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MEASURING READINESS OF HIGHER EDUCATION INSTITUTES TOWARDS ADOPTING E-LEARNING USING THE TECHNOLOGY ACCEPTANCE MODEL

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Abstract. *E-learning can be defined as a utilizing of Internet services to improve the teaching process in a virtual environment along with the traditional teaching process. The current research was indicated that e-learning has the ability to improve both formal and informal learning. Accordingly, the acceptance of e-learning greatly relies upon the individual attitude of university users (academics and students) towards this technology. Hence, this study gives an investigation using the Technology Acceptance Model (TAM) for university users (academics and students) towards measuring their readiness in adopting e-learning. The familiarity of choosing TAM among the other models is to investigate the acceptance of advent new technology due to its robust and parsimonious nature. In the context of this study, the selected sample of (academics and students) spreads over four colleges in public and private sectors. For data collection two methods have been used, the quantitative method was used represented by a questionnaire and the qualitative method was used represented by structured interview. By the obtained findings of the investigation with 375 (academics and students), for data analysis, the authors used several methods such as hierarchical regression, one-way ANOVA, descriptive statistics, t-test as well as the Structural Equation Modeling (SEM). The obtained results show the readiness of (academics and students) for adopting e-learning is high with attention to several hindrances such as lack of ICT hardware/software, in addition to poor Internet signal. Eventually, the outcomes of this study have implications for both (theoretical and practical) which are highlighted.*

Keywords: E-learning adoption, E-learning in higher education, Technology acceptance model, Structural equation modeling

1. **Introduction.** In Iraq, like several developing countries, adoption and implementation of e-learning and ICT has become a significant part of the national strategic project in the development of higher education. In Iraq, however, the expected advantage by applying e-learning would open new opportunities for non-educational people to encourage them to complete their studies. On the same aspect, it becomes a needful improvement for the country to have more competitiveness among other countries [1-4].

The implementation of e-learning is mandatory in the higher education sector, also is known as online learning. In the context of this study, the successful adoption and

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implementation of e-learning in the higher education sector can be accomplished only with the active participation of the actual users (academics and students). Acceptance of e-learning extremely relies upon the personal behavior of users [5]. Undoubtedly, many types of research have influenced the assessment (measuring acceptance) in the adoption of new technology [6-8]. There is invaluable support provided by e-learning for learners. Without e-learning, the accessibility to knowledge was limited to some learners. A student with a low budget, geographical boundaries or physical inability prevents them attending the physical class; they had fewer opportunities to complete their higher education [9]. Hence, to develop a meaningful and appropriate e-learning environment is influenced to develop a comprehension of actual user's (students, academics) attitude towards e-learning. According to [10], three main factors which influence behavioral intention to adopt new or use it are: 1) individual context, 2) organizational context, and 3) social context; accordingly, in the context of this study, the investigation of the impact on the readiness of (academics and students) on adopting e-learning is based on individual context [4,10].

In order to investigate the (academics and student's) readiness towards implementation and adoption of e-learning, the base model used is the Technology Acceptance Model (TAM). The outcomes of reviewing the relevant literature confirm the validity of the two major ingredients of TAM (PU and PEU). Here PU and PEU are abbreviations for "perceived usefulness" and "perceived ease of use" respectively. Those two constructs were used in investigating the individual's acceptance of adoption and implementation of new technologies [5-8,10-15]. The exceedingly used TAM model is considered a powerful theory which makes it the most widely applied in predicting, adopting or implementing a new technology [12,16-18]. Figure 1 visualizes the TAM model.

