Research Article

Assessment of Success of Saman Insurance E-education System Using the Delone-Mclean Modified Model

Amir Boroufar[1], *Sara Sadeghy*[2], *Sajjad Shokohyar*[3*]

Abstract

Introduction: This study has used the Delone-McLean model of information success system to assess the degree of success of the Saman Insurance e-education system by focusing on individual application of information systems from the perspective of intra-organizational users.

Methods: The descriptive-survey method and simple random sampling was employed for sampling. The statistical population consisted of 200 individuals who were managers, heads, and experts of Saman Insurance who had participated in e-education courses at least once. The structural equation model (SEM) was implemented using SMARTPLS version 2 to test the measurement method and SEM. A questionnaire was used to collect data. The validity of the questionnaire was assessed by expert opinion and Cronbach's α was assessed the reliability of the questionnaire at 0.95.

Results: The results revealed that the quality of the system, quality of information, and quality of services indirectly effect the success of e-education as determined by user satisfaction. The greatest changes in using the system, user's satisfaction and net benefits were recorded from quality of information, using the system, and user satisfaction, respectively.

Conclusion: Improving student satisfaction assures the success of an e-education system. The relevant factors for this are accessibility to a user-friendly and interactive e-education system, access to updated and relevant information required by users, and suitable support services.

Keywords

Success, Information Systems, E-education, Quality of System, Quality of Information, Quality of Services, Delone-Mclean

Introduction

Information systems play a determining role in the success of an organization. It is essential to study such systems and their roles in organizations and to have access to information systems that promote the development and success of an organization [1]. Research has examined the success of information systems for two decades. Some

[1]M.A student of Information Technology Management of Shahid Beheshti University, Tehran, Iran.

[2]M.A student of Master of Business Administration, Tehran, Iran.

[3*] Corresponding author: Faculty member of Department of Information Technology Management of Shahid Beheshti University, Tehran, Iran. *s_shokouhyar@sbu.ac.ir*

Received November 02, 2014; received in revised form September 11, 2015; accepted September 20, 2015

research has identified factors that contribute to the success of information systems and some has evaluated the degree of success of information systems [2].

E-education is an important change in information systems [3] and has undergone a radical change. Traditional teaching and learning are no longer bound to classrooms [4,5]. Here, e-education means the use of electronic devices for learning; this includes presenting subject matter via electronic media such as the internet, intranet, extranet, sound and/or videotape, satellite dish broadcasts, and TV interactively and in CD rooms [6]. Global industrial analysis reports that e-education has found its way into universities and large companies as a necessary tool to share knowledge. Advantages of e-education include reducing costs, simple education, flexibility, and ease. It has become an inseparable part of sharing information and serves as a new paradigm of modern education. The role of information technology in education is expanding. Increasing use of the internet has motivated researches to improve internet technology and web-based applied programs; nevertheless, development of e-education systems poses as a difficult issue for schools and industry. Education researchers and specialists face problems with theoretical concepts and methodology. There is little information on why many users stop participating in e-education after their first experience [7].

It is necessary to develop theories and criteria to judge the success of e-learning and develop efficient systems. Increasing the effectiveness of e-learning systems is the most important theoretical and practical research in education engineering and information systems [8]. The success of information systems in e-learning is increasing in the same manner as other investment in this area. Past studies have shown a gap in assessment of the effectiveness of e-education environment on the theoretical level. Safe ways to measure the success and effectiveness of e-education system are needed to increase the effective use of e-education programs in organizations.

Much research have been carried out on the success of information system models [9-12]. It is important to develop an approach for assessing success in e-learning. Studies have evaluated the effects of educational programs on dimensions such as learning opportunities [13], learning criteria [14], schools [15], learning environment [16], results of learning [17], teaching methodology [18], and its benefits [19]. It is evident that a comprehensive model with a perspective on quality is needed for evaluation of educational plans.

Electronic Education Success Model

Delone and McLean [20, 21] developed the most well-known model for assessing information system success. The Delone-McLean model was introduced in 1992 as a framework and model for measuring success of information systems. A number of empirical studies have measured multi-dimensional relations in information system success [22, 23]. Kiev and Seddon [24] tested parts of the model using a structural equation model (SEM). They replaced the usefulness variable and added a new variable of user involvement. The results support the Delone-McLean model to some extent.

