



Factors Affecting Students' Acceptance of E-Learning System in Higher Education Using UTAUT and Structural Equation Modeling Approaches

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Abstract. One of the important revolutionary tools widely used and globally implemented by educational institutes and universities is none other than the electronic learning (E-learning system). The aim of this system is to deliver education. As a result, the users of an E-learning system can have enormous benefits. The developed countries are successfully implementing the E-learning system besides realization of its massive benefits. On the contrary, the developing countries have failed, either fully or partially, to implement the E-learning system. A main reason is that those countries do not have an absolute utilization and considered below the satisfactory level. For instance, in United Arab Emirate, one of the developing countries, a growing number of universities are investing for many years in E-learning systems in order to enhance the quality of student education. However, their utilization among students has not fulfilled the satisfactory level. Imagine the evidence that the behavior of user is mainly required for the successful use of these web-based tools, investigating the unified theory of acceptance and use of technology (UTAUT) of E-learning system used in practical education is the basic aim of this research study. A survey on E-learning usage among 280 students was conducted and by using the given responses, the assumptions of the research resulting from this model have been practically validated. The partial least square method was employed to examine these responses. In predicting a student's intention to use E-learning, the UTAUT model was strongly corroborated by the obtained results. In addition, the findings reveal that all important factors of behavioral intention to use E-learning system were reportedly found as the social influence, performance expectancy and facilitating conditions of learning. Remarkably, a significant impact on student intention towards E-learning system was not suggested by the effort expectancy. Consequently, The three key factors leading to successful E-Learning system are thought to be the good perception and encouraging university policy.

Keywords: E-learning

Unified theory of acceptance and use of technology (UTAUT)

System quality · Student's intention to use E-learning · UAE

1 Introduction

Information and communication technologies bring a lot of opportunities to the higher educational settings [1–6]. One of such technologies is the E-learning. The students' acceptance of E-learning was emphasized by this study as an effective tool. Understanding of end-user acceptance process is basically required to effectively implement the E-learning. Hence, exploring the acceptance of E-learning approach among students within United Arab Emirates (UAE) universities, as a good example representing developing countries, was focused by this study. This research aims to deliver certain factors in line with the existing theories, which are to be considered, when the organization is recommending an E-learning activity to E-learners among the universities of Gulf region. In addition, the basic framework of this study is the unified theory of acceptance and use of technology (UTAUT) which was refined with the incorporation of some factors. The research goals can be successfully achieved by employing this model. In the higher educational institutions across the globe, the role of E-learning is effectively addressed by several research studies [7–18]. Prior to applying E-learning, the key factor that should be considered is the students' attitude. Regarding the literature and currently available researches, the Arab states of the Gulf universities have not considered those attitudes. In the higher educational environments within UAE context, students' attitudes towards the use of E-learning would be carefully examined. Therefore, exploring the factors in the acceptance of e-learning based on the unified theory of acceptance and use of technology (UTAUT) was the major goal of this study. This theory/model was proposed by [19]. In this study, the two universities covered, which have already implemented E-learning systems, were chosen to select the participants. Given below is the sequence of this paper. The UTAUT would be examined in the following section and we shall demonstrate the reason to accept it as the theoretical framework. Next the descriptions of the research model and methods would be described. Afterwards, the outcomes of the data analysis and hypotheses testing are produced. To conclude, the authors would take into account the implication of results and limitations.

2 Research Model and Hypotheses

As far as the E-learning perspective is concerned, learning activities are carried out by implementing the E-learning systems, and hence these systems have developed into an IT phenomenon, which impart itself to the UTAUT model. According to [19], practical suggestions including the UTAUT implementation have clearly described the IT behavior, and others are inspired to continue validating and testing their model. The implementation challenges of a new E-learning context can be addressed with the realization of the UTAUT model. Therefore, to assess the users' acceptance of E-learning, [19] UTAUT was adopted as a primary theoretical framework. Figure 1 is illustrative of the research model tested in this study. With reference to this model, performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating conditions (FC), and behavioral intention (BI) were hypothesized to be the factors of use behavioral (UB) to use E-learning. The earlier literature is in favor of the proposed

constructs and hypotheses. The theory base is explained in the following section and the hypotheses are ultimately derived.

