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Determinants of e-learning acceptance amongst Iranian postgraduate students

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Abstract

E-learning can address some of the unmet needs of learners and educational communities; however, not all learners and educators accept e-learning as a delivery modality. This research endeavored to study the factors which affect e-learning acceptance among Iranian post-graduate students using the Davis Technology Acceptance Model (TAM) and to identify the changes which would facilitate their improved acceptance and subsequent wider use of e-learning. This descriptive-correlation study was conducted by surveying 320 Iranian postgraduate students using a self-reporting questionnaire. Structural equation modeling was used for data analysis through LISREL software. Results revealed sufficient validity and reliability of the TAM among Iranian postgraduate medical students. Perceived ease of use, perceived usefulness of e-learning, students' attitudes toward e-learning, and the intention to use e-learning positively affected e-learning's acceptance ($p < 0.05$) among Iranian postgraduate students. According to the results, attitudes toward e-learning have more predictive power than other TAM constructs. Therefore, emphasis on students' favorable attitudes toward e-learning can be effective in accelerating its acceptance and will progress students' learning outcomes.

Keywords

technology acceptance model, medical education, usefulness, ease of use, attitude

Revisions

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Determinants of E-learning Acceptance Amongst Iranian Postgraduate Students

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Abstract

E-learning can address some of the unmet needs of learners and educational communities; however, not all learners and educators accept e-learning as a delivery modality. This research endeavored to study the factors which affect e-learning acceptance among Iranian post-graduate students using the Davis Technology Acceptance Model (TAM) and to identify the changes which would facilitate their improved acceptance and subsequent wider use of e-learning. This descriptive-correlation study was conducted by surveying 320 Iranian postgraduate students using a self-reporting questionnaire. Structural equation modeling was used for data analysis through LISREL software. Results revealed sufficient validity and reliability of the TAM among Iranian postgraduate medical students. Perceived ease of use, perceived usefulness of e-learning, students' attitudes toward e-learning, and the intention to use e-learning positively affected e-learning's acceptance ($p < 0.05$) among Iranian postgraduate students. According to the results, attitudes toward e-learning have more predictive power than other TAM constructs. Therefore, emphasis on students' favorable attitudes toward e-learning can be effective in accelerating its acceptance and will progress students' learning outcomes.

Keywords: technology acceptance model, medical education, usefulness, ease of use, attitude

Introduction

Electronic learning or e-learning refers to the use of recent computer network technologies (Lee et al., 2014) in education processes that include web-based asynchronous and synchronous communications and interactions, information achievement (Ho & Dzung, 2010), and knowledge distribution, which may occur using simultaneous online interactions (synchronous) or offline nonparallel ones (asynchronous). E-learning often is considered synonymous with other terms in the educational technology field, such as distance learning; however, distance learning does not

necessarily apply to computer technologies (Siu & Garcia, 2016). E-learning enables both educators and learners to overcome the geographical limits in attending their courses at specific times and location by applying internet technologies. Asynchronous e-learning offers an opportunity for learners to control their learning content, time, and often media, allowing them to apply their learning experiences to accomplish the learning objectives (Ruiz et al., 2006). Moreover, e-learning addresses some of the educational institution's problems, such as the increasing need for experienced lecturers; access to educational centers; and shortage of facilities and budget.

Recently, e-learning has increasingly become a common approach in universities, which have equipped themselves with e-learning systems. In the past, the primary purpose of e-learning in universities was to create fundamental changes in teaching and learning methods (Persico et al., 2014). Decman (2015) believed that learners should accept e-learning; however, they resisted the acceptance of new learning technology. This became a common issue with utilizing this learning modality in many educational institutions and universities. According to Leem and Lim (2007), obstacles in applying e-learning in universities continued to exist. Some e-learning studies (Adewole-Odeshi, 2014; Decman, 2015; Jovic et al., 2017; Ratna & Mehra, 2015) showed that the main problem of university students in using e-learning systems is mainly their rejection of this type of technology. In this regard, Dutton & Perry (2002) research revealed that 82% of full-time students preferred to take the face-to-face lecture classes rather than the online classes. In other words, the critical link of success in the implementation of e-learning in various educational settings is its acceptance by the students. Thus, in assessing e-learning application, various dimensions of student's acceptance including attitudes, intentions, and perceptions, should be taken into consideration.

