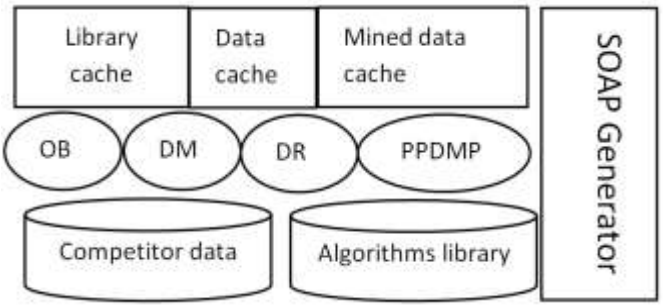

Figure 2: Competitor-Side Architectural Components.

Coordination processes are interfaces between physical components and memory buffers. Coordination processes includes SOAP Generator, ontology builder (OB), data miner (DM), data reader (DR) and Privacy Preserving Data Mining Process (PPDMP). The functions of these processes are as follows:

- SOAP Generator function: Receive "request SOAP message" and then convert it to competitor side environment. Convert mined result as "Response SOAP message" and send back to user side.
- Ontology builder (OB) function: It is responsible for Building hierarchical ontology in competitor side to be at the same abstraction level with user ontology. Hierarchical ontology will be constructed according to predefined mapping constraints between user side ontology and competitor side ontology.
- Data miner (DM) function: It provides the required algorithms from the algorithms library to perform data mining tasks and send the result to PPDMP to perform privacy process. After that, DM will place the result inside the data mined cache.
- Data Reader (DR) reads the required data from Competitor data and places them inside data buffers.
- Privacy Preserving Data Mining Process (PPDMP) provides the required algorithms from the algorithms library to perform privacy tasks and then send protected results to Data Miner.

Memory buffers component includes *library cache*, *data cache* and *data mined cache*. The aim of these buffers is to improve the performance of the proposed model. The library cache stores the most recently used DDM and PPDM algorithms, data cache stores the most recently used data, and data mined cache stores the most recent results. These buffers reduce the amount of physical reads (I/O reads) through the following steps:

a- Competitor side receives "request Soap message from user side.

b- Search for identical request and result inside these buffers. If they are available, the competitor side will directly send the result to the requester (user side) and there is no need to repeat DDM and PPDM processes again.

2.3 User-Side Architectural Components

As indicated in figure3, component types are similar to distributed competitor side. In user side, *mapping library* in physical components includes interoperation constraints, and the associated set of mappings from the user ontology to the competitor-side ontologies.

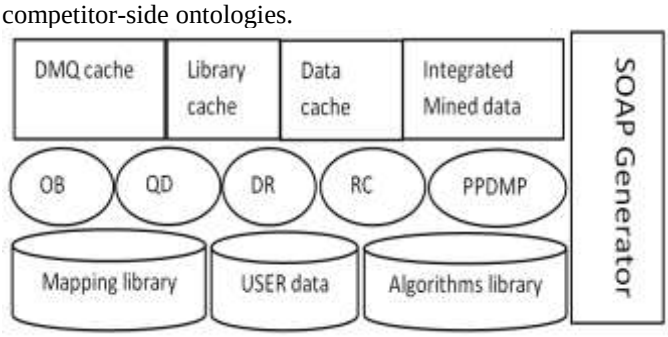

Figure 3: User-Side Architectural Components

In coordination processes, the new processes are as follows: *Query decomposer (QD*) maps and decomposes user side query into sub-quires for each competitor' side. *Result composer (RC)* integrates all competitor side results as one result according to the used data mining algorithm. Integrated result will be placed by RC inside integrated mined data. New Memory buffers components in user side are as follows: *Data mining query cache (DMQ cache)* that stores the most recently used composed/decomposed queries and *Integrand mined data cache* that stores the most recently used integrated results.

3 Conclusions

Data mining in e-commerce environments is an application of distributed data mining (DDM). To design a suitable model for Data mining in e-commerce environments, you need to consider several issues such as: heterogeneous data, privacy, data learning, increasing interoperability within secured communication, and performance. Our ECDDM model contains components which are dedicated to solve these issues. We have used memory buffers to overcome performance issues. We have used hierarchical ontologies to add semantics on data levels. We have proposed background processes for Privacy Preserving Data Mining, composition, and decomposition of data mining quires. We have used SOAP technology to deal with heterogeneous e-commerce applications, increase interoperability and secure communication messages.

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Privacy Policy Negotiation at User's Side Based on P3P Tag Value Classification

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Abstract— *Concerns of users about privacy of their personal data are of higher and higher importance to online Service Providers (SPs), as they turn into a major barrier for broad acceptance by users of services that are known to collect and utilize their personal data. With the P3P standard (Platform for Privacy Preferences), in the context of web-based applications, users are allowed to keep control over the collection, use and sharing of their personal data. However, P3P still lacks a negotiation mechanism. In this paper, we address this limitation by proposing a novel scheme to permit users to automate the negotiation of the privacy terms related to their personal data in transactions. The original idea of our contribution is to establish a classification of P3P tag values, and to define negotiation rounds and phases during which the user is able to compare his privacy preferences against the set of privacy policies provided in order of preference by the SP. For that purpose, we extended the expressiveness of the P3P and XACML languages that help users and SPs to define in an orderly way their privacy preferences / policies for the same transaction. For illustration purpose, we designed a user interface for users to define their preferences according to the classification, and we proved the feasibility of the negotiation scheme through a simple prototype.*

***Keywords*— Privacy, privacy policy, negotiation, classification of P3P tag values.**

I. Introduction

The changes brought by concepts, such as e-Government and e-Commerce, are moving internet users towards electronic based services, whatever their public or private usages. These services require more and more user's personal data to facilitate interactions between citizens and organisations.

Many researchers agree that an important enabling factor for a comprehensive usage of online services is to strengthen the consumers' confidence in online Service Providers (SPs) when they deliver their personal identifiable data. Privacy policy is the essential for building such confidence [1]. So far, P3P [2] is the most widely used standard in this direction. It has been proposed by W3C to enable SPs to present their privacy practices in a standardized machine readable format. The privacy practice lists the data elements the SP proposes to collect, and it details how each data element is to be used, how long the data are retained for, and with whom they will be shared. Acting on behalf of the user, a user agent can parse the declared privacy policy and compare it against a set of privacy preferences defined by the user. The result of the comparison might be proceeding with the request on no condition, or blocking the request. While P3P can be used by online SPs to express all terms and conditions of their privacy policy, P3P does not support negotiation of the terms and conditions of the privacy policy contract between the SP and the consumer [3]. As such, the P3P model can be categorized as a "take-it-or-leave-it" model, which is suitable for web browsing but not for the business service architecture, which is based on the benefits of the service consumption and user's satisfaction. With the growth of the e-Commerce, we think that the current approach "take it or leave it" regarding privacy policies is too much restricted. We believe that an automatic negotiation mechanism must emerge for users to better control their personal data.

