TELKOMNIKA Telecommunication Computing Electronics and Control
Vol. 20, No. 1, February 2022, pp. 201~211
ISSN: 1693-6930, DOI: 10.12928/TELKOMNIKA.v20i1.21550

Determinants of e-learning adoption in higher education in Iraq an academics and students' perspective

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Article Info

Article history:

Received Aug 17, 2021
Revised Dec 11, 2021
Accepted Dec 21, 2021

Keywords:

Clustering sampling method
E-learning adoption technology organization environment
E-learning environment

ABSTRACT

E-learning allows the students to access, repeat and use the scientific materials wherever and whenever the users want. Both academics and learners are the leading and essential actors in the process of the learning process. Moreover, the acceptance of a technology is the positive react for users by using such technology. Due to the COVID-19 pandemic, e-learning has become mandatory over the world, thus, there is a necessity to investigate the determinants of e-learning adoption in higher education institutions (HEIs) in Iraq. Consequently, this paper aims to investigate e-learning adoption and identify the determinants of e-learning in HEIs. An instrument was developed with eight dimensions based on technology organization and environmental (TOE) elements. The sample selection was of 580 students and 130 university lecturers who spread over several colleges. A clustering sampling method was used in the sampling selection process. Some hypotheses were proposed and tested via the paired T-test tool. To evaluate the relationship between the TOE variables and e-learning adoption, a regression analysis was carried out. The study findings classified into two categories, first, it helps to determine to what extent e-learning be adopted. Second, it provides meaningful guidance for higher education institutions that should follow as a pre-requested before adopting e-learning.

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1. INTRODUCTION

With the advent of technology and its services in all sectors, the higher education sector had a stake in investing in this technology. One of the most important of these investments is in the e-learning environment to support teaching and learning [1]-[4]. Recently, e-learning has become one of the most critical technologies in terms of competition among higher education institutions (HEIs) toward reducing cost and motivating more students as well as fulfilling their educative obligations [5], [6]. A study by [7] has indicated that around 70% of higher education institutes adopt e-learning and they believe that e-learning is the future of education and the education organizations should pay more attention to e-learning for their long-term strategy. Besides, this positive insight was confirmed by [8]:The 2016-2021 worldwide self-paced elearning market research report. Process and support scientific research and administration due to the use of internet and information and communication technology (ICT) facilities [9], [10].

According to [11], e-learning is the internet's application that supports the learning process with capabilities and tools to deliver essential information, skills to (academics and students) in a comprehension approach not restricted to any appropriate infrastructures, track, or techniques. Nevertheless, the adoption of e-learning in higher education can only be accomplished meanwhile students take advantage of its broad characteristics [12]. E-learning users (academics & students) should confirm that the e-learning system meets their needs as the physical classroom does [13]. In the same aspect, despite the familiarity and popularity of e-learning around the world, the performance and efficiency of this system are preferable to be measured spatially and locally [14].

Moreover, there are new trends from HEIs (Iraq) to supply a multiplicity of opportunities in obtaining knowledge via e-learning parallel with traditional learning methods [15]. In the same aspect, although many encouraging initiatives in the adoption of e-learning, there are still some restrictions that hinder the adoption of e-learning in developing countries [16]. According to [17], the familiarity with e-learning among students in the United States of America (USA) is not the case as the Asian students. Consequently, the authors find it essential to investigate determinants of e-learning adoption in Iraqi Higher Education Institutions by applying the technology organization and environmental (TOE) framework.

The rest of the paper is organized as follows: section 2 presents the relevant literature review. Section 3 describes the research model and related hypotheses concerning highlighting all research model components. Section 4 outlines the research methodology used. In section 5 the analysis of the results is discussed based on different constituents. While section 6 illustrates the discussion on the findings. Finally, the paper's conclusions and some recommendations for future direction in this field of knowledge were highlighted.

