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Investigating the Effective Factors on Adoption of E-Learning System in Qazvin University of Medical Sciences

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Abstract: The purpose of this research is to identify and introduce effective factors in the adoption of e-learning based on the technology adoption model. Accordingly, by considering the studies conducted in this field, several variables such as computer self-efficacy, content quality, system support, interface design, technology tools, and computer anxiety as factors influencing the adoption of e-learning systems were extracted, and based on them, a conceptual model of research was developed. To measure the model and the relationships between the variables in

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the model, a questionnaire was designed and provided to users of the electronic education system of Qazvin University of Medical Sciences. The results of the data analysis confirmed the correctness of all hypotheses using the structural equation modeling method, except for the effect of technology tools on the acceptance of the e-learning system. The findings of this study will help university administrators and the professors associated with this system to encourage students to make effective use of the system by creating the necessary background for effective factors.
Keywords: Technology Adoption Model, Adoption Of E-Learning System, User Interface Design, Computer Self-Efficacy, Computer Anxiety, Structural Equation Modeling.

1. Introduction

With the rapid changes in techniques and skills and the emergence of new phenomena in information technology and their impact on living methods, the educational process has been transformed as one of the fundamental elements of societies. The widespread extension of information technology and its applications, as well as advanced teaching tools, has transformed educational methods. These methods provide many possibilities for a wide range of science and technology seekers in different parts of the world and from far distances to be covered by the distance learning network and also to be trained by using traditional methods (Khorasani *et al.* (2012)).

E-learning is not only an option but an inevitable necessity as an effective factor in the reform of the educational system. (Khorasani *et al.* (2012)). E-learning transmits knowledge and skills using electronic tools and processes and powerful networks. In fact, e-learning is an educational method that links technology and individuals and creates effectiveness. This is a way of transferring educational materials through information technology and the Internet. (Farahi et al. (2011)). Skills such as e-learning can be a timely response to ever-increasing technological changes and the possibility of using new knowledge and the proper management of educational programs in the age of information and communication. However, one of the challenges of new technology is its adoption by users. (Farahi et al. (2011)). The success of e-learning is widespread in terms of adoption and use. With the development of the World Wide Web, e-learning has become customary as a form of remote learning in different societies (Ong and Lai (2006)). Many universities that provide e-learning offer numerous challenges in obtaining successful strategies, including delivery, effectiveness, and adoption of courses (Hassanzadeh *et al.* (2013)). In particular, in spite of the obvious tendency to use Web-based learning systems to facilitate learning and its activities, the number of users of these systems is not expected to increase rapidly (Bandura (1986)).

Although e-learning has been promoted among various levels of users, the tendency to continue to use such a system is still very low. It is due to the initial adoption of e-learning is the first step towards achieving the success of e-learning, and real success requires continued use (Ong and Lai (2006)). Certainly, understanding and exploring the vital factors that share the learner's adoption of the e-learning system is particularly important (Tabarsa and Nazarpoori (2015)). Various global models and methods are presented to examine the factors affecting the adoption of information technology, among which the most prestigious is the Technology Adoption Model, presented by Davis in 1989. Based on the initial

adoption of technology, two types of perceptions, and in the words of Davies, two believes play an essential role in the adoption of information technology. These two believes, which, in turn, can be influenced by external factors, are perceived usefulness and perceived ease of use. Identifying and improving these factors can increase the chances of accepting e-learning technology and satisfying users, and finally, can determine the level of real use. It also recognized why a particular system might not be accepted and, corrective steps can be followed based on the research results and recognition. If the results showed a tendency of users, the effective factors could be strengthened in order to encourage more users to use the system and also to encourage current users to continue working with the system. Therefore, the purpose of this study was to identify and introduce effective factors in adopting e-learning based on the technology adoption model. For this purpose, the electronic education system of Qazvin University of Medical Sciences has been selected as a case study. In this way, the factors extracted in the form of the conceptual model of research and also factors influencing and influenced each other are tested, and their internal and external validity are measured.

2.   Literature Review

The rapid development of information and communication technology has led to the creation of new concepts and facilities in various areas of life, including the notion of E-learning and Internet-based education, which may now be one of the most progressive achievements. Information society and its issues such as the lack of educational space, the massive amount of available information, and the time constraints of professors along with scholars, moreover, reveals the necessity of it (Siadati and taghiyareh (2006)).

E-learning uses technology as an intermediary tool for learning through electronic devices that enables users to access information easily, and interact with other online users (Wu *et al.*   (2012)). This type of learning provides educational content through e-media such as the internet, intranet, extranet, satellite broadcast, audio/video tape, interactive TV, and CD-ROM (Selim (2007)).

Several formal definitions are introduced by E-learning. E-learning generally refers to methods that use E-learning materials (Tabarsa and Nazarpoori (2015)). An E-learning system is a system in which the educator is inclusive in terms of location and time separated from each other. The content of many courses are exploited by the technology, internet, and computer networks developed through the course management software (Khorasani *et al.*   (2012)).

In cyberspaces, E-learning is the equivalent of virtual education, which is E-learning or virtual education in its simplest form, in terms of providing content through the Internet. Any kind of training provided through electronic media is called E-learning. In other words, the use of information and communication technology in teaching-learning processes is called E-learning. Therefore, the interface between information technology, communication technology, and educational technology is an E-learning that is taught by titles such as virtual education and E-learning; E-learning is an educational invention that can be provided through compact discs, LANs, or the Internet. E-learning Includes computer-based education and web-based education (Tabarsa and Nazarpoori (2015)).

Due to the Internet and mobile communications, today, most students have many technologies and can use these technologies to attend classrooms without the need for physical presence (Hanif *et al.* (2018)). The adoption and use of an information system by the end-users of that system is a way of evaluating the system's success from students' perspective in an E-learning system (Al-Emran *et al.* (2018)).