This paper focuses on a per-session privacy negotiation at the users' side. It permits to generate fine-grained privacy contracts to govern the use of data collected during a transaction. The user defines a set of privacy preferences beforehand, which in turn governs how negotiation will be conducted with the SP. Negotiation increases the chances of getting an appropriate solution for conflicting privacy needs.

The remainder of this paper is organized as follows: Section II presents related works including the privacy policy negotiation solutions in web service context. Section III describes the classification of P3P tag values, the policy models of the user and the SP, and the user interface permitting the definition of such privacy preferences. Section V presents the formalized negotiation process through discussing different phases and rounds of negotiation. Section VI presents a realistic negotiation example. Finally Section VII concludes the paper with future works.

II. Related Works and Positioning of our Works

Most of the research works about privacy policy point to the issue of policy negotiation. This topic has been fully investigated in distributed systems. Maamar [4] introduced the Web Services Policy Languages (WSPL), which support the policy negotiation by merging policies from two sources. In particular, the simple negotiation steps are given. One of the important issues presented in [4] is the dynamic policy negotiation, which is performed at runtime based on dynamic constraints per service request. In WSPL, the initial policies contain all possible combinations of parameters, and hence, support the determination of all mutually acceptable policy parameters on the first round with no further incremental

negotiation. Such a general policy negotiation process is very different from the negotiation proposal presented in our research, in which incremental parameters are negotiated when initial policies fail to match exactly. This is due to our consideration that negotiation in the highly distributed Service Oriented Economics (SOE) shall be carried out in an extended manner between heterogeneous service providers and consumers.

Barrere et al. [5] propose a solution to make an administrator located in different domains agree on a common dynamic security policy. Furthermore, dynamic inter-domain policy negotiation is fostered in the architectures consisting of distributed domains rather than relying exclusively on the centralized global repository.

Finally, Chang et al. [6] describe a solution for managing security policies in a large distributed web service environment. It allows collaborative parties to negotiate and establish security policies dynamically for each individual interoperation. However, they do not give detailed elaboration on the policy integration protocol.

On the other hand, research on privacy issues in service-oriented environment still lies in its initial stage. A recent survey study of privacy issues in web services environment was presented by Garcia et al. [7]. The authors suggested several research directions in this area. One of the most promising directions is the privacy negotiation. In particular, Korba [8] describes privacy in a distributed electronic commerce environment. The author proposed an agent-based negotiation approach to integrate the privacy policy from several organizations of different countries, where different privacy laws are enforced. However, the author does not take into consideration the context dimension at the time of defining the privacy policy. In our paper, we introduce a new context dimension in our privacy template policy so the privacy negotiation is context dependent. Moreover, El-Khatib [9] proposed a new privacy negotiation protocol for web services. The proposed protocol enables the generation and negotiation of a bilateral privacy agreement between users and service providers using an extended version of a P3P privacy policy description language. This work is the closest to our own research works. However, the author does not give any technical details about how the user and SP can reach such an agreement.

In this paper, we give a detailed description on how a privacy policy negotiation can be agreed. As such, we make use of our own XPACML language (eXtensible Privacy Access Control Markup Language) for defining the privacy preferences and the privacy policies for both users and SPs. XPACML is an extension of the XACML framework which is enriched with P3P main elements. More details about this are given in section III.

III. Classification of P3P Tag Values

P3P enables the SP to express its privacy policy by listing the personal attributes that it is requesting from the user, and by giving for each of these attributes, its own privacy requirements under three P3P tags: Purpose (for which purposes the SP is requesting data?), Recipient (with whom the SP is authorized to share the collected data?), and Retention (how long data will remain stored at the SP?). In this paper, with the privacy policy negotiation objective in mind, we propose using these tags to define the privacy preferences of the user thanks to our XPACML format. As far as we know, this is the first time P3P tags are used to express both preferences and policies.

For better flexibility than the "take-it-or-leave-it" principle, and to help elaborating a simple comparative engine, we decided to classify the different values of the P3P tags - Purpose, Recipient, and Retention - based on their increasing risk level. The next subsections present the precise classification with explanations about it.

The advantages of this classification are twofold. First, the negotiation process will respect the user's privacy preferences as specified by himself. Second, based on the range of the accepted values defined by the user, the SP will have an interval of values that can be accepted by the user.

A. *Purpose Values*

Purpose values (or intent) are the most difficult tag values to classify. This is mostly due to the evaluation of the inherent risks that are tightly linked to the personal data type and the transaction context. The established classification takes the three following elements into account: the default retention period induced by the intent, the importance of the intention of the SP, and the privacy breaches that can be caused to the user.

The deduced classification of the purpose tag values is as follows, from the best privacy preservation to the worst:

- Current: is in the top list of the classification because data have a short retention time. The intent is critical for the SP (to satisfy the current transaction). It does not present any privacy violation for the user.
- Admin / Develop: are critical for the SP, if a SP collects a data element with the intent "admin" or "develop", we can assume that the user is an administrator or a moderator of the SP.
- Historical: involves a long retention time. It is also highly critical to the SP because it is intended to respond to a legislative framework.
- Pseudo Decision/ Pseudo Analysis: is more intrusive for Pseudo Analysis than for Pseudo Decision because the user's data element is used for analysis as requested by the SP business process (example: CRM).
- Tailoring: implies that the retention time is short because the data element is retained for a punctual readjustment. There is no mention in the P3P specification if "Tailoring" is used for collection of identifiable data or not, so by default it can be used for identifiable data.
- Individual decision/Individual analysis: may represent a privacy breach for the user. The collected data are not critical for the SP but help it to improve its site.

- Contact: it is clearly said in the specification, that the collected data will be used to send publicity to visitors. The retention time of the collected data element can be indefinitely, and this can represent a breach for the user's privacy.
- Telemarketing: The same as "Contact", with restriction of the collection to the user's phone number. The final user can be bored by commercial phone calls.

Other purpose: this intent might be anything.

B. *Recipient Values*

As Recipient tag values are fully independent from the collected personal data type, the classification of them is based on the two following aspects: the number of moral entities considered as possible recipients, and whether these entities are respectful to a privacy policy similar to the SP's.

The resulted classification for Recipient values is the following, from the best privacy preservation to the worst:

- Ours: is at the first level because it relates to the SP and the agents working for him. These recipients have absolutely the same P3P privacy policy as the SP.
- Same: these moral entities have a P3P privacy policy equivalent to the SP's. It might be a lot of legal entities.
- Other-recipient: it relates to legal entities whose privacy policies are different from those of the SP's but the SP knows about this.
- Delivery: it includes a low number of entities whose practices are unknown. Those entities have no contract with the SP.
- Unrelated: the practices of those entities are unknown. It includes a great number of entities.

