The role of readiness factors in E-Learning outcomes: An empirical study

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Abstract

Although many researchers have studied different factors which affect E-Learning outcomes, there is little research on assessment of the intervening role of readiness factors in E-Learning outcomes. This study proposes a conceptual model to determine the role of readiness factors in the relationship between E-Learning factors and E-Learning outcomes. Readiness factors are divided into three main groups including: technical, organizational and social. A questionnaire was completed by 96 respondents. This sample consists of teachers at Tehran high schools who are utilizing a technology-based educating. Hierarchical regression analysis is done and its results strongly support the appropriateness of the proposed model and prove that readiness factors variable plays a moderating role in the relationship between E-Learning factors and outcomes. Also latent moderated structuring (LMS) technique and MPLUS3 software are used to
determine each variable’s ranking. Results show that organizational readiness factors have the most important effect on E-Learning outcomes. Also teachers’ motivation and training is the most important factor in E-Learning. Findings of this research will be helpful for both academics and practitioners of E-Learning systems.

Keywords:

E-Learning; Readiness factors; Outcomes; Evaluation methodologies; Iran

1. Introduction

During recent years designing and implementing web-based education (E-Learning) systems have grown dramatically (Hogo, 2010) and this type of education is playing an important role in teaching and learning (Franceschi, 2009). It is implementing as a new method of training which complements traditional methods (Vaughan, 2004) and its final ambition is to build an advanced society for citizens and support creativity and innovation (Kim, 2005). In fact this new paradigm shifts education from teacher-centered to learner-centered (Lee et al., 2009). Advantages like cost reduction, elimination of time and space constraint and assisting the traditional instruction, make it important and popular (Chao, 2009). In addition, quality of education in distance education systems depends on quality of electronic knowledge sources and other didactic materials instead of depending on teacher quality and his ability to share knowledge (Cohen, 2006). The growth rate of E-Learning market is about 35.6% (Sun et al., 2008) and recent researches have shown that only in America, nearly $40 billion is spent annually on technology based training (Johnson, 2009). According to such a heavily investing in this system, it is essential to evaluate its different aspects and understand factors which influence its effectiveness (Schreurs, 2008). Success in implementing and using this system is crucial because an unsuccessful attempt will be clearly revealed in terms of the return of investment (Govindasamy, 2001). One of the most important variables which can have a critical effect
on E-Learning successful outcomes is readiness factor and schools have to improve and upgrade their readiness to use this system (Wang et al., 2009). Although there are many researches evaluating different E-Learning aspects, there is little research on assessment of the intervening role of readiness factors in E-Learning outcomes. To overcome this shortcoming, in this study the role of readiness factors in the relationship between E-Learning factors and outcomes is assessed. E-Learning readiness factors are divided into three main categories including: technical, organizational and social factors.

The following two main questions of this research are considered:

- Do readiness factors have a moderating effect on the relationship between E-Learning factors and E-Learning outcomes?
- How much is the moderating effect for different aspects of readiness factors (which aspects are more important)?

2. Research background

With the increasing investment in E-Learning systems, it is essential to design and empirically investigate the factors which affect E-Learning outcomes (Cukusic, et al., 2010). Many researchers have studied several aspects of E-Learning and many different approaches were adopted (AbuSneineh, 2010). Most of these researches have revealed that E-Learning is a suitable method for education and it allows easy acceptance of novel strategies to improve learning outcomes (Wan et al., 2008). Despite these researches, some other researchers demonstrated that E-Learning courses still have shortcomings and most E-Learning courses have high dropout rate (Welsh et al., 2003; Stonebraker & Hazeltine, 2004; Means et al., 2009). Since most of universities and organizations are going to use this system, it is important for both practitioners and researchers to better understand how these shortcomings can be overcome and how organizations could be ready to use this system. Some researchers studied different aspects of e-readiness
to help organizations for using E-Learning more effectively. E-readiness refers to the capabilities of the organization for effective and efficient application of electronic media (Machado, 2007). Assessing E-Learning readiness can help managers and policy makers to adopt the most appropriate policies and facilities for better implementation and utilization of E-Learning system (Kaur, 2004).