Seddon [12] then introduced an improved version of the Delone-McLean model. In this model, Seddon focused on the casual aspects of the relationship of classified items and stated that usage must come before effects and benefits; however, usage does not cause them. Rai et al. [22] tested the Delone-McLean [20, 21] and Seddon [12] models theoretically and empirically and noticed that outputs of both models are compatible

with the collected data and improved on the original methods (2000). Their information system success model was highly effective not only for information system success, but also for evaluating information systems of e-education. The Delone-McLean information system success model uses six dimensions to identify factors of success: quality of system, quality of information, usage, user satisfaction, individual effect, and organization effect (Figure 1).

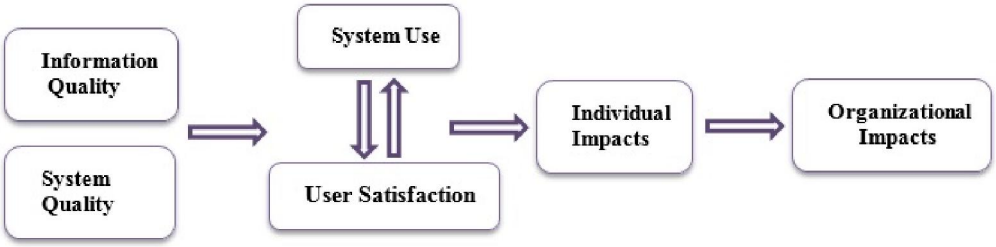

Figure 1**:** Basic Delone-McLean information system success model [10]

The Delone-McLean model has been cited 285 times and has been critiqued and challenged for creditability. In the model, system quality and information quality affect user satisfaction individually and jointly. The degree of usage can affect user satisfaction positively or negatively; however, the opposite is also true. Usage and satisfaction are direct individual variables, but effects on individual performance must have organizational effects as well [10]. The DeLone-McLean model was developed by combining individual and organizational effects as a dimension of success as called "net advantage-net benefits" and adding another quality dimensions called "service quality". The result was an updated model, especially for assessing the success of information systems in the internet. The updated model (Figure 2) was formed while preserving the hypothesis of the main model.

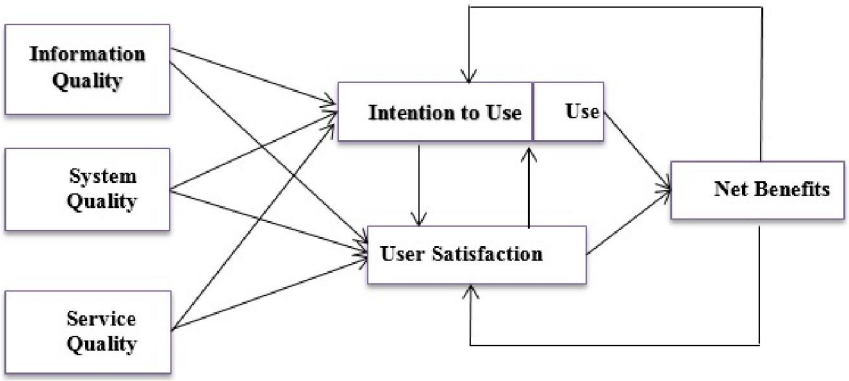

Figure 2: Updated Delone-McLean information systems success model

Research on information systems has focused on individual effects, group effects, organizational effects, intra-organizational effects, consumer effects, and social effects. Delone-McLean combined these effects in a variable called "net benefit" to save the model from becoming too complicated and prevent the enlargement of success sizes [9]. Delone-McLean claims that internet programs fit his success model and the six dimensions of success and encourages others to continue testing and challenging his model [9].

The updated Delone-McLean information system success assessment model can conform to the e-learning group [9]. The present study uses the Delone-McLean success model (2003) as a theoretical framework to develop a tool for assessing e-education system success in the area of organization. This model has been extensively used by researchers to measure dimensions of information system success. Each variable describes information system success using most dimensions of the modified Delone-McLean model [25]. Table 1 lists the dimensions effecting information system success in the Delone-McLean model [26].

