

Investigating a theoretical framework for e-learning technology acceptance

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ABSTRACT

E-learning has gained recognition and fame in delivering and distributing educational resources, and the same has become possible with the occurrence of Internet and Web technologies. The research seeks to determine the factors that influence students' acceptance of E-learning and to find out the way these factors determine the students' intention to employ E-learning. A theoretical framework was developed based on the technology acceptance model (TAM). To obtain information from the 270 university students who utilized the E-learning system, a questionnaire was formulated. The results revealed that "social influence, perceived enjoyment, self-efficacy, perceived usefulness, and perceived ease of use" are the strongest and most important predictors in the intention of and students towards E-learning systems. The outcomes offer practical implications for practitioners, lawmakers, and developers in effective E-learning systems implementation to improve ongoing interests and activities of university students in a virtual E-learning atmosphere, valuable recommendations for E-learning practices are given by the research findings, and these may turn out to be as guidelines for the efficient design of E-learning systems.

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1. INTRODUCTION

The use of world wide web (WWW) has expanded to a large extent in the previous two decades, because of which investments are being made by universities and other educational institutes in information systems (like Moodle and Blackboard), which endorse face-to-face [1-3] as well remote course delivery [4-6]. Even though the internet is viewed as a global technology, it is important to measure the effectiveness of these tools at the domestic level because users are typically employed in local/national contexts [7].

The effective use of E-learning tools is dependent on the perspective of the users, as well as their knowledge and competences with respect to both computer and mobile usage [6, 8-10]. It has been found that these significant factors have an impact on the early acceptance [11] of the users of computer technology and their behavior in the future [6, 12-15] with respect to the use of web-based learning systems [16]. Since the technology acceptance model (TAM) has satisfactory explanatory power and its widespread popularity, it was used in various studies in the technology acceptance and adoption literature in the domain of IS implementation [17], particularly in terms of E-learning [18-21]. However, there is insufficient evidence to determine if this model is appropriate for E-learning in emerging countries and the Arab nations. Hence,

the reliability and validity of TAM, as well as its generalizability, remain questionable because it was condemned for its cultural discrimination, mainly when evaluated in non-western countries [22].

There are other issues inherent in TAM as well, for example, the irregularities in the previous studies, and its inefficiency in justifying the social influence on the acceptance of technology [8, 22, 23]. These limitations will be addressed in the study by extending TAM so that it incorporates other factors like social influence" [17], "perceived enjoyment" [24], "self-efficacy". The key objectives of this study are to cater to the limitations discussed earlier. The research particularly stresses the factors that have an impact on student's acceptance [11] and usage of web-based learning systems [25] in the context of the Arab world, especially in Jordan as a cultural context and Moodle as a web-based learning system. The structure of the paper is presented below: The following section presents a literature review. Section 3 discusses the research model and hypotheses that were used in the study. In Section 4, the analysis and findings of the data collection are explained. Section 5 presents the findings and discussions, while the final section presents a conclusion of the paper with the key findings.

2. LITERATURE REVIEW

2.1. E-learning in higher education

Within the learning environment of the universities, innovations, and opportunities are created by the swift developments of information technology. A Web-based learning platform is offered by E-Learning with a practical and flexible context, which can then strengthen both learner and teacher [26-28]. With the adoption of E-learning, the knowledge is shared among masses at large through the tools and systems, for example, Internet [29], Intranet [30, 31], email [32], chat [33, 34], discussion groups [35, 36], wikis [37, 38], blogs [27, 39, 40]. We can enjoy numerous services through E-learning, and in line with the students' needs, knowledge, exposure, and expertise, we can also customize these services [41]. To improve access to higher education and to bring efficiency in the quality of learning across universities, the university education system in UAE has implemented the E-learning tools [42]. We can assume the E-learning as a facilitator for the teaching-learning process [27]. As compared to the traditional learning systems, various benefits are offered by the E-learning for the university students. The time, place and people are needed in the traditional learning system, while the E-learning has no boundaries of learning. We can utilize this limitless learning system at anytime and anywhere. Since E-learning is a technology-based system, it should be understood by the developers and the deliverers that how the users observe and respond to the E-learning systems. Foregoing in view, an insight will thus be gained to effectively design and efficiently deliver the E-learning approach, so that the overall learning experience could be enhanced.