Public: it means that collected data will be made public.

C. *Retention Values*

The retention time tightly depends on the declared intent and the recipients. As we only take into account the retention time itself, the classification for Retention tag values is simple, and is the following, from the best privacy preservation to the worst:

- No retention: the smallest retention time, the data element is deleted straight after the transaction.
- Stated purpose: depends on the declared intent, but the SP should have a calendar to delete the collected data with a precise retention time value.
- Legal requirements: as stated in the specification, the collected data are kept for a limited retention time.
- Business practices: fully depends on the commercial practices of the SP.
- Indefinitely: this value makes sense if the recipient is a public platform.

IV. User Preferences under XPACML Format

To help users defining privacy preferences, a Java desktop application has been developed for creating and maintaining the user's privacy preferences. After entering the service category (as depicted in figure 1), the user can define, for each of his personal attribute, his acceptable privacy values. That is, as depicted in figure 2, the user has to position a cursor for Purpose, Recipient and Retention on a privacy scale compliant to the previously defined P3P classification.

Fig.1. Our welcome interface for the user to create or update privacy preferences for a specific service type

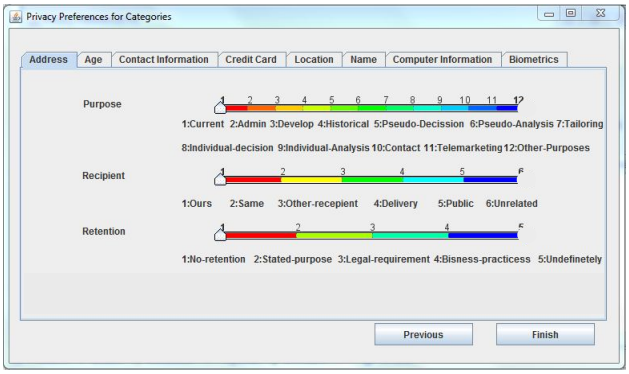

Fig.2. Defining user's privacy preferences for the Address attribute

The resulting privacy preferences are stored under XML format [ref]. More precisely, the XML markup language is a powerful tool that serves to store information according to an ordered schema. The definition of an XML document mainly identifies the XML elements and tags that will be used. In our proposed policy structure (figure 3), we reuse and redefine tags of XACML and P3P specification.

User's personal data elements are considered as a resource, thus we define new XML elements in the Target tag of XACML. Also, we introduce the P3P main tags Purpose, Recipient, Retention used in the classification in the Resource element of the XACML policy model language. This enables the adoption of the main privacy vocabulary defined by the P3P platform, and their integration into an access control language. Moreover, each Resource element is identified by a unique identifier: ResourceId. An additional element Service_Type is also defined. It describes the service category

of the SP (e.g. e-commerce, e-Telecom) for which the privacy preference applies.

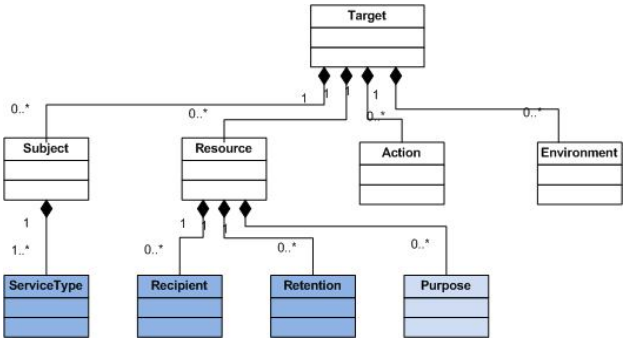

Fig.3. Our privacy policy structure

The advantages of these changes are twofold. First, they allow both the user and the SP to express respectively their privacy preferences and their privacy policies using the same privacy policy structure and vocabulary. They should differ only by the Effect attribute in the Rule element. This attribute is used by the user to permit or deny some privacy rules and is not present in the SP's privacy policy as it is implicitly a request. Second, the user can define his preferences per Service Type.

```
<?xml version="1.0" encoding="UTF-8"?>
<xacml:PolicySet ... >
  <xacml:Description>User A's Privacy Preferences</
      xacml:Description>
  <xacml:Policy ...>
  <xacml:Description>this is the privacy preferences for
      the e-commerce service</xacml:Description>
  <xacml:Target>
    <xacml:Subjects>
      <xacml:Subject>
        <xacml:SubjectMatch ...>
          <xacml:AttributeValue .../>
          <xacml:SubjectAttributeDesignator .../>
        </xacml:SubjectMatch>
        <xacml:Service_Type>e-Commerce</xacml:Service_Type>
      </xacml:Subject>
    </xacml:Subjects>
  </xacml:Target>
  <xacml:Rule Effect="Permit" RuleId="RuId">
  <xacml:Description/>
  <xacml:Target>
    <xacml:Resources>
      <xacml:Resource ResourceId="ReId">
        <xacml:ResourceMatch ...>
          <xacml:AttributeValue ...>address</
              xacml:AttributeValue>
        </xacml:ResourceMatch>
        <p3p:PURPOSE>
          <p3p:current required="always"/>
        </p3p:PURPOSE>
        <p3p:RECIPIENT>
          <p3p:ours/>
        </p3p:RECIPIENT>
        <p3p:RETENTION>
          <p3p:no-retention/>
        </p3p:RETENTION>
      </xacml:Resource>
    </xacml:Resources>
    <xacml:Actions>
      <xacml:Action>
        <xacml:ActionMatch ...>
          <xacml:AttributeActionValue>read</
              xacml:AttributeActionValue>
        </xacml:ActionMatch>
      </xacml:Action>
    </xacml:Actions>
  </xacml:Target>
</xacml:Rule>
</xacml:Policy>
</xacml:PolicySet>
```

Fig.4. User's privacy preferences

V. Negotiation Scheme

A real-life negotiation needs two parties to negotiate about a subject. Each party has its own wishes and interest for the outcome of the negotiation. They both want to maximize their benefits. The parties exchange opinions about the outcome of the negotiation. They propose and object to certain statements to finally come to consent or disagree. Disagreement is cancellation of the negotiation process, while the agreement becomes a contract between the parties. The exchanged opinions are several portions of the negotiation process itself. Mainly they are objections or rejections respectively proposals. The outcome in case of consent is called a contract. Since the exchanged negotiation portions construct the contract, this construction is called contract proposal during the negotiation until final agreement.

A negotiation is an iterative process. An iteration consists of two steps. In the first step, the contract proposal is to be checked for acceptance and the accepted parts as well as the parts to be declined must be determined. This checking and determination is supported by the developed policy classification. Second, an appropriate response of negotiation portions based on the parts to be declined gets determined. This is the task of a negotiation strategy. Such negotiation

strategy may use the preferences to generate negotiation portions.