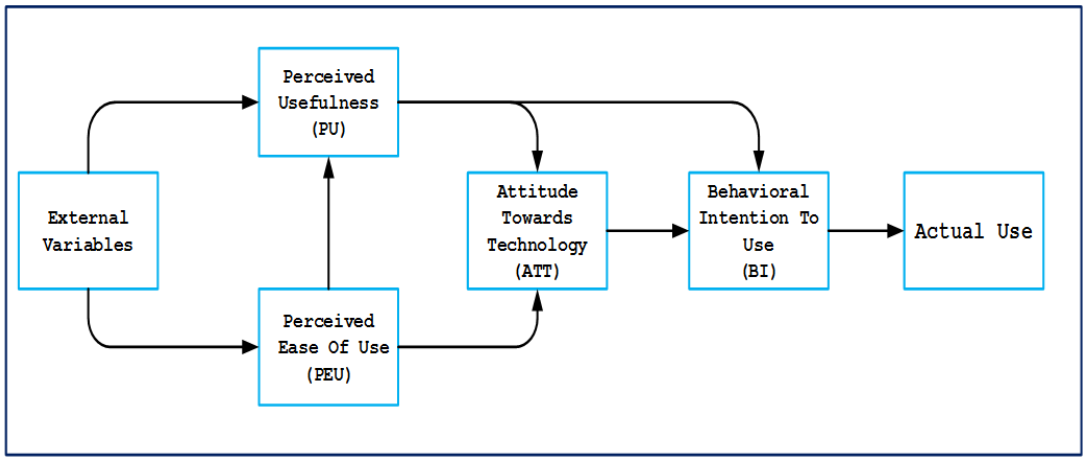

FIGURE 1. The original Technology Acceptance Model (TAM)

Researchers state that the core impairment of the TAM model is insufficient to explain external variables influencing users' PEU and PU [18]. Besides, the external variables have extremely relied on users and application domains as well as technology.

The organization of this study is as follows, the relevant literature review was conducted followed by the research methodology which is composed of the research model and hypothesis, sampling selection, checking the validity and reliability, hypothesis testing, and finally, the discussion of the results was included.

2. **Literature Review.** Recently, a clearly increasing study on the adoption and implementation of e-learning has emerged in developing countries. Both quantitative and qualitative analysis methods were used to highlight the issues which hinder its implementation process successfully.

Based on the rank of the United Nations Development Program (UNDP), the developing countries have been classified. Many studies have shown that different methods have been used in implementing e-learning. Other relevant studies have attempted to identify the challenges that limit and impede the implementation and adoption of e-learning in developing countries. Each of these studies focused on a specific case to recognize such a phenomenon. In line with the above statements, an effort to additional analysis is required especially in Iraq, where few studies have been tackled.

According to [19], there is a possibility for the adoption and implementation of e-learning technology towards developing the education process in these developing nations. Hence, poverty and poor ICT services are the major challenges that were revealed. Furthermore, the limitation of using e-learning in developing countries is classified into three main categories. The first category is "personal challenges" which focuses on issues related to personal features, behavioral habits, and characteristics. The second category is "attitudinal inhibitors" which focuses on inner variables that are related to attitudes of users for e-learning features. The last category, "contextual inhibitors", focuses on external variables that comprise the limitation/lack in ICT skills as well as organizational support in the adoption and implementation of e-learning technologies [20]. Consequently, this study has taken all of those categories into consideration. In Botswana, e-learning settles the challenges of increasing the number of students as well as the limited number of academic [21]. The author mentioned that the decision to adopt e-learning in his country "was not transported out of a desire to join an elite club of technologically savvy universities but was out of the urgent need to tackle practical problems relevant to improve and increase the quality of learning". The adoption of e-learning also expected to improve academics and students' skills in computer utilization "students' computer literacy" [22-24]. Researchers in this area confirmed the four characteristics that impact measuring the readiness of adoption and implementation of new technology: 1) training, 2) innovativeness, 3) prior experience, 4) preference for a particular model of e-learning as well as affordability [25-27].