Since 2001, some universities have launched e-learning in Iran (Mirzamohammadi, 2017). Mirzamohammadi (2017) indicated that this topic could be classified into two categories in Iran: studies that support application of the e-learning in Iranian universities (Keshavarzi et al., 2013; Rahimidoost and Razavi, 2013), and studies that do not support its application (Hosseini et al., 2015; Sheykhan et al., 2015). Research has shown that many variables influence e-learning acceptance by Iranian students (Mohammadi, 2015). Although e-learning has proliferated in Iranian universities, concerns about the level of its acceptance among students (Khorasani et al., 2012) has continued.

Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the main variables of the TAM (Davis, 1989), and are referred to by users in some studies (Momeni & Aliabadi, 2010; Tarhini et al., 2014; Ibrahim et al., 2017). According to Persico et al. (2014), the original TAM was not designed to assess e-learning systems; however, its two core indicators are often used to evaluate the effect of technology in educational contexts. Considerable research (Decman, 2015; Ibrahim et al., 2017; Lee et al., 2014; Motaghian et al., 2013; Tarhini et al., 2014) has shown that use of this model for evaluating e-learning or determining factors affect e-learning in an academic setting is effective. These studies emphasized the direct and pronounced impact of PU and PEOU on the student's intentions to apply e-learning. Most of the results indicated the relationship between student's PEOU and PU of e-learning (Decman, 2015; Ibrahim et al., 2017; Lee et al., 2014; Motaghian et al., 2013; Tarhini et al., 2014). However, Motaghian et al. (2013) demonstrated that more than 26% of Iranian medical universities were not ready to implement e-learning systems due to unavailability of this type of education in most Iranian medical universities. Moreover, even

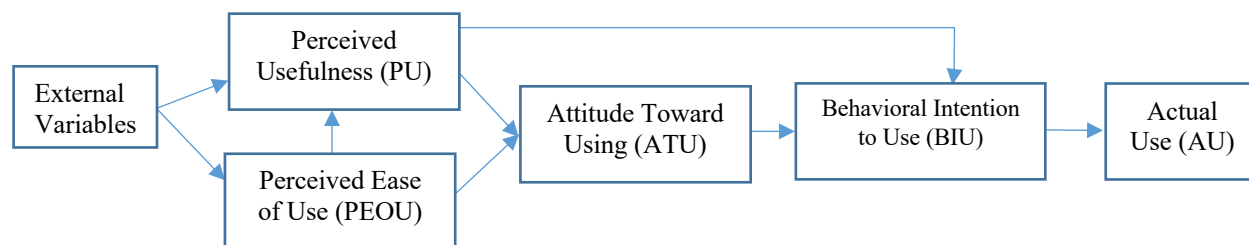
though the use of technology is highly emphasized in Iran's higher education documents, there is no specific framework for using educational technology in academic settings (Mirzamohammadi, 2017). Identifying variables that influence the implementation of e-learning in Iranian universities is essential; thus, the present research focused on evaluating an Iranian university students' perspective toward e-learning using the TAM (Schepers & Wetzels, 2007).