Our negotiation process proposal is based on several privacy preferences and policies organised in the order of preference of the user and SP. That is: the strict privacy preference first to the moderate one for the user, the moderate policy to the strict one for the SP.

The negotiation is performed at the user's computer. That is, when the user initiates a transaction, the SP delivers the list of privacy policies the SP is agreeing to apply on that transaction in the specified order of preference (from moderate to strict privacy policy). Then the user starts the negotiation of privacy terms, as depicted in figure 5. That is, the negotiation of privacy terms occurs first between the preferred SP's privacy policy and the preferred privacy preference of the user. If the two policies match, the negotiation succeeds, otherwise the second preferred privacy preference of the user is used. The process goes on until all user privacy preferences are depleted (or a match happens). In case no matching is found, if the SP provides to the user another privacy policy, this latter is used and a new privacy negotiation round starts by testing the policy against the set of preferences of the user. Several rounds might happen in case no matching is found until all SP's privacy policies are depleted.

In the worst case, the last round of the negotiation process occurs between the strictest SP's privacy policy, and the most moderate user's privacy preference. If there is no privacy conflict, the transaction can take place, otherwise, the user is asked to give his consent for the privacy element mismatches between the two policies. If the user gives his consent the transaction can take place, if not it fails.

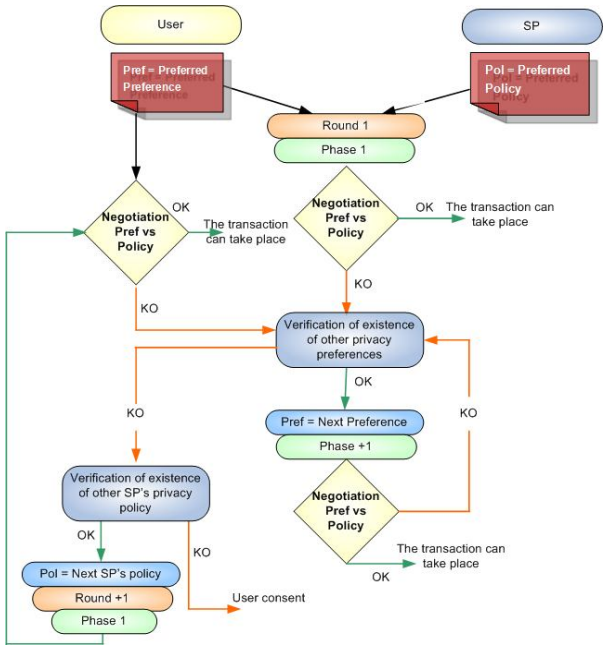

Fig.5. Negotiation process scheme

VI. Illustrative Negotiation Example

Figures 6 to 9 illustrate the full negotiation scheme when two privacy policies are proposed by the SP and two privacy preferences are configured by the user. The first round compares the first user's privacy preferences (see figure 6) against the first SP's privacy policy. A clear unmatching happens as shown in figure 6. "Tailoring" value (required for Pseudo attribute by the SP) is lower than "Pseudo decision" value (defined for Pseudo attribute in the preferred preferences of the user) on the Purpose value scale. "Same" value is also lower than "Ours" value on the Recipient value scale. Finally, "Indefinitly" value is also lower than "Stated Purpose" value on the Retention value scale.

Phase 1: Round 1, First negociation : User1 Policy 1, Server Policy 1, User2 Policy 1

Server_Data	Purpose	Recipient	Retention
Pseudo	Tailoring	Same	Indefinitly
Name	Current	Delivery	Legal requirement
Address	Contact	Delivery	Business practice
City	Contact	Delivery	Business practice
Postal Code	Historical	Ours	Legal requirement
Phone	Telemarketing	Other recipient	Stated purpose
Email	Contact	Unrelated	Stated purpose

User2_Data	Purpose	Recipient	Retention
Pseudo	Pseudo decision	Ours	Stated purpose
Name	Current	Same	Stated purpose
Address	Current	Delivery	No retention
City	Historical	Ours	Stated purpose
Postal Code	Current	Delivery	No retention
Phone	Current	Ours	No retention
Email	Contact	Same	Stated purpose

Fig.6. Preferred privacy preference (bottom table) against preferred privacy policy (above table)

Negotiation - Round 1 - Phase 1

Our negotiation software then searches for the next user's privacy preferences to complete the negotiation, still with the SP's preferred privacy policy.

Hence, a second negotiation belonging to the same round starts. Despite the matching of several values, as seen in figure 7, the second and last user privacy preferences do not solve the negotiation problem with the SP's privacy policy. As the user has no other preferences, a second round starts with the next SP's privacy policy. In figure 8, with the preferred privacy preferences, there are still incompatibilities, so the second privacy preferences of the user are tested. There are then three remaining incompatibilities (see figure 9), however, as there are no other possible policies and preferences, to solve these incompatibilities, at this step, the consent of the user is mandatory to continue the negotiation or abort it.

Phase 2: Round 1, Second negociation : Server Policy 1, User2 Policy 2

Server_Data	Purpose	Recipient	Retention
Pseudo	Tailoring	Same	Indefinitly
Name	Current	Delivery	Legal requirement
Address	Contact	Delivery	Business practice
City	Contact	Delivery	Business practice
Postal Code	Historical	Ours	Legal requirement
Phone	Telemarketing	Other recipient	Stated purpose
Email	Contact	Unrelated	Stated purpose

User2_Data	Purpose	Recipient	Retention
Pseudo	Tailoring	Public	Indefinitly
Name	Current	Same	Stated purpose
Address	Current	Delivery	No retention
City	Historical	Ours	Stated purpose
Postal Code	Current	Delivery	No retention
Phone	Telemarketing	Same	Stated purpose
Email	Other purposes	Public	Indefinitly

Fig.7. Second preferred privacy preference (bottom table) against preferred privacy policy (above table)

Negotiation - Round 1 - Phase 2

Phase 3: Round 2, Third negociation : Server Policy 2, User2 Policy 1

Server_Data	Purpose	Recipient	Retention
Pseudo	Tailoring	Same	Indefinitly
Name	Current	Delivery	Legal requirement
Address	Current	Delivery	No retention
City	Historical	Ours	Legal requirement
Postal Code	Current	Delivery	No retention
Phone	Telemarketing	Same	Stated purpose
Email	Contact	Unrelated	Stated purpose

User2_Data	Purpose	Recipient	Retention
Pseudo	Pseudo decision	Ours	Stated purpose
Name	Current	Same	Stated purpose
Address	Current	Delivery	No retention
City	Historical	Ours	Stated purpose
Postal Code	Current	Delivery	No retention
Phone	Current	Ours	No retention
Email	Contact	Same	Stated purpose