One of the best ways to understand how E-Learning limitations can be overcome is developing models of E-Learning (Alavi & Leidner, 2001). In order to do so, several researchers have proposed several models which address how different features can influence E-Learning outcomes (Alavi & Leidner, 2001; Piccoli et al., 2001; Johnson et al., 2008; Chen & Jang, 2010). For instance, Piccoli et al. (2001) believe that human dimension (including students and instructors) and design dimension (including learning model, technology, learner control, content and interaction) affect E-Learning effectiveness. Also Johnson et al. (2008) assert that creating a shared, peer-centered learning environment is important in E-Learning success.

Table 1 displays some previous researches on E-Learning outcomes.

Table 1

In general, two major approaches toward readiness factors can be determined in the literature. In the first approach, many researchers tried to extract different readiness factors for implementing an effective E-Learning system. For instance, Kaur (2004) presented the factors of technological readiness, own level of readiness, etc. Aydin and Tasci (2005) have focused on human resource readiness as an important variable in E-Learning effectiveness in emerging countries. Darab and Montazer (2011) proposed an eclectic model for assessing E-Learning readiness. Fathian et al. (2008) have evaluated e-readiness factors in Iran’s environment. They have extracted organizational features, ICT infrastructures, ICT availability and security as critical issues for e-readiness assessment. In the second approach, some researchers have considered readiness factors as an independent variable which affects E-Learning outcomes directly. For
instance, Piccoli et al. (2001) and Sun et al. (2008) have considered some readiness factors (such as: technology dimension and design dimension) as independent variables which affect E-Learning outcomes directly. Also Johnson et al. (2009) have assessed the effect of technology characteristics on E-Learning outcomes.

In this study, readiness factors are considered as a moderating variable because of two main reasons. Firstly, a moderating variable refers to a variable which can affect the strength and direction of relationships between other variables. In this research we have considered some readiness factors (for instance: organizational rules) which don’t have a direct influence on E-Learning outcomes (for instance: students’ motivation) but can influence the relationship between E-Learning factors and outcomes. Secondly, Albadvi et al. (2007) considered the intervening role of organizational readiness in the relationship between IT and firm performance. As the results of this work imply, to have a better level of performance, it is essential to invest on intervening variables in addition to invest in IT. Accordingly, it is important to know which aspects of IT and readiness factors have the greater effect on performance. Such knowledge could be used to make wiser investments in IT. Since E-Learning is an IT-enabled system, this paper aims to assess the role of E-Learning readiness factors in the relationship between E-Learning factors and outcomes based on aforementioned research.

3. Research model

Conceptual model of this study is depicted in figure 1. As shown in this figure, the model is composed from three variables including: E-Learning factors, readiness factors and E-Learning outcomes. As mentioned earlier, this research tries to examine moderating effect of readiness factors on the relationship between E-Learning factors and E-Learning outcomes.

3.1. E-Learning Factors
Selim (2007) grouped E-Learning critical success factors into 4 categories namely instructor, student, Information Technology (IT) and university support. In this research, these factors were used to determine their effect on E-Learning outcomes.

The role of teacher is critical in effectiveness and success of all kinds of education (Piccoli, 2001). Especially in distance education, teachers’ conception of E-Learning and its usefulness plays a vital role (Zhao, 2009) and their positive attitude toward using this system as a teaching assisted tool is required for E-Learning success (Liaw et al., 2007). Previous research has shown that three instructor characteristics affect E-Learning success: attitude, teaching style and IT competency (Webster, 1997). In this research, based on previous researches, four major characteristics of teachers are used to measure this factor including: motivation, attitude, training and teaching style.

Student is the most important participant in E-Learning (Aydin & Tasci, 2005). Since E-Learning is a student-centered environment, high motivated and self-confident students can result in better E-Learning outcomes (Baeten, 2010). In addition, students should be familiar with computer skills to be successful in this system. Prior research has presented that if E-Learning facilitates students’ learning and eliminates time and space constraints, they tend to use it (Papp, 2000). Also Liaw et al. assert that self-paced, teacher-led, and multimedia instructions are major factors influencing learners’ conceptions toward E-Learning as an effective tool for education (Liaw et al., 2007). Motivation, attitude and computer self-efficacy are the most important factors which are used in this research to measure ‘student’ factor.

Distance education is a result of information technology explosion and IT is the engine of E-Learning revolution (Selim, 2007). The role of IT in this type of education is vital and it is essential to prepare suitable IT skills for success of E-Learning. Information technology has reshaped the process of acquisition, communication and dissemination of knowledge within the educating process (Darab &
Montazer, 2011). It allows both the teacher and student to be separated in terms of time, place, and space. Thus an appropriate use of IT in course content delivery is critical (Lim, 2007). In this research IT is measured by the ability of E-Learning system to provide a good quality website design, the possibility of interact with classmates through the web, well structures/presented information and the possibility of online registration for participants. These measurements exist in appendix 1.