2.1 Performance Expectancy

As per [19], performance expectancy is defined as the degree to which an individual believes that s/he can have benefits realization in his/her job performance with the help of an information system. By adjusting the performance expectancy with an E-learning context, E-learning would be of great assistance for E-learners, because learners are thus enabled to instantly accomplish the learning activities, or this particular learning uplifts their education skills and performance. Consistent with the UTAUT and foregoing literature [7–16], a significant positive association was discovered between the two constructs. Therefore, the given below hypothesis is presented:

H1: Performance expectancy (**PE**) has a positive effect on behavioral intention to use E-learning system.

2.2 Effort Expectancy

The effort expectancy is defined as the degree of ease related to the information systems and their usage [19]. According to earlier research studies, constructs about effort expectancy will be the contributing factors of individuals' objectives [7–13, 15, 16]. Since E-learning is in its early stages, the effort expectancy is believed to be a vital element of behavioral intention to use E-learning. Therefore, along the lines of the UTAUT, it is anticipated that individual acceptance of E-learning will depend upon its ease and user friendliness, and the influence the effort expectancy has on behavioral intention. Accordingly, the following hypotheses were tested:

H2: Effort expectancy (**EE**) has a positive effect on behavioral intention to use E-learning system.

2.3 Social Influence

According to [19], social influence is defined as the degree to which a person realizes how the others believe that a new information system should be used by him or her. As per the previous studies, an individual's intention for using new technology is created through the social influence [7–9, 11–16, 20] Based on earlier studies and the UTAUT (e.g., [19, 21]), social influence is found to be a significant contributing factor of behavioral intention to use E-learning, and it is also learnt that how the behavioral intention is affected from the social influence. Consequently, we tested the following hypotheses:

H3: Social influence (**SI**) has a positive effect on behavioral intention to use E-learning system.

2.4 Facilitating Conditions

The environmental factors or behavior physical setting, which persuade a user’s desire to carry out the tasks, are known as the “Facilitating conditions”. The UTAUT has yielded in this construct. The inventor of UTAUT model discovered that FC is very important determinant, by which the use of information systems is influenced [19]. The current studies have corroborated the findings of [8, 9, 11–13, 15, 16, 22] In the existing research, FCs defines the degree to which individuals are of view that technical and organizational infrastructures endure to strengthen them. In this way an influence is exerted on student teachers’ aspiration to use E-learning systems. The individual support, training, materials accessible to improve skills and knowledge and E-learning system accessibility are amongst the supporting facilities. From the above said discussion, the author has suggested the following hypotheses.

H4: Facilitating conditions (FC) will significantly and positively influence student to use E-learning system.

2.5 Behavioral Intention to Use

Determining the desire of a student in accepting E-learning is the main goal of BI items [23]. Moreover, [24] were of view that the intent of the learners in employing E-learning systems besides incorporating persistent use from the present to the future is referred to as the BI (Behavioral Intention). A number of authors (e.g. [9, 13–16, 25–31] have demonstrated that actual system use of E-Systems especially the E-learning ones is directly affected by the behavioral intention. A significant positive correlation was identified between the two constructs. Therefore, the given hypothesis is submitted:

H5: Intention to use the e-learning system (BI) has a positive effect on Actual use (AU) of the E-learning system.

The following research model is authenticated from the above hypotheses, which was developed in line with the UTAUT model for E-learning acceptance among students (Fig. 1).