Fig.8. Preferred privacy preference (bottom table) against second preferred privacy policy (above table)

Negotiation - Round 2 - Phase 1

User2_Data	Purpose	Recipient	Retention
Pseudo	Tailoring	Public	Indefinitly
Name	Current	Same	Stated purpo...
Address	Current	Delivery	No retention
City	Historical	Ours	Stated purpo...
Postal Code	Current	Delivery	No retention
Phone	Telemarketing	Same	Stated purpose
Email	Other purposes	Public	Indefinitly

Fig.9. Second preferred privacy preference (bottom table) against second preferred privacy policy (above table) with remaining three incompatibilities

VII. CONCLUSION

This paper presents the need for negotiating privacy terms of a transaction between service providers and consumers. Our contribution is to depict how negotiation techniques can overcome current drawbacks of static privacy policies, and how these negotiations can be implemented using existing technologies. In this article, we presented a negotiation scheme that helps users generating a per session privacy policy based on a set of privacy policies of the SP and a set of privacy preferences of the consumer. That negotiation could be implemented in software agents that act on behalf of consumers and service providers to negotiate a binding policy between the two parties.

This negotiation is based on our newly defined P3P tag value classification, and our own privacy policy XACML-based language. It automates users making decision about acceptable privacy terms of the SP. A formalized description of the negotiation with several rounds and phases is described. An implementation of it is also illustrated through a negotiation example with two policies and two preferences. Note that this negotiation is fully implemented at the user's side, so a malicious user can falsify the behavior of that negotiation scheme to deliver as fewer attributes as possible to the SP with the strictest possible privacy policy. As such, it does not fulfill the criteria of fairness. Moreover, as noted in this paper, we define a static P3P tag value classification, but the classification for Purpose and Retention P3P tag values should be made dependent on the personal data, and service type to make it closer to privacy considerations. Future works intend to enrich this classification, and to propose a risk computation function measuring the risk level of each negotiated privacy tag value.

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DEVELOPMENT OF AN ELECTRONIC MEDICAL RECORD SYSTEM FOR THE UNIVERSITY OF NORTH CAROLINA WILMINGTON SCHOOL OF NURSING

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Abstract - *The purpose of this project was to develop an electronic medical record (EMR) system for use by the University of North Carolina Wilmington's School of Nursing (SON) faculty and student nurses in their new medical practice simulation laboratories. This system was designed to educate faculty, beginning practitioners at the undergraduate and graduate levels, and staff in Southeastern North Carolina to develop new skills and augment current skills in health care technology. The implementation of this EMR system required the development of a database and user interface according to the client's specifications.*

Presently, the EMR system is live and being used by the School of Nursing (SON) faculty and students in their instructional laboratory meetings. The goal of this project was to build the foundation for the SON's EMR system. Future work includes further development of the system's capabilities and functionality.

Keywords: electronic medical record (EMR) system, nursing, education software, databases.

1 Introduction

The use of electronic medical record (EMR) systems in medical facilities has become a standard practice in the medical care industry. On February 17, 2010, President Barack Obama signed *The American Recovery and Reinvestment Act of 2009* which included the restructuring of the nation's medical system by establishing "computerized medical records" in medical facilities nationwide; "Billions will be handed to companies creating these databases… to universities to incorporate patient databases 'into the initial and ongoing training of health professionals'" [1]. This new stimulus included the *Health Information Technology for Economic and Clinical Health (HITECH) Act*, which "authorized expenditures of at least $20 billion to promote the adoption and use of EHR [electronic health record] technologies that would ideally be connected through a national health information network" [2].

Not only is the implementation of EMR systems in health facilities projected to be an economically and medically beneficial reform, the application of education EMR systems would provide similar benefits. The incorporation of an EMR system that simulates electronic medical records would prepare future nurses for the use of modern day healthcare technologies in the workplace. EMR teaching tools are said to be able to train nursing students "to manage the complex challenges of documenting care, patient safety, compliance and hospital efficiency" [3]. Frank Mortimer, publisher for Nursing Education at Wolters Kluwer Health, Professional & Education revealed "Currently, there are more than 3,000 nursing schools in the United States, and only 1 percent of them provide student with access to EMRs."[3]. The adaptation of EMR systems in commercial and educational medical facilities nationwide assures to be promising, once various economic factors are addressed, such as the consistency, maintainability and networking of patient medical records between medical facilities.

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1.1 What is the problem we are addressing?

Although electronic medical record systems have been available for decades, the use of EMR systems in medical facilities is still very limited. The most common reason is due to the cost of installation and maintenance. U.S. News Health revealed present day EMR systems are estimated to run as high as "$20 million to $100 million" [4]. The expense of actually having an EMR system is substantially greater than the resulting benefit, especially for smaller organizations [4].

Another common reason for the limited use of EMR systems is a lack of product availability for institutions of all sizes. Specifically, many contemporary EMR systems are targeted toward large medical facilities. As a result of this market focus on large institutional clients, there exist few EMR systems designed for and available to the far more numerous small, private practice firms and public universities. Additionally, the EMR systems that are on the market do not always provide the functionalities needed for operational use by most medical clinics and facilities. In 2010, the President's Council of Advisors on Science and Technology reported to the Executive Office of President Barack Obama, "even the advanced systems geared toward hospitals and large healthcare providers lack capabilities that seem rather obvious, such as extensive clinical decision support, or the ability to easily exchange data with other providers who share responsibility for the same patients." [2]. Not only is the availability of EMR systems to public medical facilities very limited, *educational* EMR systems are even more scarce and expensive.

1.2 Project Motivation

In conjunction with the construction of the new School of Nursing (SON) building, the nursing faculty and administration at the University of North Carolina Wilmington desired to integrate an EMR system into their Simulation Learning Center. At the time, nursing students and faculty occasionally used the Wilmington area's New Hanover Regional Medical Center's live EMR system during very restricted time periods throughout the week for laboratory practices. After researching the potential cost of an adaptable EMR system for the SON, the nursing administration ran into a financial dilemma. Research showed that the cost of commercial EMR systems designed for educational use averaged around $10,000 for a yearly license, as quoted by *emr-edu.com* [6]. Due to the high cost and lack of availability of an EMR system that met its exact needs, the Nursing Department searched for more efficient and economical means of acquiring an EMR system for their Simulation Learning Center.

1.3 Project Significance

The development of a tailored EMR system for the School of Nursing would not only benefit student nurses by familiarizing them with modern healthcare technology, it would also incorporate various administrative features that would allow nursing faculty and administrators to monitor their students' work. Initially, the nursing administration expressed their interest in educational EMR systems similar to "EMR-EDU" [5], "Neehr Perfect" [6], or the present EMR system used at New Hanover Regional Medical Center. As a result, the design and development of this EMR system was modeled after some of these systems, with various adjustments made and additional features added that are required for educational purposes. A customized EMR system ensures that the software features are adaptable to the program's curriculum.