2.1 Experimental Background

Cheng (2012) updated the DeLone and McLean's Information Technology Model, Integration Model, and Deliverables Performance Model, a study that focuses on quality review in e-learning adoption Cheng (2012). Also, Farahat (2012) and Chen and Tseng (2012) used their Davis technology adoption model. Farahat (2012) identified the determinants of the adoption of online education by Egyptian university students and presented a conceptual framework based on the Davis Technology Adoption Model, which demonstrated how these factors could shape students' intention to use online education Farahat (2012). Chen and Tseng (2012) also used the Technology Adoption Model as a theoretical basis for their research, and examined the factors that influence the use of in-service training through web-based e-learning. The variables of motivation to use, computer anxiety, internet self-efficacy, perceived usefulness, perceived the ease of use, and behavioral intention were studied in this model Chen and Tseng (2012).

Motaghian *et al.* (2013) presented a model consisting of variables of information quality, service quality, system quality, computer self-efficacy, subjective norms, perceived usefulness, perceived ease of use, intention to use, and system use, to examine the factors affecting the adoption of Web-based educational system provided by university professors. The results of this research show that the standard and quality of information have a positive effect on usefulness. Self-efficacy,

service quality, standard-mindedness, and information quality affect the ease of use. Also, the usefulness, ease, and quality of the system increase the intention of the professors to use the web-based learning system. On the other hand, the usefulness of the most important factor is the desire of the professors and their actual use of the system Motaghian *et al.* (2013). A model presented by Alsabawy *et al.* (2013) includes five variables, IT infrastructure services, perceived usefulness, user satisfaction, customer value, and organizational values. This empirical study confirms that IT infrastructure services are a credible and reliable structure for measuring the success of electronic learning systems Alsabawy *et al.* (2013). Cheung and Vogel (2013) developed a research model with the expansion of the technology adoption model and the theory of planned behavior to understand student adoption behavior and also to explain the factors affecting user perceptions and the adoption of common e-learning technologies Cheung and Vogel (2013).

Cheng (2014) presented a developed model to examine the role of interaction and experience in using e-learning Cheng (2014). Also, in the same year, Agudo-Peregrina and *et al.* (2014) presented a model based on the developed model of Technology Adoption Model (Technology Adoption Model 3) to study the factors affecting the adoption of e-learning systems. In this research, variables studied were intention to use the system, perceived usefulness, perceived ease of use, subjective norms, communication to learning, the interaction between perceived self-efficacy, anxiety computers, facilitating conditions, luxury seeking understanding, innovation in the IT field, and used as The proposed model in this study Agudo-Peregrina and *et al.* (2014). Joo *et al.* (2014) also studied the willingness of learners to accept mobile learning by adding user interface variables, personal innovation, and learning satisfaction to the initial adoption model of technology Joo *et al.* (2014). Kowitlawakul *et al.* (2015), examined the factors influencing the adoption of the electronic health record software program in nursing education by adding the computer self-efficacy factor to the primary adoption model (Kowitlawakul *et al.* (2015)). Subsequently, El-Masri *et al.* (2017) examined factors affecting the adoption of e-learning systems in developing countries as well as developed countries, and used the Unified Theory of Adoption (El-Masri *et al.* (2017)). Hanif *et al.* (2018) also assessed the factors affecting students' behavioral intention to use e-learning systems at universities to increase their classroom learning. This research proposed six external factors that affect students' behavioral intention to use learning (Hanif *et al.* (2018)).

2.2   Comparison with the recent researches

After examining different models of adoption of E-learning systems, the proposed model of this study was based on the technology adoption model. Based on the initial technology adoption model, there are two types of perceptions, and in Davis's words, two beliefs, "perceived usefulness" and "perceived ease of use", play an essential role in the adoption of information technology. These two beliefs can also be influenced by external factors. Many variables such as content quality, system support, user interface design, technology tools, computer self-efficacy and, computer anxiety as external factors affecting the usefulness and ease of use of the system, were chosen. In table 1, a comparison has been made between the components of the proposed model and the recent studies.
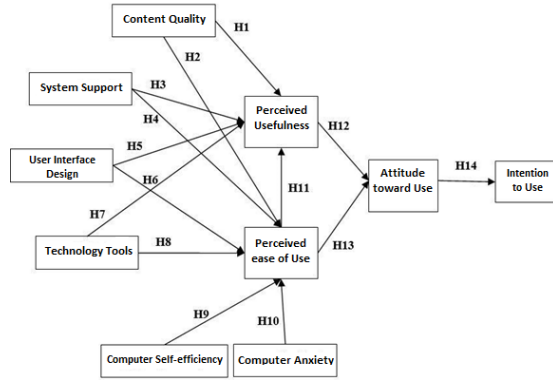
Table 1: Comparison of the proposed model with the recent studies

	Cheng (2012)	Farahat (2012)	Chen and Tseng (2012)	Cheung and Vogel (2013)	Alsabawy et al. (2013)	Motaghian et al. (2013)	Cheng (2014)	Agudo-Peregrina and et al. (2014)	Joo et al. (2014)	Kowitlawakul et al. (2015)	El-Masri et al. (2017)	Hanif et al. (2018)	Present research
Self-Efficacy			*	*		*		*		*		*	*
Perceived Usefulness	*	*	*	*	*	*	*	*	*	*		*	*
Perceived Ease of Use	*	*	*	*		*	*	*	*	*		*	*
Intention to Use	*	*	*	*		*	*	*	*	*	*		*
Quality of Content	*					*							*
System Support	*					*							*
User Interface Design	*									*			*
Computer Anxiety			*					*					*
Attitude		*		*						*		*	*
Technology Tools					*								*
Subjective Norm				*		*		*				*	
Quality of System						*							
Satisfaction					*				*				
Course Content Design	*												
Use of the System				*		*		*					
Compatibility				*									
Perceived Enjoyment	*						*						
System Performance	*												
System Interactivity	*							*					
Teacher's Attitude toward Learners	*												
System Responsiveness	*						*						
Social Effects		*											
Perceived Resources				*									
Sharing				*									
Ability to Control							*						
Experience of Use							*						
Two-way Communication							*						
Personalization							*						
Communication to Learn								*					
Innovation								*	*				
Perceived Playfulness								*					
Motivation to use			*										
Customer Value					*								
Organization Value					*								
Effort Expectancy											*		
Performance expectancy											*		
Social Influence											*		
Facilitating Conditions								*			*		
Hedonic Motivation											*		
Price Value											*		
Habit								*			*		
Trust											*		
Enjoyment												*	
Result Demonstrability												*	
Perception of External Control												*	
System Accessibility												*	

Figure 1: The Conceptual model of current research.