Top management commitment and support is a critical success factor in many IT projects (Huang, 2010) and IT projects face failure because of lack of this factor (Soong, 2001). Since E-Learning is an IT-based project, top manager should know this system and believe in its advantages. Top management support, commitment and knowledge about E-Learning advantages are measures for ‘support’ variable in this research.

3.2. Readiness factors

Many researchers have examined the role of readiness factors in E-Learning outcomes (Zhao, 2009). Prior research has proved that technical readiness is one of the most important factors influencing E-Learning outcomes (Brush, 2003) and it is crucial to match the right technology with the right learning objective (Kidd, 2010). In this research based on literature, authors’ experiences and interviewees’ statements, readiness factors categorized into three groups namely technical, organizational and social factors.

Technical factors include: Hardware, software, content, internet access, bandwidth and school’s space.

Organizational factors include: experts, organizational rules, organizational culture and management permanence.

Social factors include: society’s conception of E-Learning, governmental rules and administrative instructions.
3.3. Outcomes

Assessing E-Learning outcomes is important because individuals who are less satisfied with this system have fewer tendencies for enrolling in future E-Learning courses (Carswell, 2001). Several models have proposed to examine E-Learning outcomes (Piccoli, 2001; Wan, et al., 2008; Johnson et al., 2009; Cukusic et al., 2010). In this research based on previous researches three important factors have been examined including: Teachers progress, students progress and access to education for all.

Many studies have conducted to evaluate the relationship between E-Learning factors and its outcomes but reviewing the literature has shown that they do not always effectively predict learning transfer per se (Colquitt, 2000). In this research, the role of readiness factors in the E-Learning outcomes is assessed. Therefore, the main hypothesis of this research can be argued as follows:

- Readiness factors play a moderating role in the relationship between E-Learning factors and E-Learning outcomes.

Figure 1 depicts the conceptual model of this research.

Figure 1

4. Research Methodology

Data gathering method, measurement instrument and method of analysis are described in this section. Hierarchical regression analysis has been used to confirm the moderating role of readiness factors and latent moderated structuring (LMS) technique is used to rank each variable.

4.1. Data
Case studies and empirical researches are appropriate ways for IT researches (Baroudi, 1989). This research is an empirical study by means of questionnaire in Iranian high schools. To recognize variables affecting E-Learning outcomes and identify research variables, 9 interviews were conducted of E-Learning specialists in the IT sector of Training Bureau in Tehran. Based on an extensive review of interview transcripts and reviewing the literature, research variables were recognized. An initial set of questions was developed to measure each variable. 2 academic experts viewed each of the items on the questionnaire for its content, scope and purpose.

The participants of the study filled out a 36-item questionnaire. The questionnaire was of a likert scale one containing five levels extending from 1 (Not at all) to 5 (Extreme). 96 respondents answer research questionnaires but four questionnaires were ignored since they were not complete. This sample consists of teachers at Tehran high schools who are utilizing a technology-based educating. Demographic information of respondents are presented in the following tables.

Table 2
Table 3
Table 4

4.2. Measurement instrument

In this section we will operationally define research variables and then introduce their measuring instruments. In this study, we tried to use different references for our research and in some cases tried to use different aspects of a statement from different references in order to create a comprehensive measurement instrument which has the most fitness with our purpose. Thus, our questions are partially selected from different references. As stated before, we asked 2 academic experts to validate the questionnaire.

4.2.1. E-Learning factors
As mentioned before, to assess this variable, based on Selim (2007) we have used four factors including: student, teacher, IT and support. “Student” refers to attitudes of students toward E-Learning, their motivation to use this system and their computer self-efficacy. “Teacher” indicates the motivation of teachers for using E-Learning, their attitude toward this system, their teaching style and training for using this new paradigm of education. “IT” refers to some dimensions of Information Technology –like online registration, information management, etc- which affect E-Learning outcomes. Finally, “support” is used to determine the effect of top management commitment and support for utilizing E-Learning.

Questions of the first two factors are taken from similar works like: Gattiker and Hlavka (1992), Thurmond et al. (2002), Webster and Hackley (1997) and Liaw et al. (2007). Questions of the last two factors are customized from Sun et al. (2008) and Albadvi et al. (2007).