2. REVIEW OF LITERATURE

With the advent of technology, the education process has undergone noteworthy changes. Many techniques, algorithms, and models have been invested in and used to manage the learning process. Two decades ago, the term e-learning was limited to the learning process that used electronics as a method to deliver learning, in addition to the fact that e-learning at that time was not widely accepted. With the development of technology and the abundance of the Internet and other supporting applications that depend on the Internet, several distinct and elegant environments and platforms have been created and become ready for use by the public, commonly refers to as online courses [18]-[22]. E-learning and over time became familiar and more common due to being the most effective method in the education process in addition to disseminating knowledge in all institutions of higher education [23]. In this regard, E-learning played a prominent role in moving forward the performance of e-learning users (professors and students), which in turn improves the quality of teaching methods and it has, therefore, become a significant facilitator for distance and online education programmers, e-learning environments and mobile application learning [24].

On the other hand, e-learning provided more opportunities for those wishing to complete their studies because the requirements of e-learning are much easier than traditional education requirements, as e-education users do not have to attend class or have a fixed time for lectures. While [25] indicated that the smooth nature of e-learning depends entirely on the availability of the Internet. Another characteristic of e-learning is allowing students the opportunity to complete their studies at the same time as they pursue their work and thus they will not lose their jobs [26]-[28]. In line with the above situations, the gradual increase in the numbers of e-learning materials is outlined due to obtained incomes for (academics and students) as well as the advent of different types of e-learning [29], [30].

There are many models, approaches, and methods that have emerged to develop e-learning and investigate the adoption of e-learning. However, the main purpose of the multiplicity of approaches is not to replace it with traditional education, but to embed modern electronic technologies to support the entire learning process. As supported by [31], [32]. In the era of e-learning investment, there are two main types; the first one is regarded as course management systems (CMS). While the second one is regarded as learning management systems (EMS). A brief description of each one was outlined in the following paragraphs.

CMS is regarded as a collection of tools that enable academics to design an online course and publish it in the e-learning environment without the need to deal with any programming languages. It's also known as content management systems which was introduced in 1990 and adopted as an important part of modern higher education. It's consists of two types of components, administrative components that involve class lists and student grade records: and learning components that include all teaching aspects such as student interaction and learning objects [33], [34].

Learning management systems (LMS) is regarded as a software program that dominates the e-learning courses such as administration, documentation, tracking, reporting, and delivery of electronic educational technology responsible for all phases of the learning process. It's considered as an infrastructure that is to achieve and manage the learning content [35]. To sum it up, the main difference between CMS and

LMS is that the CMS is used as a document viewer and a more passive system. Whereas LMS is a learner's motivation and learner's interaction of e-learning application. TOE framework was used by several studies as a concrete theoretical framework to get a full understanding of technology adoption, as clearly tabulated in Table 1.

Table 1. TOE adoption

	Technologies Adoption	Toe Constructors Used	Relevant References
1.	E-Learning Adoption	All TOE Factors	[15], [16], [20]
2.	E-Commerce Adoption	All TOE Factors	[36], [37]
3.	E-Business Adoption	All TOE Factors	[38]
4.	Information Technology Adoption	All TOE Factors	[39], [40]
5.	Web Service Adoption	All TOE Factors	[41]
6.	Mobile Application Adoption	All TOE Factors	[42]

3. RESEARCH MODEL AND HYPOTHESES

3.1. TOE framework contexts

The first release of the TOE framework was in 1990 by [43]. It highlighted the determinants that affect the choice of a particular technology and the likelihood of its adoption by the particular institutions. This framework assumes that there are three organizational contexts: the technological context, the organizational context, and the environmental context through which certain technologies are adopted by institutions [43]. Similarly, researchers in the information systems (IS) domain undoubtedly relied on the TOE framework to investigate the adoption of new technologies in various sectors such as e-commerce, electronic banking, e-business, as well as e-learning [37], [38], [44]. Figure 1 visualizes the TOE Framework. As clearly shown from Figure 1, The TOE is composed of three contexts and each context has its constructs as mentioned in many relevant works [36], [45]. A brief description of each context and its constructs has been outlined in the next paragraph.