3.   Development of the Conceptual Model

By studying the existing models, the Davis Technology Adoption Model was se-
lected as the basis for the research model. There are several reasons for this
selection. One of the most important factors used in all researches is the computer
self-efficacy included in the present research model. Also, due to the newness of
this environment for users, computer anxiety was considered as one of the factors.
Finally, due to the importance of content and support for the e-learning system,
content quality factors, system support, interface design, and technology tools as
factors influencing the adoption of the e-learning system were extracted, and based
on them, the conceptual model of the research was formed. Figure 1 shows the
model of the present research. For each variable and hypothesis in the model, we
present an explanation with reason.

- **Content Quality:** The results of many studies have shown that information
  quality effectively determines the level of customer satisfaction from one
  system. The two main dimensions are content quality, content richness, and
  ongoing updates. If a student, which is a potential user of this system,
  understands that content quality is high in the e-learning system, it is likely
  the student will likely accept the system in terms of content that has a
  positive impact on learning (McKinney *et al.* (2002), Lee (2006)). Updated
  content and new content may make students feel that an e-learning system
  is a useful tool for gaining new knowledge and learning (Lee (2006)). Some
  studies have examined the impact of content quality on perceived usefulness

and perceived ease, which can be cited by Cheng (2012) and Motaghian
et al. (2013). In this research, the impact of content quality on perceived
usefulness and perceived ease is also examined. In Tables 2 and 3, studies
that have examined this relationship can be seen. Table 2 and Table 3 are
related to Hypothesis 1 (Content quality affects perceived usefulness) and
Hypothesis 2 (Content quality affects the perceived ease of use), respectively.

Table 2: Recent studies on the impact of quality of content on perceived usefulness
(related to Hypothesis 1).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Cheng (2012)	Content Quality	Perceived Usefulness	Direct	Cheng	2012	Taiwan
Lee (2006)	Content Quality	Perceived Usefulness	Direct	Lee	2006	Taiwan
Roca et al. (2006)	Content Quality	Perceived Usefulness	Indirect	Roca, et al.	2006	Spain
Motaghian et al. (2013)	Content Quality	Perceived Usefulness	Direct	Motaghian et al.	2013	Iran

Table 3: Recent studies on the impact of quality of content on perceived ease of
use (related to Hypothesis 2).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Cheng (2012)	Content Quality	Perceived ease of use	Direct	Cheng	2012	Taiwan
Roca et al. (2006)	Content Quality	Perceived ease of use	Direct	Roca et al.	2006	Spain
Motaghian et al. (2013)	Content Quality	Perceived ease of use	Direct	Motaghian et al.	2013	Iran

- **System Support:** Essentially, support makes learners understand that e-
  learning tools are a kind of easy-to-use one. When institutions can provide
  sufficient resources to learners, including trained service coordinators and ex-
  perienced technical engineers in online classrooms, ease of use of e-learning
  systems will be understood among learners Cheng (2012). Also, the avail-
  ability of system support provides facilitating conditions that make use of
  the system effective (Cho et al. (2009). Some studies have examined the
  impact of system support on perceived usefulness and perceived ease of use,
  which can be cited by Cheng (2012) and Motaghian et al. (2013). In this
  study, the impact of system support on perceived usefulness and perceived
  ease is also examined. In Tables 4 and 5, studies that have examined this
  relationship can be seen. Table 4 and 5 are related to Hypothesis 3 (Support-
  ing the system affects perceived usefulness) and Hypothesis 4 (Supporting
  the system affects the perceived ease of use), respectively.

Table 4: Recent researches on the impact of system support on perceived usefulness
(related Hypothesis 3).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Cheng (2012)	System Support	Perceived Usefulness	Direct	Cheng	2012	Taiwan
Lee (2010)	System Support	Perceived Usefulness	Direct	Lee	2010	USA-Korea
Motaghian et al. (2013)	System Support	Perceived Usefulness	Direct	Motaghian et al.	2013	Iran

Table 5: Recent studies on the impact of system support on perceived ease of use (related Hypothesis 4).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Cheng (2012)	System Support	Perceived ease of use	Direct	Cheng	2012	Taiwan
Lee (2010)	System Support	Perceived ease of use	Direct	Lee	2010	USA-Korea
Cho et al. (2009)	System Support	Perceived ease of use	Direct	cho, et al.	2009	Hong Kong
Motaghian et al. (2013)	System Support	Perceived ease of use	Direct	Motaghian et al.	2013	Iran

- **User Interface Design:** User interface design refers to the design of the structural design of an interface that displays the features and educational support of an information system. The quality of the user interface is to determine the level of perceived satisfaction, perceived usefulness, and ease of use by perceived users, so it should be considered in the development of an e-learning system Cheng (2012). Some studies have examined the impact of user interface design on perceived usefulness and perceived ease of use, which can be cited by Cheng (2012) and Cho et al. (2009). In this research, the impact of user interface design on perceived usefulness and perceived ease is also examined. In Tables 6 and 7, studies that have examined this relationship can be seen. Table 6 and 7 are related to Hypothesis 5 (User interface design affects perceived usefulness) and Hypothesis 6 (User Interface Design has an impact on the perceived ease of use), respectively.

Table 6: Recent studies on the impact of user interface design on perceived usefulness (Related to Hypothesis 5).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Cheng (2012)	User Interface Design	Perceived Usefulness	Direct	Cheng	2012	Taiwan
Joo et al. (2014)	User Interface Design	Perceived Usefulness	Direct	Lee	2010	South Korea
Cho et al. (2009)	User Interface Design	Perceived Usefulness	Indirect	cho, et al.	2009	Hong Kong

Table 7: Recent studies on the impact of user interface design on perceived ease of use (Related to Hypothesis 6).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Cheng (2012)	User Interface Design	Perceived ease of use	Direct	Cheng	2012	Taiwan
Joo et al. (2014)	User Interface Design	Perceived ease of use	Direct	Lee	2010	South Korea
Cho et al. (2009)	User Interface Design	Perceived ease of use	Direct	cho, et al.	2009	Hong Kong

- **Technology Tools:** Efficient and effective use of information technology in providing e-learning courses is critical to the success and adoption of e-learning by the students. Therefore, ensuring that the University's IT infrastructure is rich, reliable, and capable of providing the course with the necessary tools that smoothly enable the delivery process is critical to the success of e-learning (Selim (2007)). Some studies have examined the impact

of technology tools on perceived usefulness and perceived ease of use, which can be cited by Hussein *et al.* (2007). The research also examines the impact of technology tools on perceived usefulness and perceived ease. In Tables 8 and 9, studies that have examined this relationship can be seen. Tables 8 and 9 are related to Hypothesis 7 (Technology tools have an impact on perceived usefulness) and Hypothesis 8 (Technology tools affect the perceived ease of use), respectively.