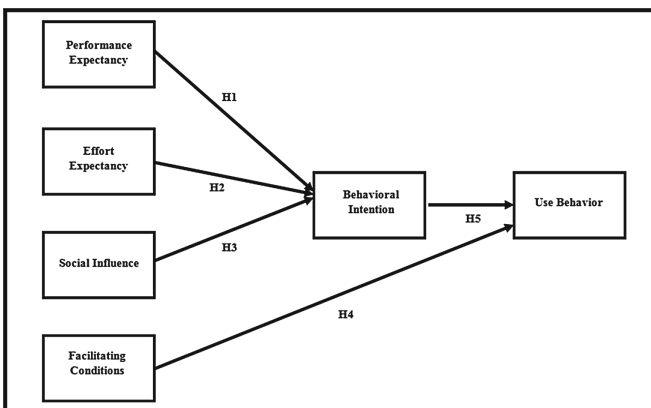


Fig. 1. Research model

3 Research Methodology

The data has been selected from two well-known educational institutions within UAE who had successfully implemented the E-learning systems. Collection of samples was major purpose in this regard. This online survey witnessed the contribution of a total of 300 respondents. The web-based E-learning systems were being used by these two universities. Moreover, the two different E-learning platform providers have developed these systems. Nearly four years ago, the academic institutes have implemented both of these E-learning platforms and this E-learning system was being used by the students of these institutes on a daily basis. The detailed sketch of the collected data is found in Table 1. Among all the responses gathered, 20 unfinished responses questionnaires were found, which were discarded. Rest, there were 280 complete questionnaires indicating a response rate of 93.3%. Generally speaking, the researchers only considered 280 responses with valid answers and the same were transformed into a sample size as recommended by [32]. Nearly 169 respondents make up the estimated sampling size for a population of 300. Afterwards, the conceptual model was used to analyze these responses. The acceptable sample size comes from structural equation modeling. Thus, a sample size of 280 was satisfying the situation to test the hypotheses in our study [33]. It is worth mentioning that the current theories were supporting the said hypotheses but the matter was observed in the E-learning background.

Table 1. Participants details

University	No. of students
The British University in Dubai (BUiD)	153
University of Fujairah	127
Total	280

3.1 Students' Personal Information/Demographic Data

Personal/demographic Information has been assessed and the results. The female student percentage was maintained at 54% and the male percentage was 46%. fifty-six percent of the respondents maintain a student age between the range of 18 and 29. There are 44% of the respondents who are more than 30 years age. Thirty-four percent of the students were from Business Administration major while students in Engineering and Information Technology, General Education, Humanities and Social Sciences and Mass Communication and Public Relations were 32%, 13%, 12%, and 9% respectively. Thirty-three percent of the respondents lived in Al Fujairah Emirate, and 28% of the respondents lived in Dubai. While Abu Dhabi, Sharjah, Ajman, Umm al-Quwain and Ras Al Khaimah have only 39% of the total respondents. Thirty-nine percent of the respondents had a bachelor degree, 40% had a master degree, and 21% had a doctoral degree.

4 Findings and Discussion

4.1 Measurement Model Analysis

A software has been developed by [34], known as the Smart PLS, which is commonly used for Partial Least Squares-Structural Equation Modeling (PLS-SEM). Within the current research, the measurement and structural models have been analyzed using the PLS-SEM [35]. The measurement model (outer model) includes the relationship which exists amongst the indicators. On the other hand, the structural model is the relationship present between latent constructs. The SEM-PLS has been applied with the highest probability method for the measurement of the current model [36]. There were various measurements carried out which include the Factor Loadings, Average Variance Extracted and Composite Reliability. These measurements help with the convergent validity and reliability. Factor loadings have been used to indicate each questionnaire variable's weight and correlation value. However, for the factors' dimensionality, the representation is made using the bigger load value. The Composite Reliability (CR) is applied to measure the reliability. There is a similar objective for CR since it brings forward a precise value by including factor loadings within the constructed formula. The average quantity of variance present within a specific variable, that states the latent construct, is known as the Average Variance Extracted (AVE). If the discriminate validity is higher than one factor, then the convergence of each factor is assessed through the AVE. After considering Table 2, it can be stated that the reliability and convergent validity condition is surpassed by the questionnaire reliability and convergent validity as part of the experiment consequence. Table 2 also indicates the questionnaire's validity and reliability after conducting an assessment upon each factor through the presentation of a variable attain from the questionnaire.

The indicators applied for the estimation of the convergent validity relative amount are factor loadings, variance extracted and reliability (consisting of Cronbach's Alpha and composite reliability). For each construct, the reliability coefficient and composite reliability (CR) [37] are higher than 0.7. This shows that the various construct measurements maintain internal consistency [38]. Table 2 indicates that 0.7 is the acceptable value that has been exceeded by the Cronbach's alpha scores [39, 40]. 0.704 to 0.850 is the construct range for the average variance extracted (AVE) values. Furthermore, the average variance extracted (AVE) values, which lie between the 0.613 to 0.769 range, are able to satisfy the explaining criteria of 50% of variance extracted from within an item set present within the latent construct [41]. Therefore, convergent validity can be attained using the construct evaluation scales.