Technology Acceptance Model (TAM)

TAM is discussed as the most effective extension of the Theory of Reasoned Action (TRA). Hu et al. (1999) indicated that it might be the most applied model for the description of user's attitudes toward health information technology. Holden and Karsh (2010) supported this by reviewing over twenty studies using the TAM in healthcare settings and concluded that the TAM was progressively characterized as a desirable theory in a health information technology context. This model attempts to describe acceptance or rejection of information technology through conforming TRA (Davis, 1989; Davis et al., 1989). The TAM introduces two particular beliefs: PU and PEOU. According to Davis (1989), PU is the level at which a person assumes that using a unique system will improve his job skills, while PEOU is considered as a level at which a person finds it free of physical and mental efforts to use a special system.

According to Lee et al. (2014), a person's attitude toward applying new technology is affected by PU and PEOU, which determine user's behavioral intentions towards the application of that new technology. Moreover, in the TAM, there are four groups of variables including: external variables, PU, PEOU, and Attitudes Toward Use (ATU). These variables can influence the Behavioral Intention to Use (BIU) of information technology and the Actual Use (AU) of it. The external variables in TAM refer to social context, which are excluded from many of the studies using this model (Hussein, 2017; Khorasani et al. 2012; Masrom, 2007). Therefore, in current study these variables were excluded (Figure 1).

Figure 1. Technology Acceptance Model (TAM)



Source. Davis et al., 1989

The current study investigated e-learning from the TAM prospect among Iranian medical university postgraduate students. Accordingly, the central question of this study is as follows: what are the factors affecting e-learning acceptance among Iranian medical postgraduate students? Consequently, the current study develops hypotheses as follows:

- H1: PEOU has a significant correlation with the PU of e-learning.
- H2: PEOU has a significant correlation with the ATU of e-learning.
- H3: PU has a significant correlation with the ATU of e-learning.
- H4: PU has a significant correlation with the BIU to use e-learning.

- H5: ATU has a significant correlation with the BIU e-learning.
- H6: BIU has a significant correlation with the AU of e-learning.

Literature Review

Many studies have been conducted on e-learning and its implications at universities (Jovic et al., 2017); however, more recently, research focus has shifted to other factors such as: the impact of former education and student's gender on e-learning (Decman, 2015; Tarhini et al., 2014); variables that have an impact on the feasibility of e-learning implementation (Mirzamohammadi, 2017); and acceptance of e-learning among students (Tarhini et al., 2016; Khorasani, 2012). Some studies found that success in e-learning programs relied on how students were involved with technology and how attitude affects the intention to an e-learning system (Ratna & Mehra, 2015; Mohammadi, 2015). In this regard, Jovic et al. (2017) believe variables that impact students' attitudes towards e-learning also affect how they use the e-learning. Similarly, Adewole-Odeshi (2014) stated that students who assumed that using the educational system is easy, look at e-learning with a positive attitude.

E-learning success depends on executing an educational model that meets students' requirements and educational objectives (Lee et al., 2011). Therefore, it seems that there is a need to investigate the acceptance of such technologies in different ways and criteria (Decman, 2015). Revyathi & Tselios (2017) assessed the acceptance of BIU learning management systems through an adapted version of the TAM. The results showed that self-efficacy influenced not only PEOU, but also BIU. Tarhini et al. (2016) also proposed a theoretical framework based on TAM, TAM2, and TRA for understanding different variables that could impact the adoption of e-learning programs in higher education systems of developing and developed countries. These factors in the framework are as follows: self-efficacy in e-learning, quality of work-life, PEOU, PU, BIU, and usage. The demographic variables are assimilated as a set of mediators in the model. The researchers further concluded that social norms, e-learning self-efficacy, quality of work-life, and making situations easy, have a moderating impact on the BIU, and AU of e-learning. In another study, Ratna & Mehra (2015) examined student's acceptance and behavior towards e-learning using the TAM within a course. The result revealed that PU strongly mediated PEOU, and attitudes, while attitudes mediated PU, PEOU, and BIU. Multiple studies (Decman, 2015; Ibrahim et al., 2017; Lee et al., 2014; Motaghian et al., 2013; Tarhini et al., 2014) utilized the TAM model for evaluating e-learning or determining factors that affect its use in the academic setting. Thus, integrating e-learning technologies in education and studying students' perceptions, attitudes, and intentions to use these technologies became essential to be assessed (Ozdamli & Uzunboylu, 2015).