Table 8: Recent researches on the impact of technology tools on perceived usefulness (Related to Hypothesis 7).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Alsabawy *et al.* (2013)	Technology Tools	Perceived Usefulness	Direct	Alsabawy, et al.	2013	Australia
Hussein *et al.* (2007)	Technology Tools	Perceived Usefulness	Direct	Hussein, et al.	2007	Malesia

Table 9: Recent researches on the impact of technology tools on perceived ease of use (Related to Hypothesis 8).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Hussein *et al.* (2007)	Technology Tools	Perceived ease of use	Direct	Hussein, et al.	2007	Malesia

- **Computer Self-Efficacy:** Self-efficacy is a personal belief that he can do a particular job or behavior. In the area of information systems, computer self-efficacy refers to the self-assessment of individual abilities to use computer skills to complete the specified tasks (Roca *et al.* (2006)). Computer self-efficacy plays a key role in its effect on perceived ease of use and perceived usefulness (Lee (2006)), (Bandura (1982)). Some studies in this regard have examined the effect of computer self-efficacy on perceived ease, which can be noted in the research by Motaghian *et al.* (2013). In this research, the effect of computer self-efficacy on perceived ease of use is also examined. Table 10 shows the studies that examined this relationship, which is related to Hypothesis 9 (Computer self-efficacy has an impact on the perceived ease of use).

Table 10: Recent studies on the effect of computer self-efficacy on perceived ease of use (Related to Hypothesis 9).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Roca *et al.* (2006)	Computer Self Efficiency	Perceived ease of use	Direct	Roca et al.	2006	Spain
Ong *et al.* (2004)	Computer Self Efficiency	Perceived ease of use	Direct	Ong et al.	2004	Taiwan
Ong and Lai (2006)	Computer Self Efficiency	Perceived ease of use	Direct	Ong & Lai	2006	Taiwan
Lee (2006)	Computer Self Efficiency	Perceived ease of use	Direct	Lee	2006	Taiwan
Agudo-Peregrina and *et al.* (2014)	Computer Self Efficiency	Perceived ease of use	Direct	Agudo-Peregrina, Hernández-García, & Pascual-Miguel	2014	Spain
Kowitlawakul *et al.* (2015)	Computer Self Efficiency	Perceived ease of use	Direct	Kowitlawakul et al.	2015	Singapore
Motaghian *et al.* (2013)	Computer Self Efficiency	Perceived ease of use	Direct	Motaghian et al.	2013	Iran

- **Computer Anxiety:** Computer anxiety is one of the individuals and personal characteristics that affect other behaviors and characteristics of the

information and technology of individuals, which is why the researchers have analyzed various aspects of it. Many people have a negative attitude towards computers and have computer anxiety (Todman (2000)). Computer anxiety involves any emotional response, including fear and anxiety, insensitivity, and distrust of computer work. (Chua *et al.* (1999)). Some researchers in this field have examined the effect of computer anxiety on perceived ease of use, which can be cited by Chen and Tseng (2012). In this research, the effect of computer anxiety on perceived ease of use is also examined. Table 11 shows the studies that examined this relationship, which is related to Hypothesis 10 (Computer anxiety affects the perceived ease of use).

Table 11: Recent studies on the effect of computer anxiety on perceived ease of use (Related to Hypothesis 10).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Agudo-Peregrina and *et al.* (2014)	Computer Anxiety	Perceived ease of use	Direct	Agudo-Peregrina et al.	2014	Spain
Van Raaij and Schepers (2008)	Computer Anxiety	Perceived ease of use	Direct	Van Raaij & Schepers	2008	China
Chen and Tseng (2012)	Computer Anxiety	Perceived ease of use	Direct	Chen & Tseng	2012	Taiwan

- **Perceived Ease of Use:** In the field of electronic learning, the perceived ease of use is the area in which an inclusive person believes that the use of the e-learning system is easy to understand and how the interaction with the system is clear and understandable. Therefore, it can be said that the perceived ease of use as another major achievement can directly affect the adoption of the electronic learning system. (Wu *et al.* (2012))

- **Perceived Usefulness:** Understanding the usefulness of a system defines a range where people believe that the use of new technology increases their efficiency. An e-learning system is used as a time-consuming IT tool by students to think that its use will increase their performance in learning (Wu *et al.* (2012)). Some studies have examined the impact of ease of use on perceived usefulness, which can be cited by Chen and Tseng (2012). In this study, the impact of ease of use on perceived usefulness is also examined. Table 12 shows the studies that have examined this relationship, which is related to Hypothesis 11 (ease of use affects perceived usefulness).