2.2. The technology acceptance model

While several universities have locally developed e-learning systems in UAE within their campuses, the acceptance of the university students will determine the success of the system. There are two levels to analyze the adoption of technology, which is either through individual and organization [43]. This study aimed at the individual level, so the university students currently using the E-learning system in their day to day learning process were taken into active consideration. The research model of this study was based on the technology acceptance model (TAM) [44, 45], which is the well-known model to justify "the technology acceptance behavior" among users and this milestone can be achieved by implementing this model [46].

In many earlier studies, the researchers have been using TAM to represent the theoretical model [21, 24, 47-49]. This was based on "users' perceived acceptance of any technology". The TAM was considered as the base model with some integrated factors so that the attitude towards using E-learning could be explored besides analyzing the behavior of intention to use it. As per TAM, two main factors determine the acceptability of technology, which are: perceived ease of use and perceived usefulness, see Figure 1. Perceived ease of use explains the degree to which a person believes that there would be no trouble in using such a technology. Moreover, perceived usefulness is the degree to which a person believes that his/her job performance will be improved with such a technology. According to a number of factorial analyses, we can consider the perceived ease of use and perceived usefulness as two different dimensions of human beings [50, 51]. It is clear that if only one option is to be chosen from the two systems having similar attributes, then the preference of the users will be the one containing easier and user-friendly features [52]. The original version of TAM is given in Figure 1 [45].

2.3. Determinants of students' acceptance of E-learning

With the adoption of TAM, the critical factors for the acceptance of E-learning had been identified by several researchers [24, 54-62]. Regarding this study, the goal was to analyze the E-learning acceptance behavior of the UAE University students, through whom, better understandings of implications to implement

E-learning systems in UAE universities successfully could be gained. This study only aimed at the students engaged in computing degrees in the UAE university system.

Several research studies analyzed the effect of specific student features upon the acceptance and implementation on online technology. These studies have been included as part of the E-learning research [47, 63-72]. Based on the perceived ease of use, the online delivery system may be preferred by the students keeping in mind their ability to make use of the internet and other kinds of electronic communication systems. These students are also interested in individual learning. The academic achievements as part of the online system are also positively influenced by the individual's perception towards the online learning usefulness [73]. Other factors associated with individuals' attributes are the social influence made by the student reference groups and student's outlook concerning online learning, and these may influence their willingness to learn online [74, 75]. It is the behavioral intention of the users that has a powerful impact on their actual usage of the technology, which is determined by the previous experience of using this technology [20, 75-77]. An integrated theoretical framework that was primarily based on TAM was put forward in this study involving E-learning acceptance and intention to use of university students. The study sought to assess the association between university students' intention to use E-learning and specific attributes like "social influence, perceived enjoyment, self-efficacy, perceived usefulness, and perceived ease of use". In addition, it sought to formulate a general linear structural model of E-learning acceptance of university students, which would have implications for a school manager or an educational practitioner to enhance the adoption of E-learning. Certain descriptive factors of E-learning use and the chosen constructs were also identified.

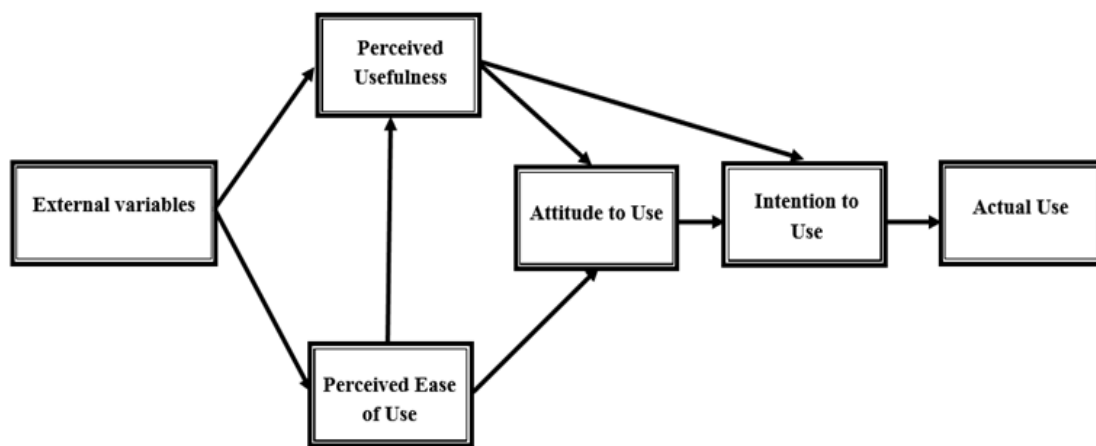


Figure 1. Original version of TAM by [53]