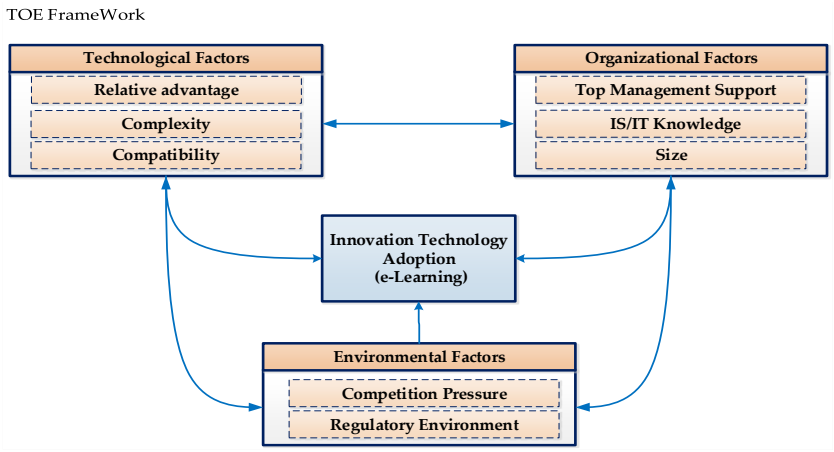

Figure 1. The original version of TOE framework

3.1.1. Technological context

Tornatzky *et al.* [43] insinuated that an adoption technology is based on the availability and familiarity of the technology as well as the fitness with the internal technology infrastructure. Another lightning definition for technology context was proposed by [41] all the available technologies to the enterprises whether internal or external may be beneficial in enhancing productivity. To sum it up, the technology context illustrates both the current technologies that are used and newly adopted technologies, which organizations are intended to use. Technology is an important element when information technology (IT) is to be integrated into the higher education sector.

3.1.2. Organizational context

The organizational context pertains to the characteristics and the organization's resources. It includes the organization's size, degree of centralization, human resources, and linkages among the organization's staff. According to [43], the organization context points to a collection of characteristics of an enterprise that visualize the processes and structure which either limit or aid the adoption of technological innovation. [41]

interpreted the organizational context as a collection of all available resources in supporting the acceptance and satisfaction of the innovation.

3.1.3. Environmental context

The environmental context is concerned with the organization's size and organization's structure, the organization's competitors, the macroeconomic context, and the regulatory environment. Based on the [43] definition, the environmental context is all regards to the platform where the organization operates, it describes the environmental situations in which the organization conducts the services [6], [44]. Accordingly, It includes the structure of the organization's competitors and regulatory environment [43].

3.2. Research hypotheses

Having detailed the stages in the context of this study, the constructs that were considered and adopted from the studies [36], [39], [42], [43] to identify determinants of e-learning adoption in Iraq. Consequently, a list of refined hypotheses was developed based on the TOE framework (see Figure 1).