Table 1: Dimensions effecting information system success in Delone-McLean model

Success dimension	Assessment criteria
System quality	Easy to use, flexibility, confidence in system, easy of learning for complexity of response time
Information quality	Coherence, understandable, precision, compatibility, completion, frequency, online, useful
Service quality	Responsive, precision, reliability, technical merit, interaction in solving user problems, personnel empathy
Using the system	Amount of use, frequency of use, compatibility of usefulness, degree of use, goal of use
User satisfaction	User satisfaction level of reports, websites, and service support
Net benefit	Improvement of decision-making, improvement of productivity, improving client satisfaction, reducing costs, increasing benefit, savings in time, making the job easier

Development of hypotheses and conceptual model

The model was selected and the methodology, research methodology, data collection tools, research samples, and methods were adopted for data analysis. The Delone-McLean information system success has been updated twice since 1992. In 2003, the model underwent two important changes. First, it included the dimension of service quality after a critique by Pit et al. [18]. Next, it adopted a suggestion by Seddon [12] to combined individual effect and organizational effect into one dimension of net benefit. Figure 3 shows the updated model.

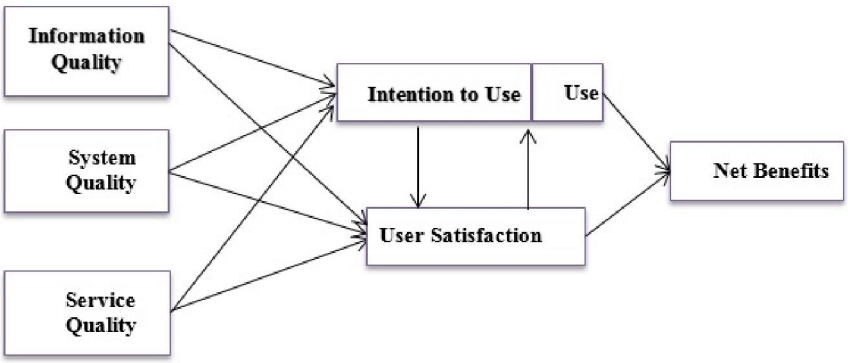

Figure 3: Updated Delone-McLean model [9]

The update made the model usable in different information systems, including web-based information systems. In e-education, learning is done using web-based applied programs. This allows the e-education system to be categorized as a web-based program. Baroudi[27] examined user satisfaction and confirmed the findings of other studies [28]; however, the reverse relation did not receive sufficient support.

With respect to the problem of Inconsistency Results in connection with this model, especially when it is used partially, some researchers [29] try to validate the model completely. In this state, different outputs were extracted. One basic hypothesis of the model is volunteer use by a user. The findings for this hypothesis and for relations have been contradictory [30]. The variables of the modified Delone-McLean model and the proposed hypothesis will be discussed below.

System quality

System quality is an individual's perception of system performance. For e-learning, system quality is measured by hardware and software that is designed to allow access by the user. A high quality e-education system includes following characteristics: accessibility, usability, realization of user anticipation, ease of learning, and short response time [31, 32]. Studies on the relationship between system quality and use of the system [24, 33- 35] confirm the existence of a direct relation between system quality, decision-making quality, effectiveness of the work, and the work quality. We believe that, because the e-education system at Saman Insurance Company is compulsory, characteristics such as low response, variety of education tools, and compatibility have no effect on the number of users of the system. Because use of this system is not summarized over the time dimension and number of users, the Delone-McLean model [9] also considers the nature, quality, and compatibility of the system. The hypotheses about the system follow.

Hypothesis one: A positive relationship will exist between the system quality and use of the system.

Researchers have used user satisfaction as alternative criteria to achieving success [22, 36, 37]. The compulsory use of an e-education system requires more sensitive satisfaction and is a higher obstacle to achieving system success.

Hypothesis two: The system quality will have positive effects on learner satisfaction.

Information quality

Information quality addresses the content provided by the organization for use by learners to improve their knowledge, learning, to achieve the goals of education, and to present higher quality reports. Understandability, precision, compatibility, and being online are characteristics of high quality information [38], but the focus is mostly on precision, accuracy of the information, completeness, coherence, and being online. Student satisfaction is affected by feedback received in a period [39]. Information quality could be a highly important variable in the success of e-education. These information elements are effective in the level of satisfaction, using the system and learning [40]. We theorize that the quality of information has a strong relationship with user satisfaction and use of the system as reflected in the following hypotheses.

Hypothesis three: The quality of information will have a positive effect on use of the e-education system.

Hypothesis four: Information quality has a positive effect on learner satisfaction.