A review of the literature reveals that many variables influence the acceptance of e-learning by students. Based on the results of the above-mentioned studies, one can conclude that the TAM is a common model for evaluating e-learning programs. Although, there are many research on the information and communication technology in the educational area, there is little research about factors influencing the acceptance and use of information and communication technology in e-learning among postgraduate students (based on searches in databases). Therefore, in order to augment existing research, the present study was conducted.

Methods

Data Collection

This descriptive-correlation study was performed using survey method to evaluate factors that influence acceptance of e-learning programs among Iranian medical university postgraduate students. A TAM questionnaire (Davis, 1989) was used for data collection. The first part of the questionnaire collected demographic information and the second part of the 18-item Likert scale type questionnaire related to acceptance, PU, PEOU, ATU, and BIU, and AU of e-learning. The participants ($N = 320$) were asked to self-report their agreement or disagreement with each statement included in the TAM questionnaire. In this instrument, a seven-point Likert-type scale ranging from *strongly disagree* and *strongly agree* was used to measure the participant's opinions.

Sample

The total number of postgraduate students in an Iranian medical university at the study time was 3,104. According to Cochran's formula (Cronbach & Meehl, 1955), a sample of 341 postgraduate students were selected by random stratified sampling method to take part in the research. Three hundred and forty-one questionnaires were distributed, and 320 questionnaires were ultimately completed, bringing the rate of return to 94.13%.

Data Analysis

The data analysis process included three stages. The first stage employed confirmatory factor analysis and structural equation modeling using LIZREL software. The principal analysis performed in this stage was examining the reliability and validity of the measurement model. The second stage analyzed the Spearman Correlation between constructs and hypothesis testing, and the third stage analyzed the relationships between constructs within the research model.

Findings

Descriptive results of the study indicated that the majority of respondents were female (72.5%) and, 75% of all participants experienced using an e-learning system. Although, the validity of the research questionnaire was confirmed in Iran through Khorasani (2012) research, in this study, the reliability of the questionnaire was re-measured using Cronbach's Alpha. The resulted Cronbach's Alpha (.923) indicated a strong reliability of the sample variables. Table 1 reports the Cronbach's alpha value for each construct of the research questionnaire.

Table 1: Cronbach's Alpha Value for Each Construct of the Research Questionnaire

Construct	Cronbach's Alpha	Number of items
Ease of use	.83	4
Perceived ease of use	.84	4
Attitude to use	.86	4
Behavioral intention to use	.81	4
Actual use	.69	2
Total	.92	18

Furthermore, the construct validity of the underlying structure of the TAM questionnaire was calculated through a factor analytic approach (Table 2). Sampling adequacy was investigated using

the Kaiser-Meyer-Olkin (Kaiser, 1974) measure. Overall sampling adequacy was .907 which indicated the research sample sufficiency to carry out a factor analysis.

Table 2. Sampling Adequacy (Validity) Based on Kaiser-Meyer-Olkin Measure

Variables	Kaiser-Meyer-Olkin Measure	Bartlett's Test of Sphericity	DF	Sig
PEOU	.793	481.939	6	.000
PU	.762	474.413	6	.000
ATU	.763	638.161	6	.000
BIU	.721	467.299	6	.000
AU	.500	105.447	1	.000
Total	.907	3194.731	153	.000

Note. PEOU = Perceived Ease of Use; PU = Perceived Usefulness; ATU = Attitude Toward Use; BIU = Behavioral Intention to Use; AU = Actual Use

Measurement Model Evaluation

As mentioned previously, data analysis of this research was conducted using structural equation modeling. Table 3 represents the research factor analyses. Chen and Tseng (2012) claimed that a factor loading value that is greater than the p-value ($p < .001$) indicates meaningful and significant results. In this study, all values were above the threshold, and there were significant correlations between all constructs. To evaluate the research model's goodness-of-fit fit, indices are provided in Table 3 (Tarhini et al., 2014), which reports the recommended and actual values of fit indices. Models with good fit, the χ^2/df ratio should not exceed 5. In the current study, this ratio calculated at 3.96 which indicates that the research model's goodness-of-fit indices are higher than the recommended ones, thus indicated that the research model's goodness-of-fit is strong.

