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The Acceptance of E-Learning Service in a Higher Education Context

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Abstract. The purpose of this study is to determine the impact of information quality (IQ) and computer self-efficacy (CSE) on perceived ease of use (PEOU) and perceived usefulness (PU), which were hypothesized to impact behavioral intention (BI) to use E-learning. Based on the Technology Acceptance Model, this study was conducted among undergraduate students of the College of Administrative and Financial Sciences, Cihan University-Erbil. The students participated in E-learning that supported the traditional teaching method via Moodle platform during COVID-19 pandemic. 209 valid questionnaires were collected and analyzed using Structural Equation Modelling to examine seven proposed hypotheses. This study found that CSE had a positive and significant impact on PEOU but an insignificant impact on PU. Moreover, IQ positively and significantly impacted PU and PEOU. PEOU and PU significantly impacted BI to use E-learning among undergraduate students. PEOU had a significant impact on PU in the context of the education system. The implication of this study is universities and administrators of E-learning programs must focus on CSE, IQ, PEOU and PU that play a significant role in increasing E-learning adoption by students, and consequently influence the success of the educational process and productivity in the time of COVID-19 outbreak.

Keywords: E-Learning · Computer self-efficacy · Behavioral intention · Information quality · TAM

1 Introduction

Electronic learning (E-learning) programs, like online learning tools and Learning Management System (LMS), have been widely embraced by universities due to the pandemic of COVID-19. E-learning is known as a service for the delivery of information through Internet technologies [1]. Meanwhile, E-learning platforms are popular innovations for cyberspace that support distance learning, face-to-face and combined (blended) teaching/learning processes [1].

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The programs provide teaching and learning support resources and functions such as the supervision of classes, online community interactions and debates, related content (i.e. lesson content and tasks), lecture slides and evaluations of courses [2]. E-learning systems are increasingly being incorporated into higher education institutions worldwide, particularly during the COVID-19 pandemic. It can be used as a substitute or supplement to the conventional mode of learning even after this pandemic.

Technology Acceptance Model (TAM) describes whether a user embraces or refuses information technology based on their perceived usefulness (PU) and perceived ease of use (PEOU) [3]. Centered on the principle of rational intervention, TAM focuses on the behavioral intention (BI) to use the technology and assumes two main determinants: PU and PEOU [4]. However, limited studies about TAM were conducted in developing countries [5, 6], thus, the findings of studies performed in the developed countries were transferred directly to the developing ones [6] without considering country-specific factors such as the computer self-efficacy and information quality. There is a lack of understanding about BI to use E-learning in the Iraqi higher education system [1]. Iraqi universities face several challenges particularly during the pandemic of COVID-19, such as poor IT infrastructure [7–10] and the lack of IT awareness among students and academic staff [11]. In response, the purpose of this study is to investigate the impact of computer self-efficacy and information quality as external factors on the TAM among undergraduate students in the Iraqi higher education context.

2 Literature Review

2.1 E-learning

E-learning is described as the teaching and learning approach that completely or partially represents the educational paradigm focusing on using electronic media and computers to increase the availability of instruction, communication and interaction [1]. The use of technological means is an integral aspect of E-learning because E-learning is presently described as learning through numerous computational devices such as laptops, cell phones, tablets and virtual worlds [1].

Students should have good ability to control their time and keep updated about the new programming skills and ICT knowledge to succeed in the current E-learning environment caused by COVID-19 pandemic. Students' experience with technology use and E-learning behaviors are essential for the successful implementation of E-learning nowadays. The productive use of IT in E-learning is vital in terms of students' acceptance and effective E-learning. The university facilities should also be sufficient, secure, and able to provide students with material as expeditiously as possible.

Similar to any other learning platform, the E-learning has its strengths and weaknesses. Regarding the strengths, E-learning can create a cooperative spirit between students, promote individual students, build strong relationships and enhance problem-solving skills between students and teachers. As far as the shortcomings are concerned, E-learning is less trustworthy in peer reviews and collaborative tasks than traditional learning [5, 12].

2.2 Theory and Research Hypotheses

Technology Acceptance Model (TAM)
TAM is considered one of the most common and effective theories among the mentioned theories. TAM consisted of six variables including PU, PEOU, attitude, BI and actual use. BI to use technology is regarded as the most significant element in classical behavioral theories of TRA [13] and TPB [14]. It was defined as the motives that drive a person to use technology. PU and PEOU are considered the major variables in the model that impact on BI to use technology and actual use [3, 15–18]. PU is to the degree that an individual assumes that applying a certain application or framework enhances his work efficiency. In contrast, PEOU is the level to which the user assumes it is effortless to use a specific technology [3].