3. **Research Methodology.**

3.1. **Research model and hypothesis.**

As mentioned above, the core purpose of this study is to investigate the readiness of e-learning in higher education institutes. The proposed model of readiness of e-learning was mainly based on the Technology Acceptance Model (TAM). Theoretically, the TAM model has confirmed to be a beneficial model in assisting to comprehend and demonstrate a user behavior in adoption ICTs [18,28]. In the context of this study, the proposed model is adapted from [11] consisting of several hypotheses. The next section highlighted the basis for these hypotheses. Based on the theory of reasoned action, a person's perceptions towards performing a behavior calculate the person's attitude toward the behavior [11]. Current research confirmed that the variables (Perceived Usefulness (PU) and Perceived Ease of Use (PEU)) in the Technology Acceptance Model (TAM) are most significant in attitude determining regard in acceptance of a technology [5-7,13,22]. Hence, when PU and PEU are high, definitely, user attitude towards e-learning has a positive impact. Therefore, this study proposes the following hypotheses.

Hypothesis 1. PU is positively related to attitude toward adopting e-learning.

Hypothesis 2. PEU is positively related to attitude toward adopting e-learning.

Hypothesis 3. ATT for readiness is positively related to BI toward readiness e-learning.

Many researchers propose that PEU has an impact on PU, because if the technology is easy it is definitely more useful [11]. Furthermore, users think applications are easier to use, they probably understand such applications as more useful because they can save time for how to operate the systems. Accordingly, this situation leads to:

Hypothesis 4. PEU is positively related to PU.

PU is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" [11]. Several researchers have confirmed a positive impact exists between PU and BI to adopt a new technology [29]. Accordingly, a relevant hypothesis was outlined.

Hypothesis 5. PU has positive influence with BI to adopt e-learning.

The satisfaction and accomplishment for a user in overall e-learning rely on personal qualities as concluded from several relevant studies [30,31]. According to [25], the personal qualities for implementing new technology can be classified into several categories such as Computer Self-Efficacy (CSE), Learning Preferences (LP), Attitude Towards Technology (ATT) as well as Technical Skills (TS). As pointed out by previous studies [25,32], in adoption of e-learning, students and academics who have information technology skills are more accepting of the e-learning process and they feel less anxious and frustrated compared with others.

The capability of users in computer science is known as a Computer Self-Efficacy (CSE). Relevant studies have illustrated high correlation exists between PEU and CSE [33]. Thus, a relevant hypothesis was outlined.

Hypothesis 6. The Academics Readiness (AR) towards e-learning has a positive influence on PU.

Hypothesis 7. The Academics Readiness (AR) towards e-learning has a positive influence on PEU.

Hypothesis 8. The Student Readiness (SR) towards e-learning has a positive influence on PU.

Hypothesis 9. The Student Readiness (SR) towards e-learning has a positive influence on PEU.

Figure 2 illustrates the proposed model and the relevant hypothesis.