Table 3. Overall Fit Indices of the Measurement Model

Model	χ^2/df	GFI	NFI	NNFI	CFI	IFI	RMSEA	RMSR
Recommended value	≤ 5	$\geq .9$	$\geq .9$	$\geq .9$	$\geq .9$	$\geq .9$	$\leq .05$	$\leq .1$
Measurement model	3.96	.96	.94	.95	.96	.98	.096	.088

Analysis of the Relationships between Constructs

The relationships between constructs, PU, PEOU, ATU, BIU, and AU were analyzed using Spearman correlation (Table 4). According to the results, ATU with a p -value = .01 has a significant correlation with the BIU e-learning ($R = .708$). Moreover, results indicated that PEOU positively correlated to PU ($R = .66$). Thus, it can be said that PEOU has a significant correlation with the PU of e-learning (H1).

Table 4 presents both PEOU and PU correlated to ATU. As a result, H2 and H3 are both supported. H4 and H5 are supported which, indicate that PU (.472) and ATU (.708) correlated to the BIU. Finally, BIU positively (.495) correlated to AU. Thus, the last hypothesis (H6) is also supported. All correlations were considerable at $p < .01$ level (Table 4).

Table 4. Spearman's Correlation Between PU, PEOU, ATU, BIU, and AU

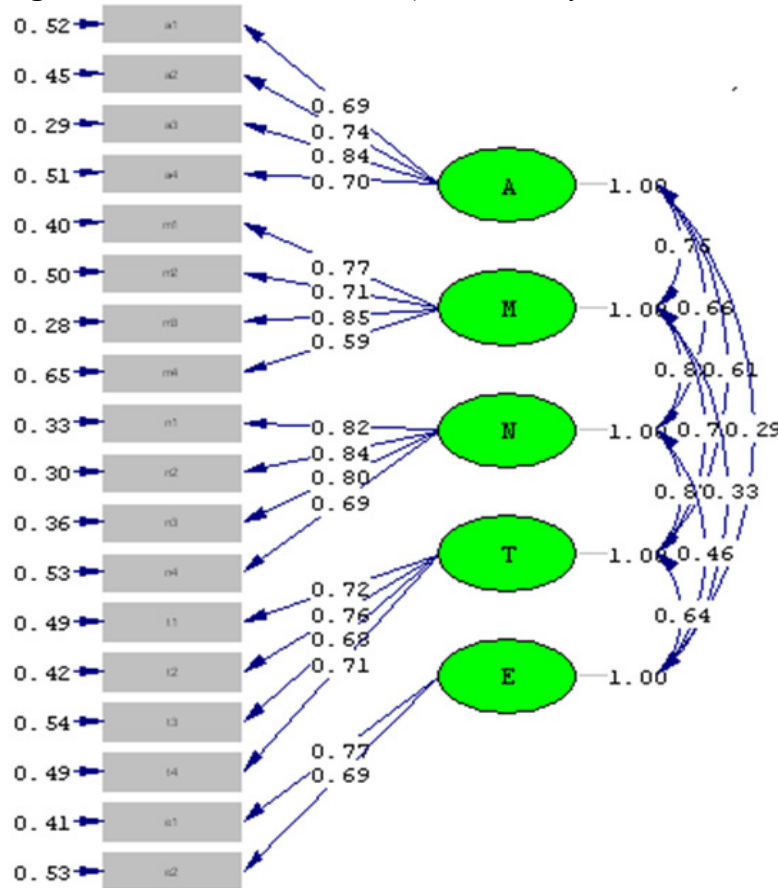
Correlation	PU	PEOU	ATU	BIU	AU
PU	1.000	.660**	.541**	.472**	.234**
PEOU	.660**	1.000	.694**	.578**	.289**
ATU	.541**	.694**	1.000	.708**	.406**
BIU	.472**	.578**	.708**	1.000	.495**
AU	.234**	.289**	.406**	.495**	1.000