Table 12: Recent studies on the impact of ease of use on perceived usefulness (Related to Hypothesis 11).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Liu et al. (2009)	Perceived ease of use	Perceived Usefulness	Direct	Liu et al.	2009	Taiwan
Teo et al. (2011)	Perceived ease of use	Perceived Usefulness	Direct	Teo et al.	2011	Turkey
Farahat (2012)	Perceived ease of use	Perceived Usefulness	Direct	Farahat	2012	Egypt
Cheng (2012)	Perceived ease of use	Perceived Usefulness	Direct	Cheng	2012	Taiwan
Cheung and Vogel (2013)	Perceived ease of use	Perceived Usefulness	Direct	Cheung & Vogel	2013	Hong Kong
Cheng (2014)	Perceived ease of use	Perceived Usefulness	Direct	Cheng	2014	Taiwan
Ong et al. (2004)	Perceived ease of use	Perceived Usefulness	Direct	Ong et al.	2004	Taiwan
Ong and Lai (2006)	Perceived ease of use	Perceived Usefulness	Direct	Ong & Lai	2006	Taiwan
Lee (2006)	Perceived ease of use	Perceived Usefulness	Direct	Lee	2006	Taiwan
Agudo-Peregrina and et al. (2014)	Perceived ease of use	Perceived Usefulness	Direct	Agudo-Peregrina el al.	2014	Spain
Chen and Tseng (2012)	Perceived ease of use	Perceived Usefulness	Direct	Chen & Tseng	2012	Taiwan
Van Raaij and Schepers (2008)	Perceived ease of use	Perceived Usefulness	Direct	Van Raaij & Schepers	2008	China
Kowitlawakul et al. (2015)	Perceived ease of use	Perceived Usefulness	Direct	Kowitlawakul et al.	2015	Singapore
Joo et al. (2014)	Perceived ease of use	Perceived Usefulness	Direct	Joo et al.	2014	South Korea
Motaghian et al. (2013)	Perceived ease of use	Perceived Usefulness	Direct	Motaghian et al.	2013	Iran
Hussein et al. (2007)	Perceived ease of use	Perceived Usefulness	Direct	Hussein et al.	2007	Malesia
Cho et al. (2009)	Perceived ease of use	Perceived Usefulness	Direct	Cho et al.	2009	Hong Kong

- **Attitude Towards Use:** Attitude is defined as the extent to which a user is interested in using the system, and it determines the attitude towards the system of behavioral intentions, which in turn results in the use of the real system Cheung and Vogel (2013). Some studies in this area have examined the effect of perceived ease of use and perceived usefulness on attitude toward use, which can be referred to the research of Farahat (2012). In this study, the impact of ease of use on perceived usefulness is also examined. In Tables 13 and 14, studies that have examined this relationship can be seen. Table 13 and Table 14 are related to Hypothesis12 (perceived usefulness has an impact on attitude toward use) and Hypothesis 13 (The ease of use affects the attitude toward use), respectively.

Table 13: Recent studies on the effect of perceived usefulness on attitude toward use (Related to Hypothesis12).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
El-Masri et al. (2017)	Perceived Usefulness	Attitude Toward Use	Direct	El-Masri & Tarhini	2017	Qatar
Liu et al. (2009)	Perceived Usefulness	Attitude Toward Use	Direct	Liu et al.	2009	Taiwan
Teo et al. (2011)	Perceived Usefulness	Attitude Toward Use	Direct	Teo et al.	2011	Turkey
Farahat (2012)	Perceived Usefulness	Attitude Toward Use	Direct	Farahat	2012	Egypt
Cheung and Vogel (2013)	Perceived Usefulness	Attitude Toward Use	Direct	Cheung & Vogel	2013	Hong Kong
Kowitlawakul et al. (2015)	Perceived Usefulness	Attitude Toward Use	Direct	Kowitlawakul et al.	2015	Singapore

Table 14: Recent studies on the effect of perceived ease of use on attitude toward use (Related to Hypothesis13).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Liu et al. (2009)	Perceived ease of use	Attitude Toward Use	Direct	Liu et al.	2009	Taiwan
Teo et al. (2011)	Perceived ease of use	Attitude Toward Use	Direct	Teo et al.	2011	Turkey
Farahat (2012)	Perceived ease of use	Attitude Toward Use	Direct	Farahat	2012	Egypt
Cheung and Vogel (2013)	Perceived ease of use	Attitude Toward Use	Direct	Cheung & Vogel	2013	Hong Kong
Kowitlawakul et al. (2015)	Perceived ease of use	Attitude Toward Use	Direct	Kowitlawakul et al.	2015	Singapore

- **Intention to Use:** Given the difficulty in interpreting the multidimensional

aspects of use, compulsive voluntarily, consciously against unknowingly, effective against ineffective, and so on. **?** suggested that the intention to use might be a valuable alternative. It is intended to use an attitude, while it is a behavior Ong and Lai (2006). Some researchers in this field have investigated the influence of attitude toward use on the intention to use the system, which can be mentioned in the research of Farahat (2012). In this research, the influence of attitude toward use on the intention to use the system is examined. Table 15 shows the studies that examined this relationship, which is related to Hypothesis 14 (The attitude toward use affects the intention to use the E-learning system).

Table 15: Recent researches on the impact of attitude toward use on the intention to use the system (Related to Hypothesis 14).

Source	independent variable	dependent variable	Type of relationship	research fellow	Year of Study	Place of Study
Liu *et al.* (2009)	Attitude Toward Use	Intention To Use	Direct	Liu et al.	2009	Taiwan
Teo *et al.* (2011)	Attitude Toward Use	Intention To Use	Direct	Teo et al.	2011	Turkey
Farahat (2012)	Attitude Toward Use	Intention To Use	Direct	Farahat	2012	Egypt
Cheung and Vogel (2013)	Attitude Toward Use	Intention To Use	Direct	Cheung & Vogel	2013	Hong Kong
Kowitlawakul *et al.* (2015)	Attitude Toward Use	Intention To Use	Direct	Kowitlawakul et al.	2015	Singapore

4.   Methodology

This research is a quantitative research group. Since this study seeks to answer this question: "Identifying the factors influencing the adoption of an e-learning system based on the technology adoption model", so this research is applied in terms of the purpose and in terms of collecting information, descriptive survey and It is precisely the type of structural equation modeling. In this section, we describe the method used in: (a) data analysis, (b) data collection, and (c) reliability and validity of the measurement tool, in this section.

4.1   Data Analyzing Method

The main problem, here, is to identify the factors affecting the adoption of an E-learning system based on the technology adoption model. To answer this question, we used Structural Equation Modeling (SEM). The reason to choose this model is that this type of modeling is one of the covariance-based methods that is widely used by researchers to measure relationships between variables Hair (2014). SEM is a multi-variable multivariate analysis of multivariate regression family, and more accurately, it is an extension of a general linear model that allows researchers to test a set of regression equations simultaneously Hooman (2008) and to examine relationships between different variables Hoyle (2012). The importance of this

technique in humanities research is that researchers often examine the relationships between different variables in the form of a model or network of relationships. These relationships are based on some hypotheses around the dependencies between variables so that the schema of the overall design of these dependencies is formed by a pre-fabricated model (Adelson (2012), Dion (2008)). The data collected in this study have been analyzed using the LISREL statistical software and the structural equation modeling technique.