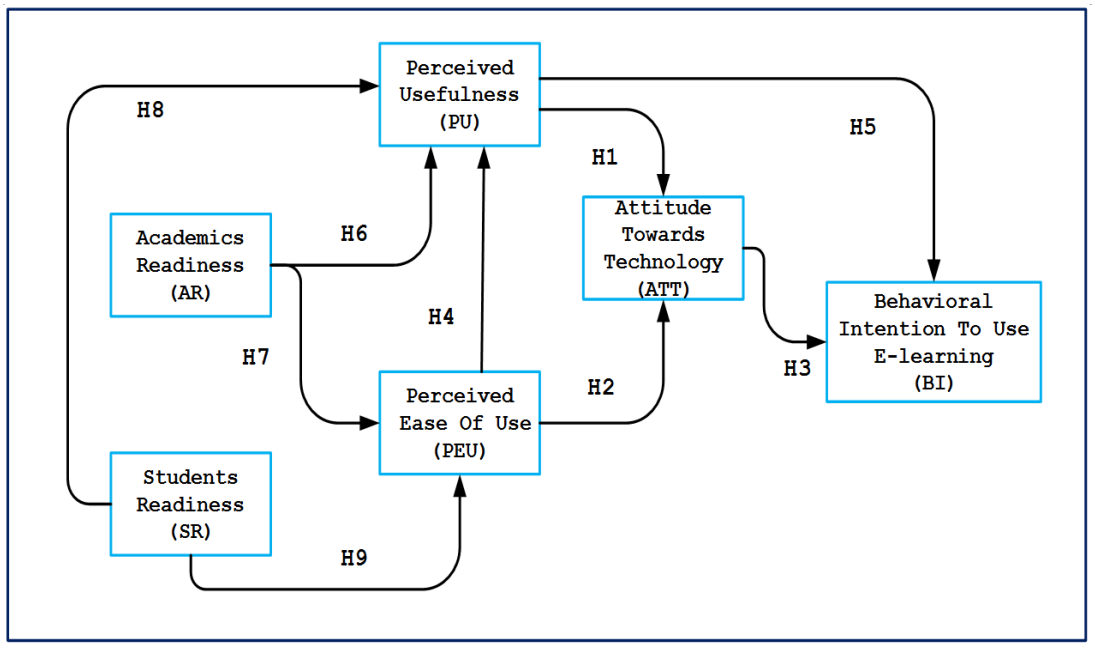

FIGURE 2. The proposed model and relevant hypothesis

3.2. **Sampling selection.** The selected sample participants in this study were both students (undergraduate and postgraduate) as well as academic's staff from a big campus of a government university in the south of Iraq. Besides, the campus capacity includes more than 10000 students for both types of studies (morning and evening study) and around

1500 full-time and part-time academic staff. The instrument was spread over 500 participants (students) and 100 participants (academic staff). Incomplete and/or duplicated surveys were discarded. Accordingly, there are a total of 407 (students) and 93 (academic staff) usable questionnaires, a 92.1% response. SPSS v.25 was used as an analysis software to analyze the collected data, as well as TAM, which was used as the theoretical framework.

3.3. **Instrument development and procedure.** E-learning readiness is measured by a 28-items questionnaire. Such a questionnaire is developed through adaptation of items from existing and relevant studies, and deductions from the conceptual explanation made in [34]. A questionnaire comprises three major parts: (a) Sample demographics, (b) Academics Readiness of e-learning (AR), (c) Students Readiness of e-learning (SR), as well as the existing variables such as Perceived Ease to Use (PEU), Perceived Usefulness (PU), and Attitude Towards Technology (ATT). Each part has several relevant items. Table 1 presents the variables, items, and the respective references.

Table 1. Constructors, items, and supporting references

	Constructors	Items	Supporting References
1	**Academics Readiness (AR)**	AR-Item1... AR-Item7	[35-37], [37,38], [7,35], [10,36], and [7,31]
2	**Students Readiness (SR)**	SR-Item1... SR-Item6	[22,31], [31,37,38], [10,23], and [7,39]
3	**Perceived Usefulness (PU)**	PU-Item1... PU-Item5	[40], [35-37], and [31,37,38]
4	**Perceived Ease to Use (PEU)**	PEU-Item1... PEU-Item5	[40], [22,31], and [31,37,38]
5	**Attitude Towards Technology (ATT)**	ATT-Item1... ATT-Item5	[41], [10,23], and [7,39]

3.4. **Validity and reliability.** The content validity was conducted based on the opinions of four experts in the area of e-learning, as well as piloting the questionnaire on a selected sample. The collected comments and suggestions from the experts help eliminate or alter some items of the developed instrument (questionnaire). Besides, Cronbach's Alphas (α) test was conducted to test the reliability of the intended instrument (questionnaire).