Incorporating administrative tools into the customized EMR system, similar to those of the learning platform Blackboard [7], allows faculty members and administrators to conduct lab practices more effectively. Furthermore, a centralized EMR system provides students with a shared learning platform throughout the nursing program. Because this system is adaptable to numerous nursing courses, students are able to develop and utilize healthcare technology skills across multiple courses.

2 EMR System Design

2.1 Patient Medical Records Home Screen

The organizational structure of the foundation of this EMR system's user interface is comprised of the following components: a navigation bar, a patient banner, and a menu bar (refer to Figure 1). The patient banner displays biographical and vital medical information on a selected patient. The left-hand menu bar is used to navigate the various medical record forms by selecting the proper submenu item associated to a medical record form. Currently, four electronic medical record forms have been implemented: *Vital Signs*, *Minimal Data Set*, *Medication Administration Record*, and *Comprehensive Health History*. (Due to space consideration, all medical record forms will not be discussed in further detail).

Figure 1. Patient Medical Records Home Screen

2.2 Medication Administration Record Form

and when specific medication(s) is/are administered to a specific patient. The design of the MAR form consists of various functionalities for administrative users to that create a customized MAR for a standardized patient. (Further details on *standardized patients* are provided in section 2.4).

Administrative users have to ability to specify the start time for a MAR form, choose medication(s) to be assigned to the patient, and select specific administration times for a selected medication (refer to Figure 2).

Figure 3 shows the student view of the MAR form after an administrative user creates an MAR form for a patient. In the student view, medication administrators (student nurses) utilize this form by entering their initials whenever he/she administers a medication to denote the type, time, and by whom a medication was administered to a patient. Wherever a medication administration

The Medication Administrative Record form is used by nursing students to record what time is selected in the administrative view, the associated cell(s) in the student view contains textboxes, permitting medication administrators (aka student nurses) to only administer a select medication at the specified time.

2.3 Form Expansion

Due to the complexity of some of the medical record forms, a special system was used to allow for future form expansions with minimal changes to the PHP pages and *no* changes to the database (refer to Figure 4).

Within each column, each checkbox is assigned a value to a power of two, beginning with 2^0 to 2^{n-1}; n equal to the number of checkboxes associated to that field. For example, there are eight columns in the *Family History* form and 19 rows associated to each column. Therefore, to efficiently store this data into the database, the associated *CHHFamHist* table in the database consists of (an *id* field as the primary key and) eight fields associated to each of

the columns (mother, father, brothers, sisters, etc.). The values assigned to the listed checkboxes below each column for the *Family History* form

begins with *value="1"* ($2^0 = 1$) for the "Unknown" field to *value="262144"* ($2^{18} = 262144$) for the "Other" field. The sums of the values of selected