TAM clarifies and predicts how users adopt and use information technologies, and the factors influencing these decisions [15, 19, 20]. TAM has been applied in many prior studies ranging from distance learning (e.g. measuring technology adoption by students), to marketing (e.g. online or internet banking) [21]. For example, a study compared TAM and TPB to identify the theory that leads to accurate prediction of IT use. The result showed that TAM predicted IT use and acceptance better than TPB [22]. Meanwhile, earlier researchers also used the foundation of TRA to develop TAM in explaining the connections between PEOU, PU, attitudes and BI in the direction of the receiver system [3]. The model described the adoption mechanisms and the reasons behind the acceptance of technologies. On a different note, TAM was proposed to explore user awareness of IT at work [3, 16], and the result confirmed user's technology adoption actions directly from the perspective of information systems [3, 16, 23]. In many pertinent experiments, the TAM model was used and thoroughly tested and generally accepted because of its simplicity [21, 24, 25].

However, studies that used TAM as the underlying theory in determining the impact of BI to use technology in the Iraqi higher education system during COVID-19 pandemic were limited, although studies on TAM and E-learning were generally numerous. For instance, a study was conducted among Greek university students about the adoption of e-Class based on TAM, and the results indicated the PEOU had an insignificant impact on BI to use e-Class [21]. On the other hands, PU had a positive and significant impact on BI among university students [26]. Al Adwan [27] reported the PU and PEOU had a positive and significant impact on BI and PU had more impact on BI than PEOU among students. Additionally, Al- Adwan [27] indicated PEOU had a positive and significant impact on PU. Several other studies confirmed the impact of PEOU on PE [2, 5, 26–28] and the impact of PU and PEOU on BI [2, 5, 27–30]. Thus, the following hypotheses were developed.

H1: PU has a positive and significant impact on BI to use e-learning among students.
H2: PEOU has a positive and significant impact on BI to use e-learning among students.
H3: PEOU has a positive and significant impact on PU among students.

Computer Self-Efficacy (CSE)
CSE refers to the degree of trust that people have in their ability to cope effectively with

a particular challenge [27, 31]. CSE is not seen as an attribute of individuals' computer capabilities but reveals what people hope they will achieve in the future with computing skills and abilities. Self-efficacy refers to users' trust in their abilities to take action to cope with potential circumstances [5]. It is connected to users' trust in their capacity to use the E-learning method in computer systems. Self-efficacy considers one of the essential elements that enhance the E-learning system users' satisfaction. Students with high trust in their computer abilities can perform in E-learning, and these students do not quickly get discouraged in the face of technological difficulties.

Past researchers reviewed 107 articles and identified 152 external variables used to extend the TAM and recognized self-efficacy as a variable extensively used to extend the TAM [15]. In further support, self-efficacy was considered the most commonly used external factor for TAM [5]. Several prior studies had used CSE as an external variable when using TAM [5]. PEOU positively and significantly impacted self-efficacy in a study conducted in Greece among university students [21]. A study in Jordan found that CSE positively and significantly impacted PU and PEOU among university students [27]. Several other studies confirmed the impact of self-efficacy on PU [6, 27], and PEOU [5, 6, 18, 27]. On the other hand, Salloum et al. [5] reported the CSE has an insignificant impact on PU.

H4: CSE has a positive and significant impact on PU of the E-learning system.
H5: CSE has a positive and significant impact on PEOU of the E-learning system.

Information Quality (IQ)

IQ is considered as one of the main elements of the Information System (IS) [32, 33]. IQ relates to producing accurate and appropriate information for learning purposes by a system [29]. IQ refers to the use of E-learning for knowledge that may be essential for learning and modified in order to allow the learner to understand it [5, 30]. IQ often relates to the users' opinion about the quality of a website [5].

IQ able to enhance PEOU and PU [20]. IQ performance is recognized as one of the most widely used and accepted measures for investigating the user acceptance of various IS [20]. According to several studies, IQ is considered an essential external element of the TAM [20, 34]. A study that empirically examined the impact of IQ on PEOU and PU confirmed that IQ positively and significantly impacts PEOU and PU [5, 20, 29]. Previous researchers confirmed that IQ significantly impacts PU when the individuals receive the information [34, 36]. Conversely, a study reported that IQ has a significant impact on PEOU but not on PU among bachelor degree students [30].

H6: IQ has a positive and significant impact on PU of the E-learning system.
H7: IQ has a positive and significant impact on PEOU of the E-learning system.

3 Methodology

The quantitative method has been used to test the seven proposed hypotheses of this study. The population of this study is undergraduate students at Cihan University-Erbil.