4.2.2. Readiness factors

In this research we have categorized readiness factors into three groups namely: technical, organizational and social. Technical factors refer to the technical dimension of E-Learning like: hardware, software, bandwidth, etc. Organizational factors stand for factors like: organizational culture, rules, etc. Finally, social factors are used to determine the impact of some aspects of society and government –like social culture, governmental regulations, etc- on E-Learning.

To our knowledge, there is no study to provide empirical study for intervening role of readiness factors in the relationship between E-Learning and outcomes. Thus questions in this section of questionnaire are adapted from semi-similar works like: Arbaugh (2000), Nagi et al (2007) and Sun et al. (2008).

4.2.3. Outcomes

To assess E-Learning outcomes we have defined measures in relation with teachers’ progress, students’ progress and access to instruction for all. “Progress” refers to satisfaction, effectiveness and productivity of
teachers and students. Since the final ambition of E-Learning is to build an intelligent society, we have used access to instruction for all as an outcome of this system.


4.3. Reliability and validity analysis

We have presented the reliability and validity analysis of the questionnaire in this section.

4.3.1. Reliability analysis

The reliability analysis of a questionnaire determines its ability to yield the same results on different occasions and validity refers to the measurement of what the questionnaire is supposed to measure (Cooper and Schindler 2003). For reliability analysis, Cronbach’s alpha is calculated by SPSS. As demonstrated in table 5, all variables have an alpha greater than 0.7 and we can conclude that the questionnaire is reliable.

4.3.2. Validity analysis

In this research, construct validity, content validity and predictive validity were analyzed to ensure the validity of the instruments (Nunnally and Bernstein 1994).

Construct validity shows the extent to which measures of a criterion are indicative of the direction and size of that criterion (Flynn et al. 1994). It also shows that the measures do not interfere with measures of the other criteria (Flynn et al. 1994). Construct validity of measurement instrument is analyzed through factor analysis. The most common decision-making technique to obtain factors is to consider factors with eigenvalue of over one as significant (Olson et al. 2005). Thus factor analysis is done and KMO and Bartlett’s significance levels are calculated to show validity of the questionnaire. Table 5 presents these measurements. As shown in this table, the questionnaire is valid and reliable.

Table 5
Content validity indicates meeting the specific range of contents that have been selected (Nunnally and Bernstein 1994). It also shows that measurement instruments have elements that cover all aspects of variables under measurement. Content validity cannot be numerically measured, but we can measure it subjectively and judgmentally. Basically, content validity depends on the appropriateness of the content and the method of rendering (Nunnally and Bernstein 1994). Since the selection of research variables is based on an intensive survey of literature and all the elements are supported by authentic research, the instrument has content validity. Furthermore, 2 academic experts have examined the content of the questionnaire during the pre-testing.

Predictive validity is in fact the correlation between measurement instrument and an independent variable taken from relating criteria (Nunnally 1978). This validity is only possible through correlation between the predictor (independent variable) and criterion (dependent) variable (Nunnally and Bernstein 1994). In this study, the results of two-variable and multi-variable correlation between “E-Learning factors” as independent variables and “outcomes” as dependent variable have shown that there is significant correlation between intended criteria under measurement in this study (Sig.: 0.000 and Correlation coefficient: 0.425).

4.4. Method of analysis

There are different ways to test the moderating role of variables but in this research hierarchical regression analysis is used. To do so, after developing a conceptual model, normality of data is tested and finally regression analysis is performed.

4.4.1. Normality test

In order to test normality of data, two ways are used. Firstly, Kolmogorov-Smirnov (K-S) test is performed (E-Learning variable = 0.085, Readiness factors = 0.917 and Outcomes = 0.559). Since non-significant
result (Sig value of more than .05) indicates normality, all variables (CSFs, Readiness factors and Outcomes) have normal data. The other way is normal Q-Q plot. Figure 1 indicates these plots. This test confirms that all variables have normal data.

4.4.2. Hierarchical regression

Moderating variable is generally defined as a variable (quantitative or qualitative) which affect direction or strength of the relationship between a dependent variable and an independent variable. Figure 3 demonstrates a model in which there are three ways. Path A reveals the relationship between dependent and independent variables. Path B reveals the relationship between dependent and moderating variables and finally path C shows the relationship between dependent variable and the result of multiplying moderating and independent variables.

Moderation hypothesis is proved if path C is statistically significant.