4.2   Data Collection Method

To collect data, a questionnaire was designed. The questions in this questionnaire were designed using the literature in the field of the adoption of E-learning systems and by using the questionnaires employed by other researchers to measure the variables in this area. To design the questions, the five-choice Likert range has been used, which is one of the most commonly used in measurement comparisons.

The statistical population of the study is the users of the virtual education system of Qazvin University of Medical Sciences, which according to the latest statistics and information obtained from the system administrators at the time of the research, their number is 900 people. In order to estimate the sample size from the statistical society, the reference table was proposed by ?, which according to this table, for the statistical population with 900 people, the minimum sample size is equal to 269 samples. The simple random sampling method was used to determine the number of members of the community. For this purpose, an electronic questionnaire was prepared, and its link was sent to the 500 users through the e-learning system of the university (virtual education system). The questionnaire was returned to users with 312 questionnaires and was based on analysis. This number of the minimum sample size calculated is convenient, according to Krejecie and Morgan tables, and can be a good indication of the population under study. The return rate for the questionnaire was 62.4%.

Table 16: Questionnaire Reference.

NO.	The variable studied	Number of questions	Sources
1	Demographic Questions	6 questions	-
2	Quality of Educational Content	2 questions	(Lee (2006), Roca et al. (2006), Wang and Wang (2009)
3	System Support	3 questions	(Selim (2007), Cho et al. (2009), Wang and Wang (2009), Cheng (2012))
4	Computer Self-efficiency	4 questions	(Ong et al. (2004), Ong and Lai (2006), Roca et al. (2006), Wang and Wang (2009))
5	Technology Tools	5 questions	(Selim (2007), ?, Alsabawy et al. (2013))
6	User Interface Design	3 questions	(Cho et al. (2009), Liu et al. (2010), Cheng (2012))
7	Computer Anxiety	4 questions	(Van Raaij and Schepers (2008), Venkatesh and Bala (2008), Agudo-Peregrina and et al. (2014))
8	Perceived ease of use	4 questions	(Ong et al. (2004), Lee (2006), Ong and Lai (2006), Van Raaij and Schepers (2008), Liu et al. (2009), Teo et al. (2011), Cheng (2012), Cheung and Vogel (2013), Cheng (2014))
9	Perceived Usefulness	4 questions	(Ong et al. (2004), Lee (2006), Ong and Lai (2006), Van Raaij and Schepers (2008), Liu et al. (2009), Teo et al. (2011), Cheng (2012), Cheung and Vogel (2013), Cheng (2012))
10	attitude toward use	3 questions	(Liu et al. (2010), Teo et al. (2011), Cheung and Vogel 2013)
11	intention to use	3 questions	(Liu et al. (2010), Teo et al. (2011), Cheung and Vogel 2013)

4.3   Reliability and Validity of the Measurement Tool

In order to verify the reliability of the questionnaire, Cronbach's alpha was used. The acceptable value for Cronbach Alpha is more than 0.7 (Cronbach (1951)). According to the results of this test, the values obtained are at a desirable level.

To assess the validity of the questionnaire, content validity and confirmatory factor analysis were used. In this regard, the design questions were approved by the experts in terms of content validity. According to the progeny Table 17 shows the results.

Table 17: Results of Reliability and Validity.

Component	Indicator	Cronbach's alpha coefficients	Factor load
Quality of Educational Content	The "virtual education system" often provides updated information		7.94
	The "virtual education system" provides information in appropriate formats	0.825	10.85
	The "Virtual Learning System" provides educational materials related to my needs		10.54
	Educational materials in the "Virtual Learning System" are updated regularly		9.31
System Support	There are enough computers to use and practice		10.44
	I can get technical support from system experts	0.822	6.06
	In general, the support of the E-learning system is satisfactory		8.66
Computer Self-efficiency	I can do my training activities using virtual learning, if I have never used a similar system before		9.26
	I can do my training activities using the virtual education system, if I have only the system guide as the reference.	0.914	8.97
	I can do my educational activities using the virtual education system, if I've seen someone else before using it before myself.		10.98
	I can do my training activities using the "virtual education system," if I only have auxiliary features within the system for guidance.		9.57
Technology Tools	I can register online in courses		8.73
	The speed of web page browsing is satisfactory		7.38
	I will not encounter any problems When I visit the website	0.700	9.66
	I can use the computer site to practice and access the system		12.23
	I can use a computer account at the university using the same account and password		12.05
User Interface Design	The apparent design of the "virtual education system" is user-friendly.		10.92
	The system interface design is so easy to use	0.828	7.93
	In general, the design of the "virtual education system" interface is satisfactory		10.04
Computer Anxiety	Computer makes me anxious		11.23
	Working with the computer makes me nervous.		11.46
	Fearing the mistake that I cannot correct, I'm hesitant to use a computer.	0.952	7.68
	When using a computer, it's scary that many of the information may be lost by knocking out a wrong key.		6.26
Perceived Usefulness	I feel like E-learning is useful to me		10.62
	Using the E-learning system gives me more control over education		10.69
	Using the "virtual education system" improves my learning performance	0.851	9.88
	Using the "virtual education system" increases my learning effectiveness		10.12
attitude toward use	Using the software is a good idea		9.11
	Using the "Virtual Learning System" is fun	0.895	10.07
	The "virtual education system" provides an attractive work environment		10.03
intention to use	I will often use the E-learning system in the future		7.16
	I will use the "virtual education system" in the future	0.914	10.14
	I strongly recommend the use of the "virtual education system" to others		9.86

5.   Results Analysis

In this section, the analysis of the results is presented. Figure , Figure , along with Table 18 shows the results of testing the research hypotheses by structural equation modeling. The R-value coefficient (R) is the proposed causal relationship between the research variables. The table also shows the coefficient of the path (R) of a significant number of (t) and fitness fitting indices such as chi-2, RMSEA, GFI, and ......

Figure shows the output of the causal relationship test between the variables of the research using the standard LISREL software.