In line with the above situation, this study conducted a factor analysis. Based on relevant literature, the main goal of determining the factor analysis was to ensure the degree of importance of each item in the designed questionnaire and which are most suitable for each dimension [12,13]. Thus, the factor analysis test was run and guided for accepting each item based on utilizing Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity, Measure of Sampling Adequacy (MSA), and factor loading. Applying KMO has significant value in the factor analysis. The outcome shows the level of reliability is above 0.60 for all measures as shown in Table 2.

As clearly indicated from Table 2, the value Cronbach's Alpha of all the variables was more than 0.7; this indicates that all variables in this research are reliable. Besides, Bartlett's test of sphericity provides a noteworthy value of 0.000 for all constructs, which demonstrates another condition is also met and satisfied (significant value of $p \leq 0.05$). Therefore, this evidence proves that the collected data are ready for the factor loading analysis test. Moreover, to understand data and present it in a meaningful manner, the descriptive statistics (calculate mean and standard deviation) were conducted. For secure accuracy and consistency, the test of the reliability was conducted. The main tests carried

out are: the composite reliability (α) and the variance extracted measure (ρ). Therefore, it was executed and the overall results of the test are detailed in Table 3.

TABLE 2. Reliability analysis result

	External Constructs	Cronbach's Alpha Test	KMO	Bartlett's Test
1	**Academics Readiness (AR) – 7-Items**	0.870	0.700	0.000
2	**Students Readiness (SR) – 6-Items**	0.820	0.770	0.000
3	**Perceived Usefulness (PU) – 5-Items**	0.790	0.710	0.000
4	**Perceived Ease to Use (PEU) – 5-Items**	0.790	0.690	0.000
5	**Attitude Towards Technology (ATT) – 5-Items**	0.860	0.850	0.000
	Overall Average	**0.826**	**0.744**	**0.000**

TABLE 3. Overall testing result

	Constructs	Items	Mean	STD	Factor Loading	α/ρ
1	**Academics Readiness (AR) – 7-Items**	AR-I1	6.36	1.34	0.612	0.88/0.74
		AR-I2	6.36	1.30	0.595	0.78/0.77
		AR-I3	6.36	1.33	0.594	0.89/0.84
		AR-I4	6.36	1.31	0.573	0.88/0.74
		AR-I5	6.36	1.35	0.591	0.89/0.84
		AR-I6	6.36	1.29	0.570	0.88/0.74
		AR-I7	6.36	1.33	0.572	0.87/0.73
2	**Students Readiness (SR) – 6-Items**	SR-I1	6.36	1.29	0.600	0.68/0.64
		SR-I2	6.36	1.31	0.597	0.80/0.70
		SR-I3	6.36	1.30	0.593	0.88/0.74
		SR-I4	6.36	1.35	0.612	0.88/0.74
		SR-I5	6.36	1.29	0.594	0.78/0.77
		SR-I6	6.36	1.29	0.594	0.78/0.77
3	**Perceived Usefulness (PU) – 5-Items**	PU-I1	6.36	1.34	0.590	0.79/0.77
		PU-I2	6.36	1.35	0.499	0.89/0.76
		PU-I3	6.36	1.30	0.603	0.83/0.73
		PU-I4	6.36	1.59	0.589	0.69/0.70
		PU-I5	6.36	1.35	0.499	0.89/0.76
4	**Perceived Ease to Use (PEU) – 5-Items**	PEU-I1	6.36	1.36	0.591	0.72/0.72
		PEU-I2	6.36	1.29	0.592	0.87/0.71
		PEU-I3	6.36	1.30	0.593	0.78/0.73
		PEU-I4	6.36	1.38	0.595	0.98/0.75
		PEU-I5	6.36	1.38	0.595	0.98/0.75
5	**Attitude Towards Technology (ATT) – 5-Items**	ATT-I1	6.36	1.27	0.590	0.69/0.65
		ATT-I2	6.36	1.26	0.589	0.89/0.65
		ATT-I3	6.36	1.34	0.584	0.99/0.85
		ATT-I4	6.36	1.27	0.590	0.69/0.65
		ATT-I5	6.36	1.26	0.589	0.89/0.65

Note: 'I' means Item.