Table 6 presents the results of hierarchical regression of this research. As shown in this table, all three paths are statistically significant.

As shown in this table, hierarchical regression results proved that in 95% confidence level, readiness factor variable plays a moderating role in the relationship between E-Learning factors and its outcomes.

Note that, we have assessed the mediating role of readiness factors but it was not significant statistically. Moreover, Boyer et al. (1997) argues that a variable couldn’t play a moderating role and mediating role simultaneously.
4.4.3. LMS technique

The LMS equations estimation method is particularly developed for the ML estimation of latent interaction effects (Klein and Moosbrugger, 2000). In a structural equation, the latent variables usually have a linear relationship in which the latent endogenous variables are linear functions of the latent exogenous variables. But in some cases another exogenous variable might have a moderating effect on the relationship between endogenous and exogenous variables. Therefore, a latent interaction effect influences the latent model structure. In fact, by recognition of the new exogenous variable, the slope of the regression of the endogenous variable on the exogenous variable will vary. The interaction effect is applied by adding a product of latent exogenous variables in the structural equation. In other words, latent interaction models include non-linear structural relationships in the structural equation. LMS executes alternative methods, for instance: LISREL or 2SLS, with regard to statistical power, efficiency and the capability of detecting latent interaction (Schermelleh-Engel et al., 2003). In this study, to run LMS technique, MPLUS3 software is used.

4.4.4. Ranking of elements

A rank for each element is determined considering readiness factor variables as moderating factor. For this purpose, using direct effect coefficients gained from the structural model, the real effect of each factor is calculated considering all paths between that factor and outcomes (OC), and then the factors are ranked in the order of calculated values for their effect on OC. The rankings are shown in Tables 7 and 8 using the results from the model. The tables show the rank of different factors based on the research model.

For example, Total effect of STUDENT is calculated as:

\[
\text{Total effect of STUDENT} = 1.00 \times 0.497 + 1.00 \times 0.101 = 0.598
\]
In the above formula, the effect of STUDENT is calculated by the summation of the two possible paths from STUDENT to OC. The coefficient of 1.00 is gained from the measurement model, 0.497 is the direct effect of ELNG on PER and 0.101 is the effect of interaction of ELNG and IST on PER, calculated from the structural model.

Total effect of STUDENT, shows the impact coefficient of student factor on E-Learning outcomes. In fact, 0.497 and 0.101 are regression coefficients and 1.00 is the weight of “student factor” in comparison with other factors which is calculated using LMS technique. Thus total effect is a weighted regression coefficient which shows the effect of different E-Learning factors on E-Learning outcomes.

Table 7

In a similar procedure, different readiness factor (RF) elements are ranked based on their moderating effects. Table 8 shows the results.

Table 8

5. Discussion and conclusion

Many researchers tried to evaluate readiness factors which affect E-Learning outcomes. For instance, Aydin and Tasci (2005) have focused on human resource readiness as an important variable in E-Learning effectiveness in emerging countries. Also Rhee et al. (2007) have assessed technological readiness for implementing an effective E-Learning. Zoraini (2004) has mentioned some organizational readiness factors such as culture and budget. Fathian et al. (2008) have evaluated e-readiness factors in Iran’s environment. They have extracted organizational features, ICT infrastructures, ICT availability and security as critical issues for e-readiness assessment. Finally, Piccoli et al. (2001) and Sun et al. (2008) have considered some readiness factors (such as: technology dimension and design dimension) as independent variables which
affect E-Learning outcomes directly. Although aforementioned researchers have studied different factors which affect E-Learning outcomes, there is little research on assessment of the intervening role of readiness factors. By reviewing the literature, we have categorized readiness factors into three main factors including technical, organizational and social factors. Also, Based on Albadvi (2007), we have tried to determine the intervening role of readiness factors in the relationship between E-Learning factors and its outcomes. Results of this study show that readiness factors play a moderating role and they strengthen the relationship between E-Learning factors and E-Learning outcomes. To our knowledge, this is the first study which categorized readiness factors into aforementioned three factors and also, this is the first study which evaluated the intervening role of readiness factors in the relationship between E-Learning factors and outcomes.

In this research, firstly, we considered technical infrastructures as a readiness factor. Some factors such as: proper software and hardware or bandwidth, can play a crucial role in E-Learning outcomes. Internet low speed and having problems while using the system may result in dissatisfaction and drop out of students from the course. One of the most important difficulties in using E-Learning in Iran is the speed of internet (Darab & Montazer, 2011).