3. RESEARCH MODEL AND HYPOTHESIS

Based on TAM, a conceptual model of E-learning technology acceptance was put forward in this study, using previous literature that employed TAM within an educational setting. Furthermore, TAM is expanded in the model by adding further predictor variables, i.e., "Social Influence, Perceived Enjoyment, and Self-efficacy". Figure 2 puts forward the comprehensive conceptual model, while the following sections describe and justify all of the predicted relationships, keeping in view the outcomes of the previous literature.

3.1. Social influence (SI)

The social influence refers to "The degree to which an individual perceives that most people who are important to him think he should or should not use the system" [78, 79]. In some situations, a system may be used by people to meet the needs of other people, rather than to concentrate on their own beliefs and feelings [17, 24, 80]. Several studies have been carried out regarding the impact of social influence on the learners' e-learning adoption or acceptance [57, 81-87]. Many studies conducted by many scholars, such as [17, 24, 57, 83, 86-88] showed that subjective norm had a significant effect on the perceived usefulness and perceived ease of use of e-learning system. This gives rise to the hypotheses given below:

H1a. Social influence (SI) has a positive influence on perceived usefulness (PU).

H1b. Social influence (SI) has a positive influence on perceived ease of use (PEOU).

3.2. Perceived enjoyment (PE)

Perceived enjoyment (PE) is defined by [58] as “The extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use” [89]. Interest has been shown by several researchers in enjoyment involved in the studies pertaining to technology acceptance since the intrinsic variables may have a positive impact on the perspective of users [57, 70, 81, 84, 86, 90]. When a user feels enjoyment while working on a new system, there may be a decline in their perceptions of the effort they are putting in. Therefore, perceived enjoyment signifies a significant factor that describes the adoption or acceptance of e-learning. Earlier studies showed that there is a significant effect of perceived enjoyment [21] on perceived ease of use [42, 57, 70, 91], and perceived usefulness [42, 57, 70, 86, 90, 91] of e-learning. When students know that they will have an enjoyable experience while working on e-learning systems, there is a greater likelihood that they will have a positive effect on the usefulness and ease of use of such systems [44]. Therefore, the hypotheses given below were formulated:

H2a. Perceived enjoyment (PE) has a positive influence on perceived usefulness (PU).

H2b. Perceived enjoyment (PE) has a positive influence on perceived ease of use (PEOU).

3.3. Computer self-efficacy (CSE)

According to [92-94], self-efficacy is “The degree to which an individual believes that he or she has the ability to perform a specific task/job using the computer”. Self-efficacy is linked to computer systems in this study (i.e., the confidence shown by the users in their own capacity to employ the e-learning system). It was stated in many studies such as [57, 82-84, 88, 95, 96] that computer self-efficacy (CSE) plays a critical role in identifying the emotions and behavior of a person. Hence, it is claimed that when there are high expectations of efficacy, there are greater possibilities of achieving success in a given task. An analysis of the e-learning literature showed that the most extensively used external determinant of TAM was computer self-efficacy. Different empirical studies showed that there was a significant effect of computer self-efficacy on the perceived usefulness, perceived ease of use of the e-learning system [57, 82-84, 88, 95, 96]. Therefore, the hypotheses given below were formulated:

H3a. Computer self-efficacy (CSE) has a positive influence on perceived usefulness (PU).

H3b. Computer self-efficacy (CSE) has a positive influence on perceived ease of use (PEOU).