Table 3 clearly indicates that the discriminant validity requirements have been satisfied as all AVE values are higher than the squared correlation present amongst the measurement model constructs [38, 42]. If the AVE value is above 0.5, the construct includes a measurement variance of minimum 50%. The AVE analysis is present in Table 3. The AVE score square root is presented in the tables bold diagonal elements. The table also indicates that the AVE values square root is present within the 0.783 to 0.877 range and this is higher than the 0.5 recommended value. As compared to other correlations in the construct, the AVE is higher within each construct and such an

aspect indicates that the constructs would have a greater variance maintaining their own measures as compared to the model constructs that increase the discriminate validity.

Table 2. Convergent validity results which assures acceptable values (factor loading, Cronbach's Alpha, composite reliability ≥ 0.70 & AVE > 0.5).

Constructs	Items	Factor loading	Cronbach's alpha	CR	AVE
Behavioral intention	BEH_INT_1	0.789	0.704	0.826	0.613
	BEH_INT_2	0.763			
	BEH_INT_3	0.797			
Effort expectancy	EFF_EXP_1	0.820	0.788	0.875	0.700
	EFF_EXP_2	0.856			
	EFF_EXP_3	0.835			
Facilitating conditions	FAC_CON_1	0.869	0.757	0.861	0.674
	FAC_CON_2	0.825			
	FAC_CON_3	0.766			
Performance expectancy	PER_EXP_1	0.894	0.850	0.909	0.769
	PER_EXP_2	0.894			
	PER_EXP_3	0.841			
Social influence	SOC_INF_1	0.818	0.743	0.854	0.661
	SOC_INF_2	0.851			
	SOC_INF_3	0.768			
Use behavior	USE_BEH_1	0.819	0.795	0.880	0.709
	USE_BEH_2	0.865			
	USE_BEH_3	0.841			

Table 3. Fornell-Larcker scale

	Behavioral intention	Effort expectancy	Facilitating conditions	Performance expectancy	Social influence	Use behavior
Behavioral intention	0.783					
Effort expectancy	0.385	0.837				
Facilitating conditions	0.498	0.473	0.821			
Performance expectancy	0.397	0.685	0.514	0.877		
Social influence	0.440	0.570	0.606	0.565	0.813	
Use behavior	0.447	0.472	0.586	0.612	0.559	0.842

The coefficient of determination (R^2 value) measure is applied to analyze the structural model [43]. The model of predictive accuracy can be decided upon through the use of the coefficient. It is managed as the squared correlation present amongst the

specific endogenous construct’s actual and predicted values [43]. The coefficient is used to connote the exogenous latent variables that maintain a joined influence upon the endogenous latent variable. Amongst the actual and predicted values of the variables, the coefficient maintains a squared correlation. Therefore, within the endogenous constructs it maintains a variance degree which is defended using the exogenous construct that is associated with it. If the value is above 0.67, it is considered high even though direct 0.33 to 0.67 qualities within the scope are available. The scope qualities considered weak lie in the range of 0.19 to 0.33 [43]. It is inadmissible if the estimation is lower than 0.19. According to Table 4, the model includes a Moderate predictive power with a support of approximately 43 and 34% of the variance in the Behavioral Intention and Behavioral Intention respectively.

Table 4. R² of the endogenous latent variables.