As can be seen in Table 3, all the items in the intended questionnaire are found valid and can be used to represent respective constructs. As stated earlier, factor loadings ≥ 0.50 are considered practically significant and well-defined structures [14-16]. Hence, this study used scale loading value >= 0.7. To examine the simple bivariate relationships among variables in the model, the general structural model was utilized and all hypotheses were examined within the context of the structural model. The justification of this is to obtain the interpretation of the outcomes due to a relationship between two variables that would be examined while keeping the other variables in the model.

Moreover, Table 4 illustrated the one-way ANOVA test between the age of the participants and their influences on readiness to adopt e-learning. In this test, the sample was classified into several groups based on the participants' age. And then the descriptive statistic (calculate mean and STD. deviation) was conducted. And p-value was calculated.

Table 4. One-way ANOVA test 1

	Age Group (Years)	**No. of Participants**	**Mean**	**STD. Deviation**
1.	20 or below	102	6.7891	0.7823
2.	21-30	103	6.4387	0.9623
3.	31-35	197	6.3214	0.9003
4.	36-45	48	6.5312	0.8712
5.	46 and above	50	6.1724	1.0043
	Total	**500**	6.4505	0.9042
	***p*-value**		**0.9010**	

The outcomes in Table 4 show that there is no impact between the participant's age and their readiness to adapt to an e-learning system. The p-value of 0.9010 is greater than the pretest level of significance ($p = 0.814 > 0.05$).

On the other aspect, a new classification of participant's sample was conducted based on their ICT background. (No ICT background L0, Beginner in ICT L1, Intermediate in ICT L2, Advance in ICT L3, Experts in ICT L4), and also the descriptive statistic (calculate mean and STD. deviation) was conducted. And p-value was calculated. It is clearly shown in Table 5.

Table 5. One-way ANOVA test 2

	Having ICT Background	**No. of Participants**	**Mean**	**STD. Deviation**
1	L0	45	6.2391	0.9820
2	L1	209	6.6787	0.8623
3	L2	96	6.9114	0.9001
4	L3	77	5.9310	0.9712
5	L4	78	5.8721	0.9043
	Total	**500**	6.2102	0.9042
	***p*-value**		**0.8911**	

The outcomes in Table 5 show that there is no impact between ICT experience participants and their readiness to adopt an e-learning system. The p-value of 0.9010 is greater than the pretest level of significance ($p = 0.814 > 0.05$). In evaluation of the discriminant validity of the model variables, [42] proposes an approach that conducts a comparison among the square root of the Average Variance Extracted (AVE) for the model variables with its corresponding correlation values. As clearly visualized in Table 6, the diagonal values mean the square roots of AVE which are higher compared to the values in

TABLE 6. Discriminant validity for the proposed model

Model Variable	AR	SR	PU	PEU	ATT	BI
AR	**0.851**					
SR	0.284	**0.864**				
PU	0.344	0.453	**0.874**			
PEU	0.295	0.325	0.322	**0.865**		
ATT	0.391	0.442	0.652	0.432	**0.861**	
BI	0.293	0.214	0.435	0.324	0.421	**0.882**

their corresponding rows and columns which reflect the satisfactory level of discriminant validity.

3.5. **Hypothesis testing.** Figure 3 clearly indicates the significant structural relationships and standardized path coefficients among the proposed model constructs.