- H1: There is a positive relationship between relative advantage and e-learning adoption. Explanation: whenever the interest earned or relative advantage of e-learning high as increased opportunities for the education organization to allocate more technological, administrative, financial, and other sources. Thus, it can be indicated that the rate of e-learning adoption is influenced by the advantages offered as supported by [36], [39], [40]. On this basis, hypothesis (H1) has been formulated.
- H2: There is a negative relationship between technical complexity and e-learning adoption. Explanation: the complexity in innovative technology defines to what extent users encounter in will understand the technology adopted. There is an inverse relationship between the complexity of the use and adoption of an innovation. Thus, the more noticeable the complexity of using e-learning applications, the opportunity to use its adoption will be less. On this basis, hypothesis (H2) has been proposed.
- H3: There is a positive relationship between technical compatibility and e-learning adoption. Explanation: according to [46], compatibility is a degree of innovation that lines with and consistent lifestyle, life requirement, technological requirement, process, and values. Most previous research indicates that the compatibility of adopting new technology has a positive impact on innovations [47-49].
- H4: There is a positive relationship between education institute sizes with e-learning adoption. Explanation: according to [50], the education institute size refer to staff number as well as capital invested in such institute. Besides, large institutions benefit more from adopting new technologies, given the great flexibility of these institutions and the ability to take risks [38]. It can be confirmed that most of the Iraqi universities are large educational institutes and more likely suitable for adopting new technology such as (e-learning). Therefore, hypothesis 4 was proposed.
- H5: There is a positive relationship between top management support and e-learning adoption. Explanation: top management support means to what extent the top management we'll support the adoption of new technology such as (e-learning) [51]. Recently, e-learning is the foremost goal of the Ministry of Higher Education in Iraq, it is, therefore, possible to emphasize the availability of full support from higher departments, and for this, it will be of greatest significance to top management in support of the adoption of e-learning. For this, hypothesis 5 was formulated.
- H6: There is a positive relationship between IS/IT knowledge and e-learning adoption. IT/IS knowledge factor means. Regarding the environmental context, it will be outside the scope of this study. Therefore, the related hypotheses regarding the environmental context will not be taken into consideration in this study intentionally. The hypothesized model is displayed in Figure 2.

3.3. The methodology used

Generally, academic research is the organized and systematic method of finding answers to questions. It is systematic because it is a process broken up into clear steps that lead to conclusions. Research is organized because there is a planned structure or method used to reach the conclusion. Therefore, in the context of this study, a systematic research process shows a way that the research objectives are achieved. Generally, it concludes; research design, sampling selection, research Instrument, as well as reliability and validity of measurement instruments.

3.3.1. Sample and data collection

In the context of this study, an online instrument (questionnaire) was developed and used in between (September 2019 - March 2020). For sample selection, the convenience sampling method was utilized due to is consistent with the approach adopted in several previous studies of technology adoption [52], [53]. For data analysis, The statistical package for the social sciences (SPSS) is chosen because several studies are supported the employment of SPSS in similar types of research [54], [55]. SPSS v25 is also utilized because

of its capability to describe and test a comprehensive "system contingency approach". Out of the 710 responses (undergraduate students and lecturers) were collected and then examined for missing values and substituted with mean. Univariate and multivariate outliers were examined which resulted in 77 cases being dropped. Thus, the total number of participates in this study were 633 cases. Table 2 illustrates the demographic data of the selected sample.

Table 2. The demographic data of the selected sample

Sample	Age		Gender		Study specialization	
Undergraduate Students	20…25 510	26… and above 70	Male 270	Female 310	Near to ICT 375	Far from ICT 205
Academics	30…45 88	46 and above 42	Male 75	Female 55	Near to ICT 97	Far from ICT 33

3.3.2. Measures applied

To exam the hypothesized model illustrated in Figure 2, the proposed instrument was organized based on prior published studies that synthesize six dimensions, and each dimension has seven items. This study used somewhat agree in the middle category instead of a neutral scale; to force the respondents to choose a side, while neutral choice does not appropriate with these constructs of this study. Hence, a 5-point Likert-type scale has been decided to use in the study scale from 1 (strongly disagree) to 5 (strongly agree). The survey instrument comprises six dimensions and each dimension has seven items, which cover all dimension questions. Table 3 presents the dimensions and their items.