Secondly, we regarded organizational readiness factors. Factors such as: organizational rules, culture and experts, are considered in these factors. These factors can lay the ground for an appropriate move from traditional education system to E-Learning system. It means that educating organizations should try to adapt their rules and culture and train sufficient E-Learning experts to empower E-Learning outcomes after implementation.

Social readiness factor is another factor which can moderate the relationship between E-Learning factors and E-Learning outcomes. E-Learning not only affects students and teachers life, but also has an important
effect on parents and society. Therefore it is essential to consider social rules on E-Learning outcomes. Factors like: society’s conception of E-Learning, governmental rules and administrative instructions, are the most important social factors.

Our interviewees believe that one of the most difficulties in implementing and using E-Learning in Iran is lack of readiness in teachers. Thus it is important to train them for using this system. Also, interviewees argue that top managers in training bureau don’t believe in advantages of E-Learning yet. Another difficulty in using E-Learning is management permanence. Some managers who were investing on implementation of E-Learning have been changed and new managers don’t continue their programs. Our experts also remark some concerns about E-Learning budget, cultural readiness and internet bandwidth.

Based on Selim (2007), E-Learning factors grouped into 4 categories namely: Student, teacher, IT and support. Also based on previous researches and authors’ experiences readiness factors grouped into three groups including: Technical, Organizational and Social. A survey conducted and 96 teachers In Tehran high schools filled research questionnaire. Using hierarchical regression analysis, it is proved that “readiness factors” variable plays a moderating role in this relationship. For instance, Organizational readiness factor has a moderating effect. This means that organizational factors like management permanence and organizational rules cannot have a direct effect on E-Learning outcomes like teachers’ motivation but these factors can affect E-Learning outcomes indirectly by influencing top management support (which is an E-Learning factor in our model). In fact, management permanence can assure managers to implement E-Learning which is an expensive and lengthy project appropriately. A successful implementation of E-Learning will result in its effectiveness and motivates teachers to use this system.

The moderating effect of social readiness factors implies that some social factors (such as governmental regulations) cannot play a direct role in E-Learning outcomes but these factors may affect the strength of
this relationship. In the other hand, some technical factors (such as school’s space) don’t have a direct impact on teachers’ productivity but a better environmental condition will affect E-Learning outcomes indirectly.

Finally, LMS technique and MPLUS 3 software were used to rank the effects of different aspects of variables. Results demonstrated that organizational readiness factors are the most important aspects influencing E-Learning outcomes. Technical and social readiness factors are in lower levels of importance. The results of the ranking of different E-Learning elements show that in spite of previous researches who have shown that student is the most important element of E-Learning (Aydin & Tasci, 2005), teachers’ motivation and training factor plays the most important role in E-Learning outcomes in Iranian high schools. This result revealed that to shift learning environment from teacher-centered to learner-centered, the first step is to train teachers and clarify advantages of this new paradigm for them.

5.1 Managerial recommendations

Based on results of the questionnaire and interviews, there are two important problems in utilizing E-Learning in Iran. The first problem is management support. Our interviewees stated that many managers still don’t believe in this system and therefore they don’t support it. The other major problem is teacher’s conception of E-Learning. Our interviewees believe that teachers attitude toward this system is not appropriate. Also they believe that students are more familiar and comfortable with new technologies like internet and multimedia. Therefore it is important to first convince managers and second train teachers and clarify advantages of this new paradigm for them. The results of LMS technique emphasize on this argument. Also, LMS technique reveals that organizational readiness factor is the most important factor to achieve better E-Learning outcomes. Thus managers should provide a good organizational environment to implement and use E-Learning system more effectively.
5.2 Limitations and future research directions

This study has some limitations that should be taken into consideration, especially due to the fact that this study is based on Iranian high schools. The suggested model might show different results in other countries. Subsequent research can explore these issues using a broader research sample. Also some researchers believe that E-Learning factors are more than 4 elements which can be taking into account for future researches.