3.4. Core TAM constructs

The adoption of new technology such as mobile technology is facilitated by the perceived usefulness and perceived ease of use [42, 97, 98]. It was stated in the TAM and other relevant studies that these factors have a significant impact on the behavioral intention to use. The user’s perspective regarding the ease of understanding helps to a large extent in identifying the potency and the extent to which the user exhibits adaption to new technology [53, 99]. It was shown in a previous study that perceived ease of use (PEOU) has a significant influence on the perceived usefulness [57, 70, 83, 84, 88, 90, 100-104]. Several studies have been carried out in the past that claim that there is a positive association between the perceived ease of use (PEOU) and the behavioral intention to use E-learning system (BI), direct as well indirect [57, 70, 83, 84, 88, 90, 100-104]. According to [105], perceived usefulness (PU) will affect their intention to directly or indirectly agree to and adjust to the E-learning system. In the previous, it has been found that perceived usefulness (PU) has a significant positive relationship with the intention to use the E-learning system (BI) [57, 70, 83, 84, 88, 90, 96, 100-104]. This research puts forward the hypotheses given below, in accordance with the given literature, in addition to presenting a significant positive association between BI, PU, and PEOU.

H4. Perceived ease of use (PEOU) has a positive influence on perceived usefulness (PU).

H5. Perceived usefulness (PU) has a positive influence on behavioral intention to use social network technology (ELSA).

H6. Perceived ease of use (PEOU) has a positive influence on behavioral intention to use social network technology (ELSA).

The research model given in Figure 2 has been developed in this research using the hypotheses given above.

4. RESEARCH METHOD

4.1. Procedure

Data collection was carried out by the postgraduate students at the University of Al Fujairah. The questionnaire is the fundamental tool of data collection, were distributed among the students to validate the various research hypotheses and to determine the impact of factors being researched. The questionnaire included 17 items that were distributed under different factors, including “social influence, perceived

enjoyment, self-efficacy, perceived ease of use, perceived usefulness, and behavioral intention to use E-learning system". A total of 270 respondents taking part in the research filled the questionnaire.

On the whole, since 30 surveys were uncompleted, the questionnaires were of no use. Therefore, the total number of complete questionnaires were 270, demonstrating a response rate of 90%. The valid responses that were taken into account and modified into a sample size amounted to 270 responses, according to [106] the estimated sampling size for a population of 460 in 210 respondents. The responses were then examined using the conceptual model. This is acknowledged as a sample size when the structural equation modeling is used for performing the investigation. Therefore, a sample size of 270 is high when compared to the insignificant requirements used for the analysis of the hypotheses in this research [107].

4.2. Participants

Once the questionnaires were collected, respondents were classified in accordance with the distinct standards: age, gender, and the use of the E-learning system. The sample size of the study was 270 students, of which 175 were females, and 95 were males (65% and 35% respectively). The ages of 68% of the students were between 18 and 29. The ages of the rest of the 32% of the participants were over 30 years. Out of the 270 students, 265 (98%) were believed to highly competent in computer skills. 92% of the candidates stated that they use the E-learning system every day.