Constructs	R ²	Results
Behavioral intention	0.432	Moderate
Use behavior	0.338	Moderate

4.2 Structural Model Analysis

The proposed hypotheses have been tested using a structural equation model which is embedded in the SEM-PLS software. There exists a maximum likelihood estimation that indicates the association between the theoretical constructs present within the structural model. Table 5 and Fig. 2 summarize the results. Out of 5 hypotheses, there are 4 hypotheses which are significant as observed in Table 5 and Fig. 2. Based on the data analysis hypotheses H1, H3, H4, and H5 were supported by the empirical data, while H2 was rejected. Performance Expectancy (PE), Social Influence (SI) has significant effects on Behavioral Intention (BI) ($\beta = 0.258, P < 0.05$), ($\beta = 0.286, P < 0.01$) respectively, but Effort Expectancy (EE) has insignificant effects on Behavioral Intention (BI) ($\beta = 0.114, P = 0.164$), hence, H4 and H5 are supported, but H2 is rejected. Behavioral Intention (BI), Facilitating Conditions (FC) has also significant effects on Use Behavior (AU) ($\beta = 0.206, P < 0.01$), ($\beta = 0.483, P < 0.001$) respectively, hence, H1 and H3 are supported.

Table 5. Results of structural model-research hypotheses significant at $p^{**} \leq 0.01, p^* = 0.05$

H	Relationship	Path	t-value	p-value	Direction	Decision
H1	Behavioral intention → use behavior	0.206	3.265	0.001	Positive	Supported**
H2	Effort expectancy → behavioral intention	0.114	1.395	0.164	Positive	Not supported
H3	Facilitating conditions → use behavior	0.483	7.356	0.000	Positive	Supported**
H4	Performance expectancy → behavioral intention	0.258	2.872	0.042	Positive	Supported*
H5	Social influence → behavioral intention	0.286	3.402	0.001	Positive	Supported**

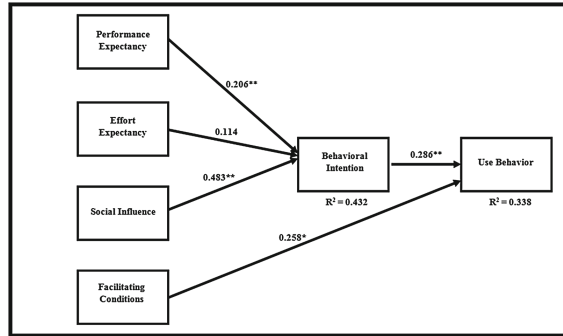


Fig. 2. Path coefficient results (significant at $p^{**} \leq 0.01$, $p^* < 0.05$)

5 Conclusion and Future Works

5.1 Study Contributions and Discussion

The objective of the research is to extract factors which affect the perception regarding electronic learning (E-learning) keeping in mind the perspective of the UAE students. The data analysis results have been taken into account to state the proposed research model relevance and the hypothesis being used for the analysis of the behavioral intention to adapt E-learning system. The research hypotheses have been analyzed using the Structure equation modeling (PLS-SEM). In Fig. 2, the structural model has been presented which is assessed through the analysis of the structural paths, t-statistics and variance explained (R-squared value). The data analysis findings have been stated in Table 5. The five hypotheses mentioned earlier have been tested using the PLS technique. Evaluation was carried out upon the path significance of every hypothesized relationship that is part of the research model and the variance explained (R^2) by every path. Four hypotheses have been supported out of the proposed hypotheses. The hypotheses attained from UTAUT model (H1, H3, H4, and H5) have been supported. The research study indicates that Facilitating Conditions, Performance Expectancy, and Social Influence would help enhance the behavioral intention to adapt E-learning system, was also found in past studies [7–16]. It has also been observed that a positive influence was subjected upon use behavioral intention including the behavioral and facilitating conditions, thus supported H1 and H3. Positive influence was also subjected upon the Performance Expectancy and Social Influence on Behavioral Intention, supporting the H4 and H5. With the help of this outcome, it is possible to indicate the E-learning significance in terms of competency and high confidence levels when making use of online learning platforms.

5.2 Limitations and Future Directions

The present research suffers from limitation since other regions and their research results have not been considered. This information would have allowed for significant input and the points of the research could have been strengthened. Furthermore, it

could help test the regional differences amongst the technology adoption perceptions and a robust model may be developed related to the developing nation's deterministic factors on technology adoption. The research includes developing models or frameworks which indicate the e-readiness. A comprehensive context is available for recognizing the concept of technology adoption within developing countries like UAE. The future strategies and their context is formed related to the ability of technology to bring forward positive business and social alterations within the developing countries.

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