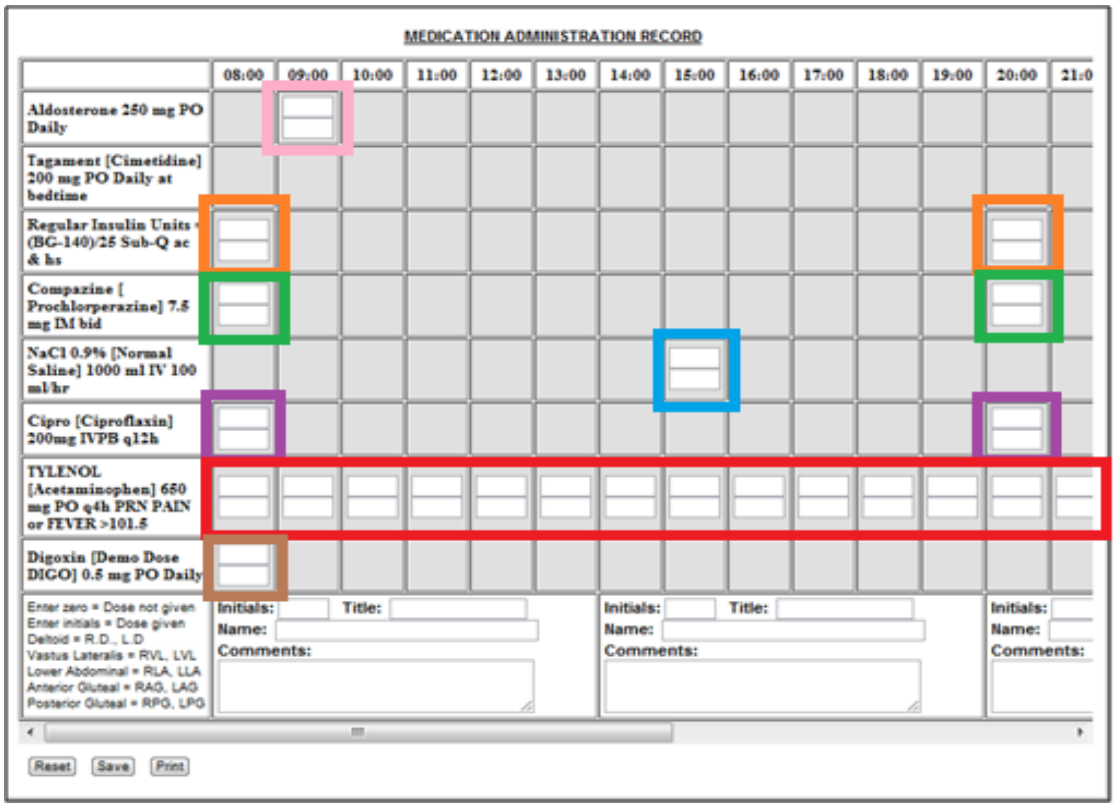


Figure 2. Medication Administration Record Form – Administrative User View

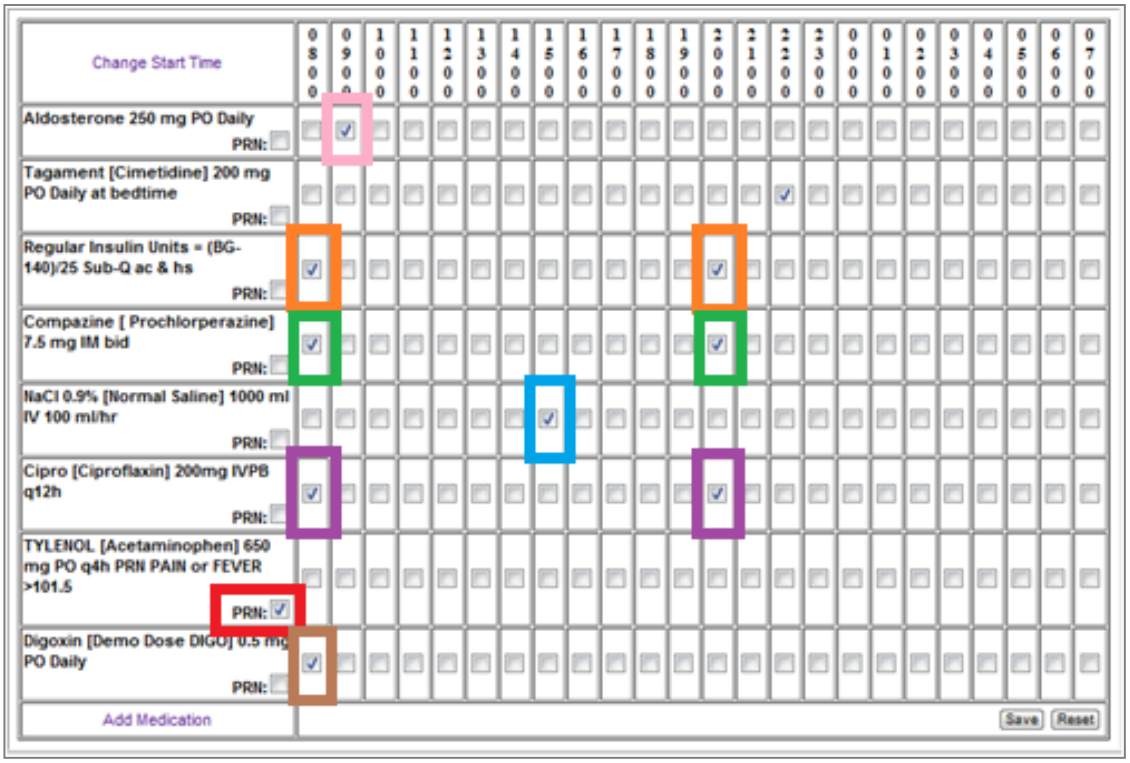
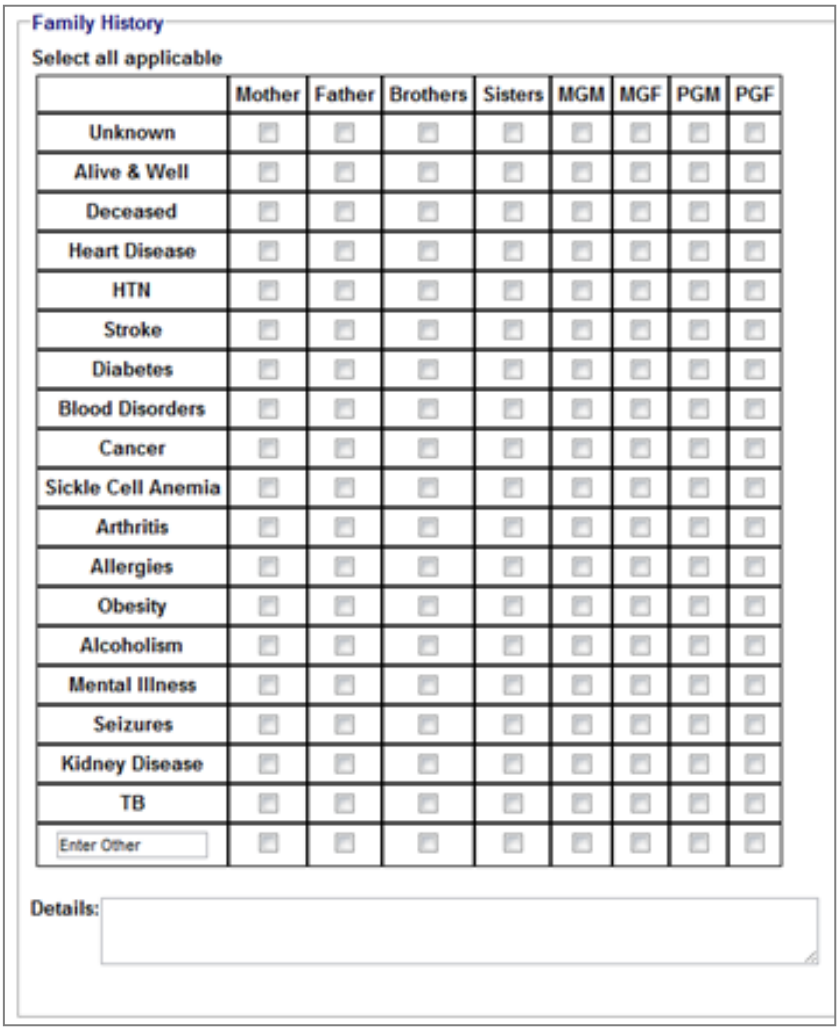


Figure 3. Medication Administration Record Form – Student User View



Family History

Select all applicable

	Mother	Father	Brothers	Sisters	MGM	MGF	PGM	PGF
Unknown	☐	☐	☐	☐	☐	☐	☐	☐
Alive & Well	☐	☐	☐	☐	☐	☐	☐	☐
Deceased	☐	☐	☐	☐	☐	☐	☐	☐
Heart Disease	☐	☐	☐	☐	☐	☐	☐	☐
HTN	☐	☐	☐	☐	☐	☐	☐	☐
Stroke	☐	☐	☐	☐	☐	☐	☐	☐
Diabetes	☐	☐	☐	☐	☐	☐	☐	☐
Blood Disorders	☐	☐	☐	☐	☐	☐	☐	☐
Cancer	☐	☐	☐	☐	☐	☐	☐	☐
Sickle Cell Anemia	☐	☐	☐	☐	☐	☐	☐	☐
Arthritis	☐	☐	☐	☐	☐	☐	☐	☐
Allergies	☐	☐	☐	☐	☐	☐	☐	☐
Obesity	☐	☐	☐	☐	☐	☐	☐	☐
Alcoholism	☐	☐	☐	☐	☐	☐	☐	☐
Mental Illness	☐	☐	☐	☐	☐	☐	☐	☐
Seizures	☐	☐	☐	☐	☐	☐	☐	☐
Kidney Disease	☐	☐	☐	☐	☐	☐	☐	☐
TB	☐	☐	☐	☐	☐	☐	☐	☐
Enter Other	☐	☐	☐	☐	☐	☐	☐	☐

Details:

Figure 4. Subsection of *Comprehensive Health History* form

checkboxes are stored into the database in their associated fields. This summation is equivalent to performing a bitwise OR across the array of checkboxes.

When the form is loaded, the stored value is decoded for each column using bitwise AND with a mask to determine whether the checkbox was checked. The mask is 2 to the power of the row number (starting with row zero). If the result is nonzero, this indicates the checkbox was checked; else, zero indicates the checkbox was not checked.