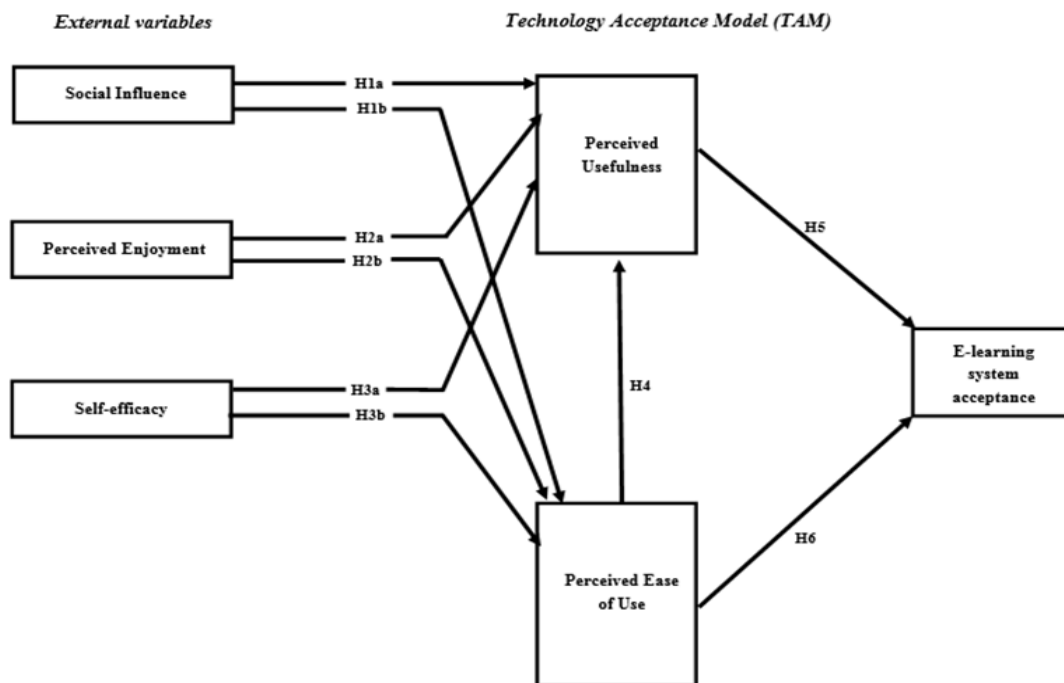


Figure 2. The proposed theoretical model

5. RESULTS AND DISCUSSIONS

5.1. Measurement model analysis

Before checking for important connections in the structural model, the measurement method must show a reasonable level of reliability and validity [108, 109]. The measurement model is made up of correlations between the latent factors and the variables identified that underlie that construct.

5.2. Convergent validity

The Cronbach's alpha scores, as shown in Table 1, are greater than 0.7, and the construct's composite reliabilities differ from the range of 0.722 to 0.898. Therefore, the condition for explicating at least 50 percent of this variance extracted between a set of the elements underlying the latent structure meets all the AVE (Average Variance extracted) values between 0.553 and 0.786. As a consequence, the convergent validity of the measurements for the constructs of buildings is considered. The following [110] metrics are used as indicators to measure the relative value of convergent validity, which are factors loadings, variance

extracted, and reliability (consisting of Cronbach's Alpha and composite reliability). For all constructs, the reliability coefficient and composite reliability (CR) surpass 0.7, for all of the constructs, which shows that ongoing coherence among many dimensions of a construct [111].

Table 1. Convergent validity results which assures acceptable values (factor loading, cronbach's alpha, composite reliability ≥ 0.70 & AVE > 0.5)

Variables	Item	FL	Cronbach's Alpha	CR	AVE
E-learning system acceptance (ELSA)	ELSA_1	0.766	0.799	0.722	0.745
	ELSA_2	0.869			
Perceived ease of use (PEOU)	PEOU_1	0.727	0.791	0.873	0.591
	PEOU_2	0.799			
	PEOU_3	0.889			
Perceived Enjoyment (PE)	PE_1	0.915	0.878	0.888	0.761
	PE_2	0.845			
	PE_3	0.819			
Perceived Usefulness (PU)	PU_1	0.851	0.917	0.898	0.786
	PU_2	0.869			
	PU_3	0.729			
Self-efficacy (SE)	SE_1	0.896	0.817	0.844	0.628
	SE_2	0.788			
	SE_3	0.891			
Social Influence (SI)	SI_1	0.727	0.717	0.814	0.553
	SI_2	0.719			
	SI_3	0.910			

5.3. Discriminant validity

As is shown by Table 2 and Table 3, the criteria for discriminant validity have been fulfilled as all the AVE values in the measurement model are larger than their squared correlation, among the constructs [108, 109, 111].

Table 2. Fornell-larcker scale

	ELSA	PEOU	PE	PU	SE	SI
ELSA	0.844					
PEOU	0.392	0.911				
PE	0.268	0.559	0.797			
PU	0.494	0.429	0.611	0.929		
SE	0.123	0.529	0.335	0.312	0.876	
SI	0.102	0.529	0.246	0.414	0.621	0.808

Note: SI, social influence; PE, perceived enjoyment; SE, self- efficacy; PEOU, perceived ease of use; PU, perceived usefulness; ELSA, E-learning system acceptance.

Table 3. Heterotrait-monotrait ratio (HTMT)

	ELSA	PEOU	PE	PU	SE	SI
ELSA						
PEOU	0.228					
PE	0.324	0.281				
PU	0.466	0.232	0.519			
SE	0.261	0.108	0.300	0.446		
SI	0.026	0.204	0.528	0.641	0.417	

Note: SI, social influence; PE, perceived enjoyment; SE, self- efficacy; PEOU, perceived ease of use; PU, perceived usefulness; ELSA, E-learning system acceptance.