Acknowledgement

The authors would like to thank the reviewers for their constructive and invaluable comments.
References


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Table8. Results of ranking different RF elements
Fig 1. Research conceptual model

E-Learning Factors
- Student
- Teacher
- IT
- Support

Readiness Factors
- Technical
- Organizational
- Social

Interaction

Outcomes
- Teachers Progress
- Students Progress
- Access to instruction

Normal Q-Q Plot of E-Learning
Fig. 2. Q-Q plots
Fig. 3. Moderating effect model (Adapted from Albadvi et al. 2007)

Fig. 4. Complete structural model
<table>
<thead>
<tr>
<th>Researcher(s)</th>
<th>year</th>
<th>Dependent variable (s)</th>
<th>methodology</th>
<th>results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alavi</td>
<td>1994</td>
<td>Perceived skill, self-reported learning and grades</td>
<td>Evaluated effectiveness and efficiency of computer-mediated collaborative learning by an empirical study</td>
<td>Technology-mediated learning environments may improve students' achievement</td>
</tr>
<tr>
<td>Schutte</td>
<td>1997</td>
<td>Students’ scores on exam</td>
<td>Compared a traditional classroom and a virtual classroom by an experimental research</td>
<td>Virtual class scored an average of 20% higher than the traditional one</td>
</tr>
<tr>
<td>Maki et al.</td>
<td>2000</td>
<td>Students’ scores on exam</td>
<td>Evaluated the on-line format relative to the traditional lecture-test format, using a pretest-posttest nonequivalent control group design</td>
<td>The students in the on-line sections expressed appreciation for course components and the convenience of the course, but the lecture sections received higher ratings on course</td>
</tr>
<tr>
<td>Piccoli et al.</td>
<td>2001</td>
<td>Performance (e.g. achievement, recall), self-efficacy and satisfaction.</td>
<td>Presented a framework of Virtual Learning Environment (VLE) effectiveness and compared it to a traditional classroom</td>
<td>Two classes of determinants including human dimension and design dimension affect VLE effectiveness</td>
</tr>
<tr>
<td>Lim et al.</td>
<td>2007</td>
<td>Learning performance (to what degree the trainees learn?) and Transfer performance (how well the trainees applied what they learned to their job tasks)</td>
<td>Proposed a model on variables affecting E-Learning performance and confirmed it using an empirical study</td>
<td>There is a positive relationship between individual, organizational and online training design constructs and training effectiveness constructs</td>
</tr>
<tr>
<td>Wan et al.</td>
<td>2008</td>
<td>Learning effectiveness and satisfaction</td>
<td>Using a survey, confirmed their hypothesizes which are asserted that prior experience with ICT and virtual competence are two significant factors that affected E-Learning outcomes</td>
<td>Virtual competence and prior experience with ICT affect E-Learning outcomes</td>
</tr>
<tr>
<td>Johnson et al.</td>
<td>2009</td>
<td>Perception of course utility, course satisfaction and course grade as E-Learning outcomes</td>
<td>Proposed a model of variables influencing E-Learning outcomes and assessed it by a survey</td>
<td>Technology characteristics, trainee characteristics and Metacognitive activity affect E-Learning outcomes</td>
</tr>
</tbody>
</table>
Chu & Chu 2010 Perceived learning, persistence and satisfaction
A survey to prove a proposed model to evaluate E-learning outcomes for adult learners
Internet Self-Efficacy fully mediates the relationship between peer support and E-Learning outcomes.

Chen & Jang 2010 Engagement, Achievement, and satisfaction
Proposed and tested a model for the effect of online learner motivation and contextual support on online learning outcomes
The direct effect and indirect effects of contextual support exerted opposite impacts on learning outcomes.

Table 2. Respondents’ computer skills

<table>
<thead>
<tr>
<th></th>
<th>I don’t use computer at all</th>
<th>I am familiar with computer</th>
<th>I am a professional user of computer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>%5</td>
<td>%75</td>
<td>%20</td>
</tr>
</tbody>
</table>

Table 3. Respondents’ educating background

<table>
<thead>
<tr>
<th></th>
<th>0-5 (yrs)</th>
<th>5-10 (yrs)</th>
<th>10-15 (yrs)</th>
<th>15-20 (yrs)</th>
<th>20-25 (yrs)</th>
<th>25-30 (yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>%13</td>
<td>%09</td>
<td>%18</td>
<td>%25</td>
<td>%21</td>
<td>%14</td>
</tr>
</tbody>
</table>

Table 4. Respondents’ web-based educating background

<table>
<thead>
<tr>
<th></th>
<th>1 year</th>
<th>2 years</th>
<th>3 years</th>
<th>4 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>%54</td>
<td>%25</td>
<td>%12</td>
<td>%9</td>
</tr>
</tbody>
</table>