Figure shows the output of the causal relation test between the variables of the research using the LISREL software in a significant state.
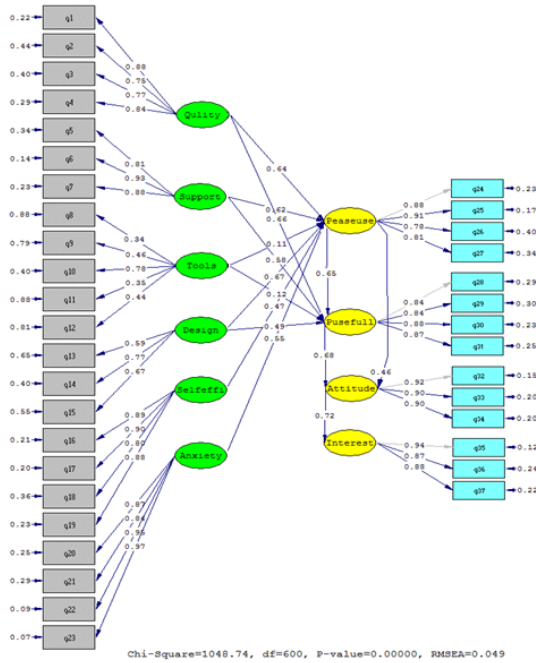
Figure 2: Output of the causal relationship test between the variables of the research using the standard LISREL

Table 18: Structural Model Fitment Indicators.

Value Indicator	Desirable amount	result
χ^2/df	< 3.00	1.75
GFI	> 0.90	0.92
AGFA	> 0.90	0.91
RMSEA	< 0.08	0.049
RMR	< 0.05	0.011
NFI	> 0.90	0.97
IFI	> 0.90	0.98

Chi-Square=1048.74, df=600, P-value=0.00000, RMSEA=0.049
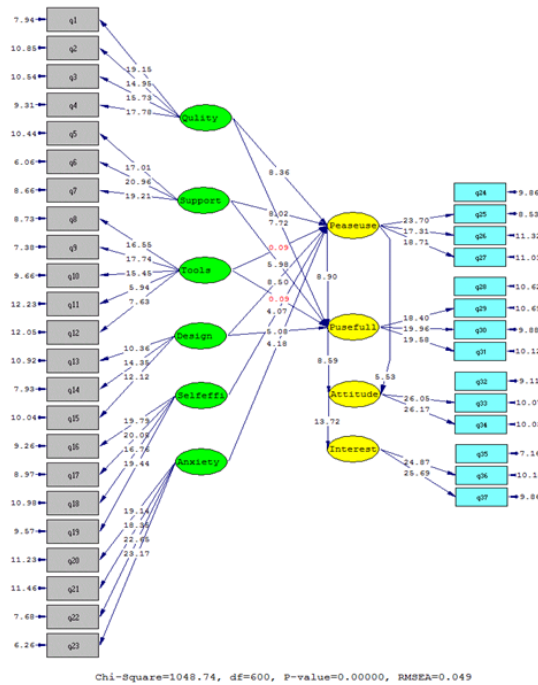
Figure 3: Output of the causal relation test between the variables of the research using the

Table 19: Results of Structural Model Assessment.

Route (Path)		Route (Path) coefficient (R)	Significant number (t-value)	Result	Effectiveness Rating
From the variable	To the variable				
Content Quality	Perceived ease of use	0.64	8.36	Significant Effect	(6)
	Perceived Usefulness	0.66	7.72	Significant Effect	(4)
System Support	Perceived ease of use	0.62	8.02	Significant Effect	(7)
	Perceived Usefulness	0.58	5.98	Significant Effect	(8)
IT Tools	Perceived ease of use	0.11	0.09	Significant Effect	(14)
	Perceived Usefulness	0.12	0.09	Significant Effect	(13)
User Interface Design	Perceived ease of use	0.67	8.50	Significant Effect	(3)
	Perceived Usefulness	0.49	5.08	Significant Effect	(10)
System Support	Perceived ease of use	0.62	8.02	Significant Effect	(7)
	Perceived Usefulness	0.58	5.98	Significant Effect	(8)
Computer Self-efficiency	Perceived ease of use	0.47	4.07	Significant Effect	(11)
Computer Anxiety		0.55	4.18	Significant Effect	(9)
Perceived ease of use	Perceived Usefulness	0.65	8.90	Significant Effect	(5)
Perceived ease of use	attitude toward use	0.46	5.53	Significant Effect	(12)
Perceived Usefulness		0.68	8.59	Significant Effect	(2)
attitude toward use	intention to use	0.72	13.72	Significant Effect	(1)

The results of Table 19 show that the structural paths are significant at 0.05 level. As it can be seen:

- Considering the significance of the t-values for the relationship between the quality of content and the perceived ease of use and perceived usefulness, are

8.36 and 7.72, respectively.

- For the relationship between the variables supporting the system and the ease of use Perceived and perceived usefulness of 8.02 and 5.98 respectively.

- For the relationship between user interface design and perceived ease of use and perceived usefulness of 8.50 and 5.08, respectively.

- For the relationship between the self-efficacy variables of the computer self-efficiency and the ease of perceived use is 4.07, and for the relationship between computer anxiety variables and perceived ease of use is 4.18.

- Also, for the relationship between perceived ease of use and perceived usefulness variables of 8.90, and for the relationship between perceived ease of use and perceived usefulness and attitude toward use, respectively, were 5.53 and 8.59.

- For the relationship between Attitudes toward the use and intention of using 13.72 are all greater than 2, and the assumptions are confirmed at 95% confidence level.

- For the relationship between the technology tools and perceived ease of use, the t-value is 0.09, and for the relationship between technology tools and perceived usefulness is 0.09, both of which are less than 2. Therefore, the relevant hypotheses are not approved.

The validity and fitness of the model are verified because: (a) the amount of chi-2 low, the amount of RMSEA is less than 0.08; (b) the ratio of Q2 to the degree of freedom (1.75) less than 3; (c) the amount of GFI and AGFA; and (d) The order of 0.92 and 0.91 is above 90%, which indicates good fit of the model.

6.   Discussion

The first and second hypotheses are concerned with content quality. The first hypothesis shows the impact of content quality on perceived usefulness. Also, in the second hypothesis, the impact of content quality on perceived ease of use. The confirmation of these hypotheses suggests that the electronic education system of Qazvin University of Medical Sciences provides up-to-date information tailored to users' needs and is regularly updated. Other researches such as Cheng (2012), Lee (2006), Roca *et al.* (2006)) and Motaghian *et al.* (2013) achieved similar results in their research.