5.4. Structural model analysis (SEM)

With the final goal to examine the proposed hypotheses, the relationships that the theoretical constructs for the structural model have with each other were assessed via a structural equation model that had SEM-PLS with the maximum likelihood estimation [6, 24, 25, 42, 112-115]. As appeared in Table 4 and Figure 3, the model had a high predictive power [116], that's, the percentage of the variance within perceived usefulness, perceived ease of use, and e-learning system acceptance are nearly 70%, 70%, and 71%, separately [117-140]. All hypotheses were found to be significant. Based on the data analysis hypotheses H1a, H1b, H2a, H2b, H3a, H3b, H4, H5, and H6 were supported by the empirical data. The results showed that perceived usefulness (PU) significantly influenced social influence (SI) ($\beta=0.723$, $P<0.001$),

perceived enjoyment (PE) ($\beta=0.277$, $P<0.05$), self-efficacy (SE) ($\beta=0.566$, $P<0.001$), and perceived ease of use (PEOU) ($\beta=0.302$, $P<0.05$) supporting hypothesis H1a, H2a, H3a, and H4 respectively. Perceived ease of use (PEOU) was determined to be significant in affecting social influence (SI) ($\beta=0.424$, $P<0.001$), perceived enjoyment (PE) ($\beta=0.312$, $P<0.001$) and self-efficacy (SE) ($\beta=0.404$, $P<0.001$) supporting hypothesis H1b, H2b, and H3b respectively. Furthermore, E-learning system acceptance (ELSA) was significantly influenced by perceived usefulness (PU) ($\beta=0.256$, $P < P<0.001$) and perceived ease of use (PEOU) ($\beta=0.519$, $P < P<0.05$) which support hypotheses H5 and H6. A summary of the hypotheses testing results is shown in Table 5.

Table 4. R² of the endogenous latent variables

Constructs	R ²	Results
PU	0.694	High
PEOU	0.703	High
ELSA	0.714	High

Note: PU, perceived usefulness; PEOU, perceived ease of use; ELSA, E-learning system acceptance.