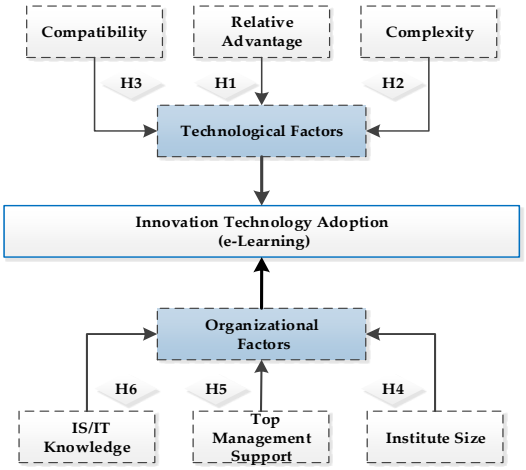

Figure 2. The hypothesized model

Table 3. The instrument dimensions and their items

	Instrument Dimension	Relevant Items
1	Compatibility (C)	C 1...C7
2	Relative Advantage (RA)	RA 8…RA 14
3	Complexity (COM)	COM 15…COM 21
4	IS/IT knowledge (I2ST)	I2ST 22…I2ST 28
5	Top Management Support (TMS)	TMS 29…TMS 36
6	Institute Size (IS)	IS 37…IS 42

3.3.3. Content validity and reliability test

Content validity has been used to check to what extent the elements represent the dimensions in the performed test. Therefore, five experts in the area were chosen to test the content validity of the proposed instrument in the field of e-learning adoption, then piloting the instrument on a selected sample. The important comments gathered from experts helped modify, eliminate, and add some elements to the proposed instrument. On the other aspect, Cronbach's alphas has been calculated to measure the reliability of the proposed instrument. Besides, a factor analysis (FA) test has been conducted to confirm the importance of the proposed instrument items as supported by [56]-[58].

Consequently, FA tests have been run and directed for accepting each of the proposed instrument's items based on using Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity. Adapting KMO show a

significant value in conjunction with the factor analysis, it can be used to measure the sufficiency of the selected sample. The overall findings of the reliability are above 0.60 for all items as shown in Table 4.

The findings in Table 2 confirm that all dimensions and their items are reliable based on CA values of more than 0.750. On the same aspect, Bartlett's test of sphericity provides a noteworthy value of 0.001 for all dimensions, which introduces a condition that satisfied ($p \leq 0.05$). Hence, the collected data are willing for the factor loading (FL) analysis test. Besides, to understand the collected data and introduce it in a worthy way, descriptive statistics were calculated. For measuring the accuracy and consistency of the developed instrument, the test of reliability has been conducted ("the composite reliability (α) and the variance-extracted measure (p)"). Table 5 shows the overall testing findings.

Table 4. Overall reliability findings

	Instrument Dimensions	CA	KMO	Bartlett's Test
1	Compatibility (C)	0.978	0.800	0.001
2	Relative Advantage (RA)	0.906	0.804	0.001
3	Complexity (COM)	0.878	0.811	0.001
4	IS/IT knowledge (I2ST)	0.799	0.815	0.001
5	Top Management Support (TMS)	0.885	0.798	0.001
6	Institute Size (IS)	0.804	0.788	0.001