The third and fourth hypotheses are concerned with system support. The third hypothesis shows the impact of system support on perceived usefulness. Lee (2010), Cheng (2012) research shows the impact of the system support variable on the perceived usefulness variable. While the results are inconsistent with the findings of the research conducted by Motaghian *et al.* (2013). The fourth hypothesis also shows the impact of system support on perceived ease of use. The results of research by Cho *et al.* (2009), Lee (2010), Cheng (2012) and Motaghian *et al.* (2013) confirm the impact of the system support variable on perceived ease of use. The confirmation of the third and fourth hypotheses suggests that appropriate technical support is provided to address the student's potential problems.

The fifth and sixth hypotheses are concerned with the user interface. The fifth hypothesis shows the impact of user interface design on perceived usefulness. The sixth hypothesis also shows the impact of user interface design on perceived ease of use. In studies by Cho *et al.* (2009), Cheng (2012) and Joo *et al.* (2014), the impact of this variable on the usefulness and ease of use was acknowledged. The sixth hypothesis also shows the impact of user interface design on perceived ease of use. In the studies by Cho *et al.* (2009), Cheng (2012) and Joo *et al.* (2014), the impact of this variable on the usefulness and ease of use was acknowledged. Confirmation of these hypotheses suggests that the user interface design of the E-learning system at Qazvin University of Medical Sciences is user friendly, and users are satisfied with the system interface functionality.

The seventh and eighth hypotheses are concerned with a technology tool. The seventh hypothesis shows the ineffectiveness of the technology tool variable on perceived usefulness. Also, the results from the eighth hypothesis show that the technology tool variable does not affect the perceived ease of use. However, the results contradict the findings of Hussein *et al.* (2007), as well as Alsabawy *et al.* (2013). The disapproval of these hypotheses suggests that the quality of high-speed Internet access is not well suited for using e-learning systems for students, which is why students have difficulty accessing pages in terms of speed. The use of dedicated services provided by Internet service providers can help resolve this issue.

The ninth hypothesis shows the effect of computer self-efficacy on the perceived ease of use. This result is consistent with the findings of other researchers, including Ong *et al.* (2004), Ong and Lai (2006), Roca *et al.* (2006), Lee (2006), Motaghian *et al.* (2013), and Kowitlawakul *et al.* (2015). However, there was no meaningful relationship between these two variables in Agudo-Peregrina and *et al.*

(2014). The confirmation of this hypothesis suggests that the e-Learning system of Qazvin University of Medical Sciences has provided a user-friendly guide for users to work with the system easily.

The tenth hypotheses shows the impact of computer anxiety on the perceived ease of use. The impact of computer anxiety on the perceived ease of use was not confirmed in the research by Agudo-Peregrina and *et al.* (2014). While the results of this study and other researchers, including Van Raaij and Schepers (2008) and Chen and Tseng (2012), showed a significant relationship between computer anxiety and perceived ease of use. Of course, given the new e-learning environment for students, this anxiety seems natural. The eleventh and twelfth hypothesis are concerned with easy use. The eleventh hypothesis shows the effect of perceived ease of use on perceived usefulness. The twelfth hypothesis shows the effect of perceived usefulness on the attitude toward use. Thirteenth hypothesis shows the effect of perceived ease of use on attitude toward use. The fourteenth hypothesis shows the effect of attitude toward use on intent to use. The eleventh to fourteenth hypotheses are the basic variables of the Davis Technology Adoption Model, which have been confirmed in the researches of Kowitlawakul *et al.* (2015) and Motaghian *et al.* (2013).

7.   Conclusion

The purpose of this research is to identify and introduce effective factors in accepting e-learning based on the Davis technology adoption model. For this purpose, the electronic education system of Qazvin University of Medical Sciences was selected as a case study. In order to design a conceptual model of research, researches have been conducted on the adoption of e-learning systems. Based on the comparison of available models, periodic variables, content quality, system support, interface design, computer anxiety, technology tools, Computer self-efficacy, perceived ease of use, perceived usefulness, and attitude toward using the system were utilized as factors influencing the adoption of the e-learning system.

To evaluate the model, the responses of 312 students of Qazvin University of Medical Sciences were analyzed. The analysis was done using the structural equation modeling technique. The results of the research indicate that the quality factors of the content of the course, system support, interface design, computer anxiety, technology tools, computer self-efficacy, perceived ease of use, perceived usefulness influence indirectly and the attitude toward using it, influence directly on users' intention to use, also the impact of the technology tools on the intention

to use the system was rejected.

The results of this study will help university administrators and the professors associated with this system to encourage students to make optimum use of the system by creating the necessary fields for applying effective factors.

The limitations of this research can be the lack of cooperation of students in the exact filling of research questionnaires. On the other hand, this study examined only some of the factors mentioned in the literature, in which other external factors could be used to measure the impact on perceived ease of use and perceived usefulness that could affect people's attitudes to use the system and accept the system. Like any study, there are a number of limitations to our research:

- This study was an E-learning system of Qazvin University of Medical Sciences. Using an E-learning system at this university is not compulsory. Therefore, only a limited number of university students who were users of the system were examined.

- In this study, all lessons are not provided electronically, and the related students are not involved in the use of the E-learning system, and this study was not considered.

- Training and learning in the environment under study are not fully electronic, and simultaneous users are present in both the traditional classroom environment and the virtual education classes (E-learning). This can be effective on the decision of users and their willingness to use it.

- In this study, the student's willingness to accept the E-learning system was studied only. While university professors are also system users and students, and the use of students from the system requires that professors conduct courses through the system, policymakers and E-learning managers in educational institutions should pay special attention to some special factors. These factors may affect the improvement of educational performance and increase the productivity of students in designing and implementing web-based systems and the process of admission of the system by students.

It seems that professors can play an effective role in encouraging students to adopt E-learning systems. Therefore, in future research, the factors that influence the attitude and desire of teachers to use the E-learning system can be studied. Moreover, investigating the factors studied can be done in other educational environments with more extensive statistical samples and also taking into account the

specific features of users of this environment, and to provide more comprehensive results than the subject matter under review.

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