Service quality

Service quality measures the quality of services presented by information system unit to support end-users. Delone-McLean [9] emphasized that service quality is important for measurement of information system department success. Because the success of an e-education system relates to system output and student satisfaction in learning, we believe there is a positive relationship between service quality, user satisfaction and use of the system as reflected in the following hypotheses:

Hypothesis five: Service quality will have a positive effect on use of e-education system.

Hypothesis six: Service quality will have a positive effect on learner satisfaction.

Compulsory use of e-education system required a re-evaluation of the previous research. The use of the system will affect user satisfaction and vice versa; the empirical results should be studied to determine how user satisfaction is obtained. In compulsory systems, user satisfaction has no effect on using the system. Users could be highly dissatisfied (or satisfied) but are required to maintain a certain level of use of the system.

Because previous studies have produced contradictory results [41-43], the relationship between user satisfaction and use of the system was omitted from the model. We believe that use of a compulsory system requires research at the organizational level prior to user satisfaction. This study assumes a higher level of use will be associated with a higher level of satisfaction; thus, the following hypothesis is proposed:

Hypothesis seven: There will be a positive relationship between use of the system and user satisfaction.

Use of the system

Use of the system is one variable to measure system success [10, 44- 46]. Compulsory use of the system is a requisite condition that could affect individual performance. In this research, use of the system has been defined as the amount and nature of use of the e-education system. When a system is considered to be productive, there will be an increase in use of the system. When the subject studied in the system is compulsory, the e-education system is no longer under a topic for profit or profitability. If students believe that using the system will increase their abilities and improve their performance, the e-education system can be considered to be a success; thus, following hypothesis is proposed:

Hypothesis eight: Foreign language learners with higher level of use most probably agree that e-education system will create value in learning.

User satisfaction

User satisfaction is measured by establishing a successful relationship between a system and its users. The definition of success is that the user believes his demand to be fulfilled [47]. If a system meets user needs, satisfaction will increase [48]. Previous studies [45, 49] have shown that using a system positively increases user satisfaction. Some studies [43, 50] have found no significant relationship between use of the system and user satisfaction. Others [42, 51] have noted that this relation is not necessarily positive. When use of an e-education system is not optional, success must be measured based on the educational results [52]. If students are satisfied with a system and its role in learning, the e-education system is perceived to be a success; thus, following hypothesis is suggested:

Hypothesis nine: Most students will express higher satisfaction when the e-education system adds to the value of their learning experience

Methods

The present study used the descriptive-survey method to evaluate e-education system success for Saman Insurance. The statistical population consisted of 200 managers, heads and experts at Saman Insurance (Tehran branch) with at least one experience in an e-education course. A literature review was used to collect secondary

data from books, journals, reliable papers, dissertations, and the internet. The statistical information and data for testing the hypotheses was collected by analyzing the questionnaire and the secondary data was used to extract the conceptual model.

A total of 132 individuals were chosen by simple random sampling. The Krejcie and Morgan formula was used to determine the volume of samples. All participants signed a letter of intent prior to participation and were assured that the names of participants would remain confidential. The criteria for acceptance was intention to participate in the study and being a manager, head, or expert at Saman Insurance.

A total of 109 questionnaires were returned. To study the validity and reliability of the research tools, the questionnaires were emailed to 10 professors, experts, and theorists of e-education, who were asked to rank the importance of each dimension and question on a 5-degree Lickert scale (very high to very low). The results obtained from calculating the consistency of each question with the relevant dimensions revealed that all showed significant consistency. Cronbach's α for reliability of the questionnaire was 0.953 (Table 2).