Cihan University was selected because it implemented the E-learning since three years ago via Moodle platform to support the traditional teaching process at the campus. 300 questionnaires were randomly distributed among students at the College of Administrative and Financial Sciences, where only 224 questionnaires were returned, and 209 were valid for analysis. The questionnaire was close-ended and consisted of two main parts. The first part contained the demographic questions, and the second part comprised 24 questions representing the five variables. The questionnaire was measured by a five-point Likert scale ranging from (1) Strongly disagree, to (5) Strongly agree. All the items were adopted from previous studies. PU, CSE and IQ consisted of 5 items adopted several studies [5, 20, 27]. Additionally, BI and PEOU consisted of 6 items [5, 20, 27]. The data were analyzed using two software. The preliminary analytical analysis was conducted via SPSS version 21 for data coding, data entry, outlier values, missing values and descriptive demographic analysis. The main analysis was conducted via AMOS version 24 for hypothesis testing.

4 Findings

4.1 Confirmatory Factor Analysis

The analysis began with the Confirmatory Factor Analysis (CFA) to assess the validity and reliability of the proposed model. The CFA indices consist of Composite Reliability (CR), Factor Loadings and Average Variance Extracted (AVE) [35]. The factor loading should exceed the cut-off value of 0.60 [35]. The reliability was measured by Cronbach's Alpha (CA) and CR to find the internal consistency, and the cut-off level for both criteria were 0.70 [35]. All the CR and CA values in this study exceeded 0.70. The AVE should be higher than 0.5 [35]. To achieve the model fit a minimum three fit indices should be achieved [35], and the suggested fit indices should achieve RMSEA and Relative Chi-Square as a primary requirement and at least one of the other indices such as GFI, CFI, TLI and IFI.

4.2 Measurement Model

All the item loadings exceeded the recommended value of 0.60, and the loadings showed between .625 (CSE3) and .969 (PEOU3), except for item CSE4 which had poor loading and removed to enhance the model fit. However, the model reliability examined by CR and CA indicated that all the constructs were reliable and achieved the reliability level equal to or higher than 0.7. Table 1 depicted the results of validity and reliability for all the items and constructs. The AVE showed to be greater than 0.5 for all the constructs (see Table 1).

In the current model, the value of RMSEA is .063, which is less than 0.08 and the Relative Chi-Square value is 1.816, which is less than the cut-off level of 5. In contrast, other indices, namely CFI (.949), IFI (.949) and TLI (.940) achieved and exceeded the recommended cut-off value of 0.90 [34], but the GFI (.857) were less than .90. However, if RMSEA, Relative Chi-Square and any other indices exceeded the recommended cut-off value, the analysis can be continued to the next step [35]. Figure 1 illustrated the model fit indices, which were generated by AMOS. After ensuring the model fit, the next step was analyzing the structural model.

Table 1. Factor loadings, AVE, and construct reliability of the variables

Constructs	Items	Factor loading	CA	CR	AVE > 0.5
BI	BI1	.681	.895	0.760	0.638
	BI2	.859			
	BI3	.841			
	BI4	.836			
	BI5	.758			
PU	PU1	.610	.881	0.746	0.602
	PU2	.886			
	PU3	.904			
	PU4	.788			
	PU5	.639			
PEOU	PEOU4	.975	.944	0.877	0.806
	PEOU3	.969			
	PEOU2	.896			
	PEOU1	.728			
IQ	IQ1	.855	.896	0.765	0.652
	IQ2	.851			
	IQ3	.751			
	IQ4	.812			
	IQ5	.759			
CSE	CSE1	.720	.830	0.824	0.532
	CSE2	.878			
	CSE3	.625			
	CSE5	.669			

4.3 Structural Model

The purpose of this step is to determine the influence of independent variables on dependent variables. The current study proposed seven hypotheses, and the results indicated as following;

The first hypothesis indicated the PU significantly impacted BI among undergraduate students with p-value $0.00 < 0.05$ and the CR (t-value) > 1.96. Thus, H1 is supported. The second and third hypotheses indicated the PEOU had a positive and significant impact on BI (t-value $= 3.712 > 1.96$) and PU (t-value $= 3.931 > 1.96$) with p-value $0.00 < 0.05$. Thus, H2 and H3 supported.

The fourth and fifth hypotheses showed the CSE had an insignificant impact on PU because the p-value $0.270 > 0.05$ and t-value $1.102 < 1.96$. Besides, the CSE showed a significant impact on PEOU with p-value $0.001 < 0.05$ and the t-value $3.202 > 1.96$. Thus, H4 was not supported, and H5 was supported.

IQ significantly impacted PU and PEOU with p-value 0.00 and t-value $= 0.034 < 0.05$ respectively and t-value 7.498 and $2.110 > 1.96$ respectively. Thus, H6 and H7 were supported. Table 2 and Fig. 1 depicted the results of the seven proposed hypotheses.