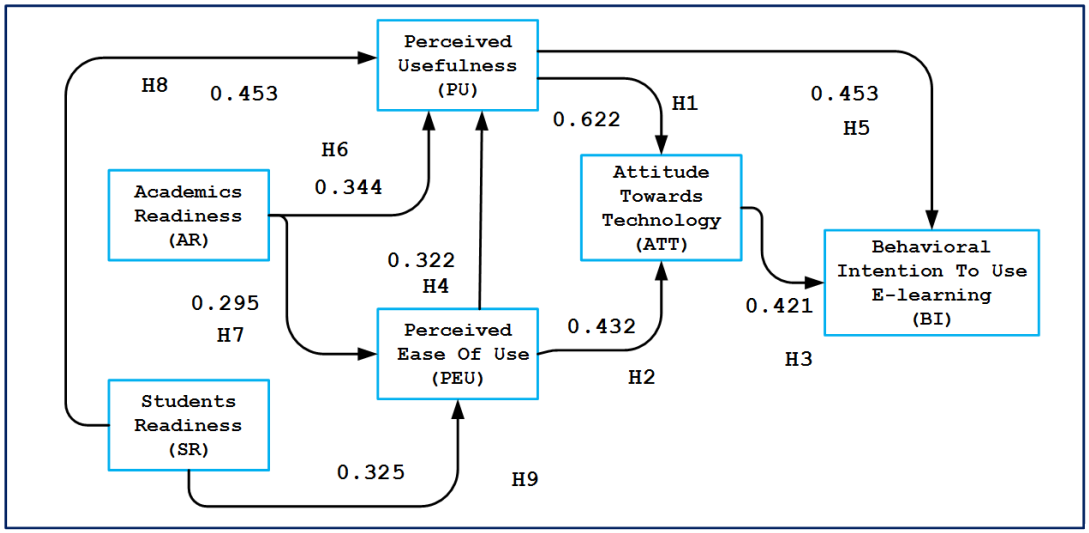

FIGURE 3. Structural modeling analysis results

3.6. **Result of hypothesis testing.** Perceived usefulness has a positive influence on BI in readiness of e-learning ($\beta = 0.641$); therefore, hypothesis H1 is accepted. The influence of PEU on BI in readiness of e-learning was found significant at $p < .05$ ($\beta = 0.172$); therefore, H2 was accepted. A positive influence of PEU is observed on PU ($\beta = 0.374$); therefore, hypothesis H4 is accepted. Academic readiness has a significant positive impact on both PU ($\beta = 0.301$) & PEU ($\beta = 0.380$); therefore, both hypotheses 4 and 6 are accepted. The positive influence of student readiness on PU ($\beta = 0.378$) and PEU ($\beta = 0.278$) was also found significant; hence hypotheses 8 and 9 have been accepted. (Note: The symbol β means Standard Path Coefficients.)

4. **Discussion of the Results.** The core aim of this paper is to investigate measuring the reediness of the adoption of e-learning among higher education institutes by proposing the influencing factors and to expose the relationship between those factors. An extension of TAM was used with two external variables (academics and students readiness). The results indicate that academics and students readiness to adopt e-learning is highly influenced by their PU. A positive influence of both academics readiness and students readiness variables on both PU and PEU is also confirmed from the results of this study.

Consequently, it can be indicated from the results above, by adopting an e-learning system there is a suitable and positive influence of (academics and students) towards the

readiness of applying e-learning. So even though there are many challenges they faced and will face, the outcomes indicate that the readiness is high. Moreover, it can be concluded that there is an influence between ATT and PEU. Most of the participants agreed with the usability of e-learning tools; thus, this will lead to be easy to use those tools for processing the data and information.

5. **Conclusion.** The main objective of this study was to measure the readiness of the higher education institutions of the adoption and interactivity with e-learning. Besides, this paper examines the applicability of TAM in the context of measuring readiness towards adopting e-learning among the higher education in Iraq. An extension of TAM was thus proposed with the addition of two external variables (student readiness and academics readiness) to measure the readiness of academics' and students' acceptance of e-learning. The examination of the relationships between the factors (adapted from the initial model developed by [11] as well as the factors proposed by authors) was conducted. The results confirmed a strong effect of both students and academics readiness of both PU & PEU. Generally speaking, students and academics enhance their perception toward adopting e-learning in higher education institutes.

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