Although encoding a collection of bits with an integer conserves space, this was not the motivation for choosing this technique. The motivation was to allow flexibility in the number and names associated with a set of checkboxes, until the number of checkboxes exceeds $11/\log_{10}2$ (~ 36).[1]

2.4 Nonstandardized versus Standardized Patients

Nonstandardized patients can be created by any type of user. The patient's information and medical record forms can only be edited by the user who created the patient. (In exception, administrative users who have system overriding privileges can also have the ability to edit or delete any non-standardized patient).

Standardized patients can only be created by an administrative user but can be referenced or used in the EMR system by any user. (Note: Medication Administration Record (MAR) forms can only be created for standardized patients by an administrator.) The purpose of a standardized patient is to be able to create a patient template with default patient information settings that can be used by all students in a laboratory practice. Faculty can then view all students' work by searching the one standardized patient.

2.5 Search for Students' Work

Faculty users have the ability to select any user or patient to display all medical records filled out by a selected student user, associated with a patient. This is a feature which is important for educational purposes not found in commercial EMR systems.

[1] The checkboxes were encoded in an *int11* integer field because this is the default integer size. Since *int11* can hold up to 11 decimal digits and a value of 2^n is required to store n checkboxes, a *int11* field can encode $11/\log_{10}2$ binary digit.

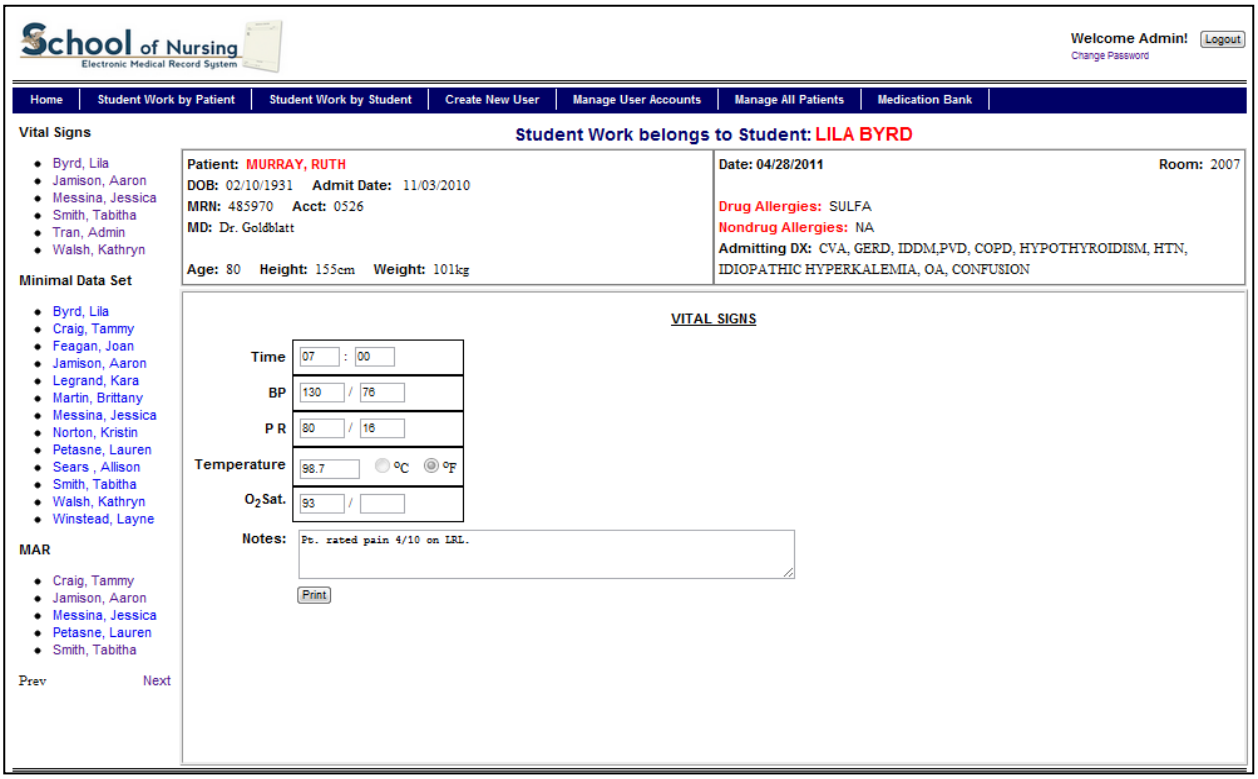


Figure 5. Display Students' Work

Figure 5 displays the *Display Students' Work* view which consists of a panel on the left-hand side that lists the students/patients associated to a specific form, a patient banner associated to the selected patient across the top, and the associated patient form populated with the entries submitted by the selected student.

For student' work displayed by patient:

- All students who created a form for this patient are listed in the left-hand panel by their names.
- The left panel is organized into the forms associated to this patient.
  (i.e. All "Vital Signs" forms created for this patient are listed under the "Vital Signs" header in the left panel *by the students' names*).

For student's work displayed by student:

- All forms created by this student are listed on the left-hand panel by those patients' names for which the student created a form.
- The left panel is organized into the forms associated with this student.

3 Conclusion

Adoption of electronic medical record systems in medical facilities nationwide will greatly benefit our medical facilities' efficiency, accuracy and accessibility. The United States Department of Health and Human Services Secretary Kathleen Sebelius states, "Expanding the use of electronic health records is fundamental to reforming our health care system . . . . Electronic medical records can help reduce medical errors, make health care more efficient and improve the quality of medical care for all Americans." [8]. Furthermore, Dr. David Blumenthal, National Coordinator for Health Information Technology explains, "With these programs, we begin the process of creating a national, private and secure electronic health information system… designed to help doctors and hospitals acquire electronic health records and use them in meaningful ways to improve the health of patients and reduce waste and inefficiency." [8]. In general, we can conclude that not only is the creation of new, adaptable EMRs economically beneficial to our nation, their creation will increase our medical facilities' consistency, maintainability, and networking of all patients medical records.

Electronic medical record systems are quickly being integrated into everyday use at various medical facilities. The implementation of the EMR system described in this paper allows the faculty and staff at the University of North Carolina Wilmington's School of Nursing to provide student nurses with hands-on experience working with EMR systems prior to entering professional practice. The system we built is a personalized EMR system for the students, faculty and staff at the School of Nursing that effectively matched their course curriculum and included features tailored to the faculties' specific needs.

3.1 Future Work

The result of this project merely built the foundation for the School of Nursing's EMR system. Plans are in place to expand the capabilities of the EMR system such as adding more medical forms to the system and possibly developing on some of the system's functionalities beyond simply data entry; for example, document image processing.

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