Table 2. Hypotheses test

Label	Path	Estimate	SE.	CR.	P-value	Label
H_1	BI ← PU	.330	.072	4.569	***	Supported
H_2	BI ← PEOU	.164	.044	3.712	***	Supported
H_3	PU ← PEOU	.161	.041	3.931	***	Supported
H_4	PU ← CSE	.076	.069	1.102	.270	Not supported
H_5	PEOU ← CSE	.389	.121	3.202	.001	Supported
H_6	PU ← IQ	.521	.069	7.498	***	Supported
H_7	PEOU ← IQ	.228	.108	2.110	.034	Supported

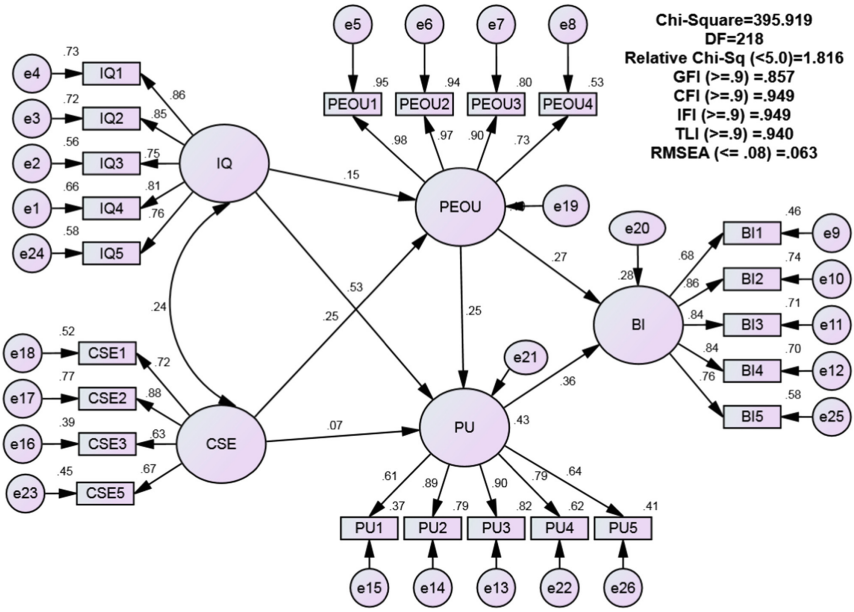

Fig. 1. Structural model

5 Discussion

The results indicated that PU and PEOU have a positive and significant impact on BI to use E-learning. This results are in line with previous findings [2, 5, 27, 28]. The simpler and more useful E-learning tools like Moodle are viewed, the more confident students will use them. These results indicated that students' adoption of E-learning was regarded as practical behavior. Students chose to embrace emerging technology such as Moodle because they thought they could produce great results with fewer efforts. The people involved in this study were undergraduate students. They feel that their BI will benefit from simple use and efficient accessibility of good quality content by E-learning tools

such as the Moodle. The results indicated the PU had more impact on BI to use E-learning than PEOU. Although Moodle has essential functions, students are more likely to take up the difficulty with E-learning. PEOU has a significant impact on PU, and this result confirmed by previous studies [2, 5, 26, 27]. The research respondents assumed that E-learning by Moodle is intuitive to use and thus considered useful for learning. This finding indicates that the more quickly the usability of Moodle is perceived, and the less work they need to do than conventional approaches, the more useful Moodle is perceived. CSE has a significant impact on PEOU, and this result is consistent with previous studies [5, 6, 18, 27]. Students with a high degree of belief in their programming abilities or computer skills are better at using E-learning. These students are not easily discouraged in the face of technical difficulties but will often attempt to overcome problems or challenges. They understand that the use of E-learning for self-learning is simple and easy to use. A high CSE helps students explore the different features and choices needed to execute their assignments and communicate successfully with e-learning. CSE has an insignificant impact on PU among undergraduate students, and this finding is parallel with prior finding [5], but also inconsistent with previous studies [6, 27]. CSE among students cannot increase the PU, and the students perceived that self-efficacy could not improve the usefulness of E-learning. IQ has a positive and significant impact on PEOU and PU, and this finding is parallel with previous studies [5, 29]. These findings indicate that the students' expected ease of use will inevitably improve as the knowledge underlying the e-learning system and its consistency became deeply rooted.

6 Conclusion

This research enhances the use of TAM, in addition to the added variables applied to the model in the Iraqi higher education context. The analysis results also include a clearer view of environmental influences and offer policymakers, practitioners, developers, and designers practical advice to successfully implement E-learning programs. University management must develop suitable E-learning systems infrastructure and assess student readiness for E-learning systems. The policymakers and administrators of E-learning programs must focus on certain variables that play a significant role in increasing adoption by students, which influences the success of the educational process and the productivity of the students.

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