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].

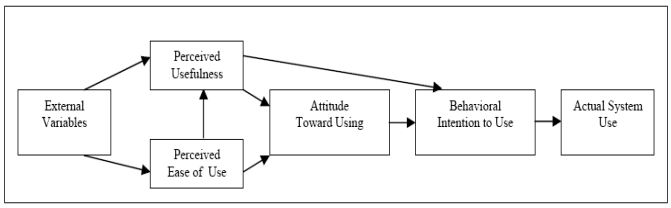

Fig. 1 Original technology acceptance model

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.

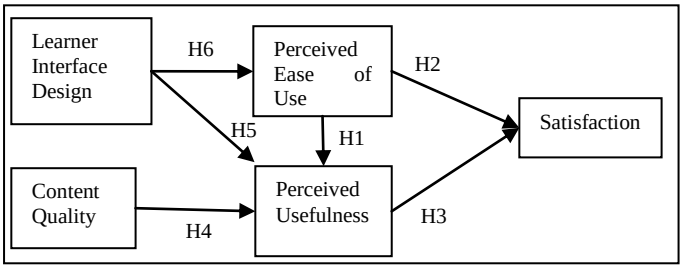

Fig. 2 Proposed Research Model

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.

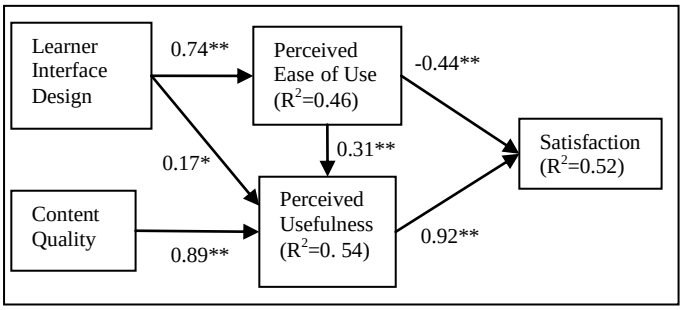

Fig. 3 Model testing results: *P < 0:05; **P < 0:01.

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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