Table 5. Overall testing findings

	Instrument Dimensions	Items Index	Mean	STD	FL	α/ρ
1	Compatibility (C)- Composed of Seven Items	C- 1	4.55	1.03	0.625	0.88/0.74
		C- 2	4.55	1.19	0.687	0.87/0.72
		C- 3	4.55	1.07	0.626	0.87/0.84
		C- 4	4.55	1.61	0.611	0.98/0.71
		C- 5	4.55	1.23	0.672	0.89/0.73
		C- 6	4.55	1.06	0.661	0.78/0.77
		C- 7	4.55	1.07	0.622	0.98/0.86
2	Relative Advantage (RA)- Composed of Seven Items	RA-1	4.55	1.04	0.626	0.85/0.74
		RA-2	4.55	1.14	0.681	0.88/0.74
		RA-3	4.55	1.27	0.636	0.87/0.72
		RA-4	4.55	1.31	0.640	0.87/0.84
		RA-5	4.55	1.20	0.622	0.98/0.71
		RA-6	4.55	1.01	0.691	0.89/0.73
		RA-7	4.55	1.17	0.678	0.78/0.77
3	Complexity (COM)- Composed of Seven Items	COM-1	4.55	1.02	0.626	0.98/0.86
		COM-2	4.55	1.91	0.618	0.85/0.74
		COM-3	4.55	1.20	0.632	0.88/0.74
		COM-4	4.55	1.33	0.611	0.87/0.72
		COM-5	4.55	1.17	0.676	0.87/0.84
		COM-6	4.55	1.22	0.613	0.98/0.71
		COM-7	4.55	1.14	0.642	0.89/0.73
4	IS/IT knowledge (I2ST)- Composed of Seven Items	I2ST- 1	4.55	1.19	0.655	0.78/0.17
		I2ST- 2	4.55	1.07	0.661	0.98/0.86
		I2ST- 3	4.55	1.27	0.628	0.98/0.71
		I2ST- 4	4.55	1.01	0.644	0.89/0.73
		I2ST- 5	4.55	1.99	0.677	0.78/0.78
		I2ST- 6	4.55	1.14	0.601	0.98/0.76
		I2ST- 7	4.55	1.09	0.620	0.85/0.75
5	Top Management Support (TMS)- Composed of Seven Items	TMS-1	4.55	1.06	0.636	0.98/0.86
		TMS-2	4.55	1.07	0.640	0.78/0.78
		TMS-3	4.55	1.04	0.622	0.85/0.75
		TMS-4	4.55	1.14	0.691	0.98/0.71
		TMS-5	4.55	1.27	0.678	0.87/0.84
		TMS-6	4.55	1.31	0.626	0.89/0.73
		TMS-7	4.55	1.20	0.618	0.89/0.50
6	Institute Size (IS)- Composed of Seven Items	IS- 1	4.55	1.88	0.629	0.87/0.84
		IS- 2	4.55	1.11	0.672	0.98/0.71
		IS- 3	4.55	1.17	0.682	0.89/0.73
		IS- 4	4.55	1.02	0.631	0.78/0.77
		IS- 5	4.55	1.21	0.618	0.98/0.76
		IS- 6	4.55	1.29	0.676	0.98/0.75
		IS- 7	4.55	1.33	0.619	0.89/0.83

As indicated in Table 3, the majority of the instrument's items are valid and suitable to represent respective and relevant dimensions. Noteworthy, the value of factor loadings is greater than 0.50, which is considered essentially significant and well-defined structures as supported by [59]-[61]. Henceforth, this

research utilize a scale loading value ≥ 0.7. To test the simple bivariate relationships between dimensions in the model, the "general structural model (GSM)" was applied and the proposed hypotheses have tested surrounded by the context of the structural model. The justification of this is to gain the interpretation of the findings resulting from a relationship among the variables be examined while keeping the other variables in the model. On the other aspect, a one-way ANOVA test was conducted as shown in Table 6. a new classification was conducted in the selected sample based on years' experience and their influences on e-learning adoption in higher education institutes. In this test, the sample was classified into several groups based on the participants' years' experience. Subsequently, the descriptive statistic was calculated as well as p-value was calculated.

The findings gained from ANOVA test1 indicate that there is an impact between the respondents' experience and the adoption of the e-learning system. The p-value of 0.4011 is greater than the pretest level of significance ($p = 0.4011 < 0.05$). To evaluate the discriminant validity of the proposed model (see Figure 2), an approach was proposed by [62], this approach is based on carrying out a rapprochement between "the square root of the average variance extracted (AVE) for the model's dimensions and on the other side their correlation values for each dimension". As indicated in Table 7, the findings reflect that the level of discriminant validity is satisfying.

Table 6. One-way ANOVA findings

Years' Experience Group	No. of Respondents	STD	Mean
Less than 1 Year (Students)	200	0.8017	4.5501
Between 1 and 4 Years (Students)	380	0.9026	4.6071
Between 5 and 10 Years (Lecturers)	100	0.8055	4.6623
More than10 Years (Lecturers)	30	0.8021	4.6429
Total	710		
p-value			0.4011