Note. PEOU = Perceived Ease of Use; PU = Perceived Usefulness; ATU = Attitude Toward Use; BIU = Behavioral Intention to Use; AU = Actual Use
N = 320; Correlation is significant at the $p < .01$ level (2-tailed).

Analysis of Structural Equation Modeling

According to the results (Figure 2) the fit between the data and the model is acceptable ($X^2/df = 3.96$, $CFI = .96$, $GFI = 921$, $NFI = .94$, $NNFI = .95$, $CFI = .96$, $IFI = .98$, $RMSEA = .096$, and $RMSR = .088$). Therefore, the study proceeds to analyze the relationships between constructs within the proposed research model. Based on factor analysis, the research model's parameter estimate distinguished through the correlation and loading value of each construct (Figure 3).

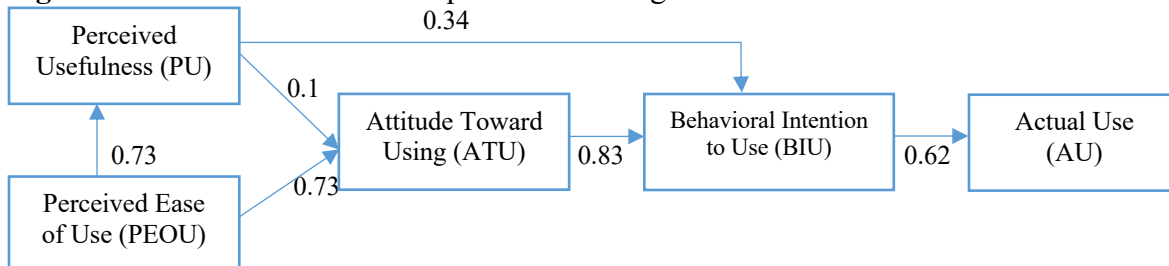
Figure 2. Measurement Model (Factor Analysis of Each Construct)



Note. Chi-Square = 496.02; $df = 125$; $p = .01$; $RMSEA = .096$

Based on the values from the result of structural equation modeling, all relationships were significant ($p < .01$). Furthermore, findings show that attitude toward using e-learning chips into the BIU e-learning at a value level of $alpha = .83$, $p < .01$ which, shows this variable's significance.

Figure 3. Result of a Structural Equation Modeling



Conclusions

The research fit indices and the significance of almost all research variables, showed that TAM is a suitable model to evaluate the e-learning acceptance among the Iranian medical postgraduate students. Research results are consistent with prior TAM research, indicating the applicability of Davis's TAM theory in explaining e-learning acceptance (Hussein, 2017; Ibrahim et al., 2017; Khorasani et al., 2012; Lee et al., 2011; Ratna & Mehra, 2015). Similar to the findings of this study, Sumak et al. (2011) found that among studies, TAM has applicability in the academic community.

The results of correlation analysis (Table 4) are consistent with numerous prior TAM studies, showing that both PEOU and PU are determinants of attitude for technology acceptance (Davis, 1989; Davis et al., 1989; Hussein, 2017; Khorasani et al., 2012). The students agreed that it was easy to use the e-learning system; therefore, the easiness of e-learning influenced their attitudes towards e-learning, which means that PEOU influences ATU positively. This finding indicates that when the students perceive that they are able to use e-learning technology effortlessly and quickly they are more likely to seek learning opportunities that use it. Conversely, findings also showed that the usefulness of e-learning significantly influenced attitudes towards e-learning ($r = .541$). Thus, students who expect to receive more benefits from e-learning are more willing to use it. This assumption is in line with Davis's research results (Davis, 1989), who believed that an individual's tendency to use new technologies related to his or her perceptions of that technology's benefits.