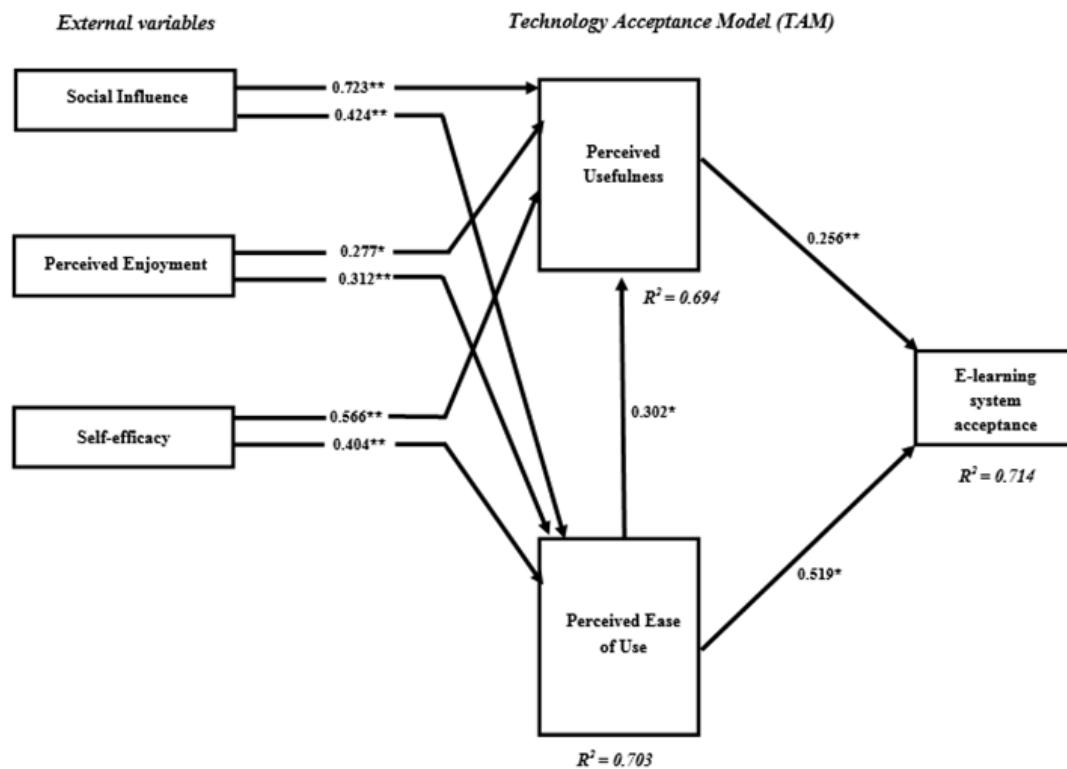


Figure 3. Result of the research model

Table 5. Hypotheses of the study

HYP.	REL.	PATH	T_VAL	P_VAL	DIR.	DES.
H1a	SI-> PU	0.723	22.271	0.000	Positive	Supported**
H1b	SI -> PEOU	0.424	19.539	0.000	Positive	Supported**
H2a	PE -> PU	0.277	1.850	0.031	Positive	Supported*
H2b	PE -> PEOU	0.312	8.891	0.003	Positive	Supported**
H3a	SE -> PU	0.566	15.404	0.000	Positive	Supported**
H3b	SE -> PEOU	0.404	8.329	0.004	Positive	Supported**
H4	PEOU -> PU	0.302	2.133	0.011	Positive	Supported*
H5	PU -> ELSA	0.256	17.459	0.000	Positive	Supported**
H6	PEOU -> ELSA	0.519	6.426	0.021	Positive	Supported*

Note: *p < 0.05; **p < 0.01 SI, social influence; PE, perceived enjoyment; SE, self- efficacy; PEOU, perceived ease of use; PU, perceived usefulness; ELSA, E-learning system acceptance.

6. CONCLUSION

The objective of this research is to extract the critical factors associated with E-learning acceptance or adoption within the UAE. The critical factors were subjected to a statistical analysis which showed social influence (SI), perceived enjoyment (PE), and computer self-efficacy (SE) maintain a positive and strong effect upon, perceived ease of use (PEOU) and perceived usefulness (PU). Additionally, behavioral intention to use the E-learning system (ELSA) is being significantly affected by the perceived usefulness (PU) and perceived ease of use (PEOU). Various other research studies assessed the positive influence of social influence, perceived enjoyment, and computer self-efficacy on perceived ease of use, perceived usefulness, and E-learning acceptance. The administration at the university is engaged in creating an E-learning infrastructure and to carry out assessments. The research is engaged in extracting and analyzing the learner perspectives influential factors keeping in mind the acceptance and adoption of E-learning systems. Thorough information can be gained through external factor research results. The recommendations and the information can be shared with practitioners, developers, policymakers, and designers so that they may effectively adopt the e-learning systems.

The research model presents a framework that can be used by the university administration so that they may create the E-learning infrastructure and analyze the readability of the students. When the E-learning practice is being planned or evaluated, the online platforms and university administration should consider these factors. The social factors are also significant which are related to the students' adoption of E-learning and they have been presented as part of the research outcomes. Furthermore, the E-learning culture should be deployed so that the entire E-learning process is understood and the E-learning adoption is supported. This culture should be present within the student community, the readability of the students towards E-learning must be developed and evaluated, students should be provided with internet access free of cost and a server should be of high capabilities, the computer labs should be built using appropriate E-learning facilities and all university students should be able to access these facilities throughout the day. Furthermore, it is possible to strengthen E-learning through planning and to carry out events and implementing an E-learning culture amongst the students and relatives. The positive attitude towards E-learning can also be developed by conducting training courses as it would help state E-learning usefulness and ease perceptions. Hence, E-learning is practiced efficiently only after enhancing behavioral intention.

A strict research process is being followed within this research, but there is a specific limitation that needs to be considered so that future research can benefit. The response rate attained from the students was quite low. The research results have been extracted using the UAE population, which makes use of the E-learning systems. Hence, when generalizing the results, the cross-cultural difference amongst provinces should be kept in mind. The research also analyzed the intention of the learners to adopt the E-learning systems, and much importance has also been given to the role played by the faculty in stating the adoption intention. Future studies would indicate the role played by the faculty for E-learning system adoption.

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