Note: STD= Standard Deviation

Table 7. Findings of discriminant validity

Model Dimensions	C	RA	COM	I2ST	TMS	IS
C	0.877					
RA	0.432	0.951				
COM	0.457	0.457	0.827			
I2ST	0.332	0.332	0.421	0.861		
TMS	0.492	0.492	0.531	0.457	0.884	
IS	0.411	0.411	0.400	0.339	0.552	0.921

4. HYPOTHESIS TESTING

Hypothesis testing is an act in statistics used by an analyst to test an assumption related to sample data. Hypothesis testing is used to assess the plausibleness of a hypothesis by utilizing sample data. The collected data might be gathered from a huge amount of people. Consequently, Figure 3 points out the overall findings of the significant structural relationships and standardized path coefficients for the dimensions of the research model.

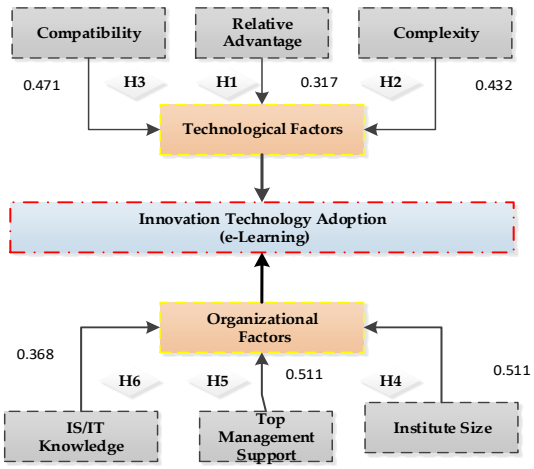

Figure 3. Overall findings of structural modeling analysis

5. FINDINGS OF HYPOTHESIS TESTING

This study aimed to examine the determinants of e-learning adoption in HEIs in Iraq. The relative advantage was found a positive influence on e-learning adoption (β = 0.531); thus, H1 is accepted. Moreover, the influence of complexity on the e-learning environment was found to be not significant, p < 0.15 (β = 0.072). Therefore, H2 was accepted. Meanwhile, the relationship between technical compatibility and e-learning adoption was found significant, (β = 0.542); hence, H3 is accepted. Consequently, the relationship between education institute sizes with e-learning adoption also was found significant, (β = 0.515); thus, H4 is accepted. Similarly, the relationship between top management support and e-learning adoption was found significant, (β = 0.515); therefore, H5 is accepted. Finally, the relationship between IS/IT knowledge and e-learning adoption was found significant, (β = 0.567); therefore, H6 is accepted.

6. RESEARCH IMPLICATIONS

It is clear that the economies of developing countries are very limited compared to developed countries and this directly affects the education sector, but this does not prevent governments in developing countries from doing their best to catch up with the world in terms of adopting the latest technologies. However, HEIs still lack the adoption and use of modern technology and its use in the education process. Inadequate resources and lack of infrastructure are among the serious challenges facing these institutions. The main findings of this research have considerable practical and theoretical implications for the adoption and utilization of e-learning side by side with traditional learning in Iraq. This study helps top management, academic staff, as well as lecturers to have a comprehensive look at the elements when they are adopting e-learning in HEIs they belong to.

7. CONCLUSION

The main aim of this study was to identify the determinants of e-learning adoption in HEIs in Iraq. Regarding scientific research, this study contributes to the body of knowledge on e-learning by investigating and extending the TOE framework from a student and lecturer's perspective. Three technological factors and three organizational factors, which belong to the TOE framework examined in this study. Six hypotheses were proposed and the study accepted all of these hypotheses. The findings also illustrate relative advantage had a positive influence on students and lecturers' in e-learning adoption. Besides, a negative relationship was found between technical complexity and e-learning adoption. On the same aspect, a positive relationship was found between technical compatibility and e-learning adoption. Moreover, a positive relationship between educations institutes sizes with e-learning adoption. Similarly, a positive relationship was found between top management support and e-learning adoption. Finally, a positive relationship was found between IS/IT knowledge and e-learning adoption. The overall findings from this study have positioned as a contribution to the knowledge on e-Learning adoption.

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