The outcomes of this research are in line with findings of previous research, including Ratna and Mehra (2015) and Jovic et al. (2017) who, found out that PU has a considerable impact on student's ATU. In addition, the results support previous studies in Iran (Khorasani et al., 2012; Mohammadi, 2015) that emphasized the potential effect of PEOU and usefulness toward positive attitude in acceptance of e-learning. Moreover, research findings showed that a positive attitude toward e-learning has statistically significant effects on BIU to e-learning and PU also affected BIU to e-learning. Current results strengthen the argument made in a prior study by Ibrahim et al. (2017) who, stated that BIU to e-learning exerts a significant influence on the PU and positive ATU toward e-learning (Jovic et al., 2017).

TAM presumes that BIU is a predictor of actual system use. The findings of current research are consistent with TAM (see Figure 1), which theorizes that real use of the e-learning system could be influenced by BIU, which is determined by PU, and PEOU (Davis, 1989). Davis (1989) stated that PU has significantly more correlation with user behavior than PEOU did. However, results of this study showed that PEOU has a more significant effect on the BIU than PU (see Figure 2). This finding agrees with Park (2009) who did a study on analysis of the TAM in understanding university students' BIU e-learning. He found that PEOU could predict attitude and probable intention to use e-learning further. He also suggested that managers should produce e-learning content that is more user-oriented. This type of learning technology helps to change user perceptions and foster greater satisfaction levels among them, which ends in further positive use of e-learning. Moreover, designing creative games and incorporating heuristic methods into learning content can draw students' attention toward using the e-learning.

Compared to other predictors of BIU, structural model analysis showed that ATU is the most vital determinant and thus, it can be said that it has an essential role in encouraging the students to apply e-learning. In other words, student's attitudes have more predictive power than PEOU and, PU on acceptance of e-learning. These results aligned with previous studies (Davis et al., 1989; Park, 2009). Furthermore, as stated in a study by Hussein (Hussein, 2017), unforeseen factors can influence the intentions to accept e-learning, and research suggests that attitudes are critical.

According to the results, as PEOU has more significant impact on BIU than PU. So, by designing user-friendly e-learning systems in the medical education context in Iran, student's attitudes toward this style of learning may improve, which will help educational policymakers and educators promote the use of e-learning among Iranian students. As a whole, integrating e-learning into postgraduate programs will facilitate and improve quality of the medical teaching and learning process in Iran.

In conclusion, by identifying the factors influencing the use of e-learning by students, it is essential to consider the attitude factor in developing e-learning systems for university students to increase their intention and use of such technologies. This study also showed the efficacy of e-learning within medical education institutions, especially among postgraduate students.

Implications

Current research can be used by higher education institutions that develop e-learning courses especially in medical settings. If students perceive that the application of e-learning is simple and valuable, its acceptance will increase which could affect their attitude and, consequently their intention to use e-learning more frequently. Finally, by utilizing the TAM as a theoretical framework, current research assists experts, practitioners and educators in gaining a more positive perspective on students' acceptance behaviors toward e-learning. Moreover, these findings can be especially relevant to system designers, instructors, and university administrators.

Limitations and Further Research

The main limitation is that this research has been conducted only among postgraduate medical students, which makes it difficult to generalize the results to other students. As the sample of the current study was limited to post-graduate medical students, the same research design can be conducted in other context such as undergraduate students or non-medical student's contexts. Additional research can be carried out to maintain e-learning acceptance among university students based on other models.

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