Table 5. Reliability and validity analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reliability Analysis</th>
<th>Descriptive results</th>
<th>Factor Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of questions</td>
<td>Cronbach’s Alpha</td>
<td>N</td>
</tr>
<tr>
<td>E-Learning</td>
<td>15</td>
<td>0.700</td>
<td>92</td>
</tr>
<tr>
<td>Readiness factors</td>
<td>13</td>
<td>0.828</td>
<td>87</td>
</tr>
<tr>
<td>Outcomes</td>
<td>8</td>
<td>0.732</td>
<td>92</td>
</tr>
</tbody>
</table>

Table 6. Hierarchical regression results
### Table 7. Results of ranking different ELNG elements

<table>
<thead>
<tr>
<th>Rank</th>
<th>E-Learning element</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Teacher</td>
<td>0.900</td>
</tr>
<tr>
<td>2</td>
<td>Student</td>
<td>0.598</td>
</tr>
<tr>
<td>3</td>
<td>IT</td>
<td>0.531</td>
</tr>
</tbody>
</table>
Table 8. Results of ranking different RF elements

<table>
<thead>
<tr>
<th>Rank</th>
<th>Readiness factors element</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organizational</td>
<td>0.137</td>
</tr>
<tr>
<td>2</td>
<td>Technical</td>
<td>0.101</td>
</tr>
<tr>
<td>3</td>
<td>Social</td>
<td>0.073</td>
</tr>
</tbody>
</table>

Appendix 1: Questionnaire

Based on your valuable experiences in using E-learning, please indicate the extent to which each following element affects E-learning outcomes, ranging from 1 to 5: (1 = not at all, to 3 = moderate effect, to 5 = extreme effect)

<table>
<thead>
<tr>
<th>Question</th>
<th>Not at all 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Extreme 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readiness factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1- Appropriate hardware in school</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>2- Appropriate software in school</td>
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<tr>
<td>3- Appropriate course content</td>
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<tr>
<td>4- The speed of internet</td>
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<tr>
<td>5- Proper school space for E-learning system</td>
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<tr>
<td>6- Cultural readiness for change in learning style</td>
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<tr>
<td>7- Adequate skilled employees in E-learning</td>
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<tr>
<td>8- Appropriate organizational rules</td>
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<tr>
<td>9- Managerial readiness to implement the system</td>
<td></td>
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</tr>
<tr>
<td>E-Learning Factors</td>
<td>Not at all (1)</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>Extreme (5)</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>10- Sufficient budget and investment in E-Learning</td>
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<tr>
<td>11- Society’s conception of E-Learning</td>
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<tr>
<td>12- Appropriate governmental rules and regulations</td>
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<td>13- Appropriate administrative recipe</td>
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<tr>
<td>14- Teachers’ motivation for using E-Learning</td>
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<tr>
<td>15- Teachers training for using this system</td>
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<tr>
<td>16- Teachers’ attitude toward the technology</td>
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<td>17- Teachers’ teaching style</td>
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<tr>
<td>18- Students attitude toward E-Learning</td>
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<tr>
<td>19- Students motivation to use this system</td>
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<tr>
<td>20- Students ability to use a computer to display or present information in a desired manner</td>
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<tr>
<td>21- Existence of required IT experts in school</td>
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<tr>
<td>22- The possibility of interact with classmates through the web</td>
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<tr>
<td>23- Good design of website</td>
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<tr>
<td>24- Well structured/presented information</td>
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<tr>
<td>25- The possibility of registering courses on-line</td>
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<tr>
<td>26- Top management knowledge about advantages of the system</td>
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<tr>
<td>27- Top management support</td>
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</tbody>
</table>
28- Top management commitment

Please indicate the extent to which using E-Learning system affects each following criterion

<table>
<thead>
<tr>
<th>Question</th>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Enhancing students effectiveness in learning</td>
<td></td>
<td></td>
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<tr>
<td>2- Improving students satisfaction with the course</td>
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<tr>
<td>3- Enhancing students productivity</td>
<td></td>
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</tr>
<tr>
<td>4- Enhancing teachers effectiveness in educating</td>
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</tr>
<tr>
<td>5- Improving teachers satisfaction with the educating environment</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>6- Enhancing teachers productivity</td>
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<tr>
<td>7- Access to instruction for all</td>
<td></td>
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<tr>
<td>8- Build an advanced society for citizens to support creativity and innovation</td>
<td></td>
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</tr>
</tbody>
</table>