Table 2: Convergence validity variance of research structures

System Quality	T value	7.16	12.9	6.45	22.6								
	load factor	0.675	0.711	0.691	0.836							0.53	
	Item	**Q1**	**Q2**	**Q3**	**Q4**								0.73
Information Quality	T value	7	12.4	22.4	10.8	10.1							
	load factor	0.757	0.736	0.839	0.683	0.684						0.54	
	Item	**M1**	**M2**	**M3**	**M4**	**M5**							0.79
Service Quality	T value	11.47	10.91	26.35	33.24	17.11	25.64						
	load factor	0.715	0.738	0.839	0.869	0.776	0.843					0.63	
	Item	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**						0.89
System Use	T value	15.91	22.94	7.01	7.6								
	load factor	0.77	0.82	0.71	0.67							0.56	
	Item	**U1**	**U2**	**U3**	**U4**								0.74
User Satisfaction	T value	23.17	36.73	42.02	18.12	18.38							
	load factor	0.861	0.89	0.905	0.852	0.819						0.75	
	Item	**I1**	**I2**	**I3**	**I4**	**I5**							0.92
Net Benefits	T value	20.41	20.07	31.95	28.27	8.8	17.63	10.86	10.73	11.01	11.75		
	load factor	0.799	0.804	0.873	0.854	0.679	0.79	0.72	0.693	0.692	0.702	0.58	
	Item	**W1**	**W2**	**W3**	**W4**	**W5**	**W6**	**W7**	**W8**	**W9**	**W10**		0.92
												AVE	**Co-α**

The questionnaire was then emailed to the selected statistical sample. SMARTPLS (version 2) software was used to analyze the data in two stages to assess the reliability

and validity of the structures and the structural pattern by examining the casual relations between structures and their defining power. Modeling based on variance was used for structural equation modeling and did not contain the limitations of co-variance-based software such as LISREL. The results were satisfactory for data that is skewed, ranked, ordered, for which there are a low number of samples, and for co-linearity of variables [53]. In the present research, the method was used because of the low volume of samples.

This research was carried out from April 2014 to October 2014 at Saman Insurance (Tehran branch); the subject territory is learning management systems (LMS). The questionnaire contained 41 questions and was structures as follows:

Part one: Introduction to questionnaire describing the importance of the research, its goals, and scope.

Part two: Five questions on subject particulars.

Part three: A total of 41 questions for evaluating the six categories of the modified Delone-McLean success model.

The 5-degree Lickert scale was used to assess the LMS. The reply options denote the degree of assessment by the participant of LMS at Saman Insurance. The measurement model test assessed convergence and divergence validity of the research measurement tools and issues related to the validity and reliability of the structures. Larcker and Fornell [54] suggested three factors for assessing convergence validity:

Reliability of each response

Combined reliability of each structure

Average variance extracted (AVE)

The reliability of each answer and AVE was measured to determine convergence validity. A factorial value of ≥0.6 indicates a well-defined structure for a response. The factorial values were deemed significant at $p = 0.05$ [55]. Responses with a factorial value of < 0.6 were omitted. Table 2 shows the factorial values of the responses and their "t" values. AVE measures the sum of all variance attributed to the model in proportion to the measurement error variance; that is, to what degree the model defines the variable variance (Larcker and Fornell). The suggested value is >0.05 and the results are listed in Table 2 [54].

The divergence validity was extracted by comparing the square root AVE of each structure and the consistency of that structure with other structures. If the square root of the AVE of a structure is greater than the consistency of that structure with other variables, model reliability will be valid [54]. Table 3 presents the divergent validity of research variables. The consistency matrix shows that relationships between all variables were significant at $p < 0.01$.

Table 3: Consistency matrix and results for divergence validity of research variables

	System Quality	Information Quality	Service Quality	System Use	User Satisfaction	Net Benefits
System Quality	0.73					
Information Quality	0.65	0.74				
Service Quality	0.44	0.46	0.78			
System Use	0.41	0.54	0.36	0.75		
User Satisfaction	0.58	0.59	0.53	0.63	0.87	
Net Benefits	0.50	0.57	0.56	0.64	0.84	0.76

Values for consistency matrix diameter are the square root of AVE. ($p < 0.01$).

Results

The structural model and research hypothesis will be possible through studying the path coefficient and R^2 value. To determine the significance of the path coefficient, the "t" statistic was determined and the results listed in Table 4. The path coefficient is used to determine the share of each independent variable to determine the variance of each dependent variable. R^2 denotes the reliability of variance of the dependent variable as influenced by the independent variable or variables. Table 4 indicates that all relationships hypothesized were supported and confirmed significant at $p < 0.01$, except hypotheses one, four, and five, which were deemed significant at $p < 0.05$. The structure model explained 31% of changes for the variable of user satisfaction, 57% of changes for use of system, and 72% of changes for net benefits. The path coefficient shown in Figure 4 indicates that he greatest changes in using the system, user's satisfaction and net benefits were recorded from quality of information, using the system, and user satisfaction, respectively.

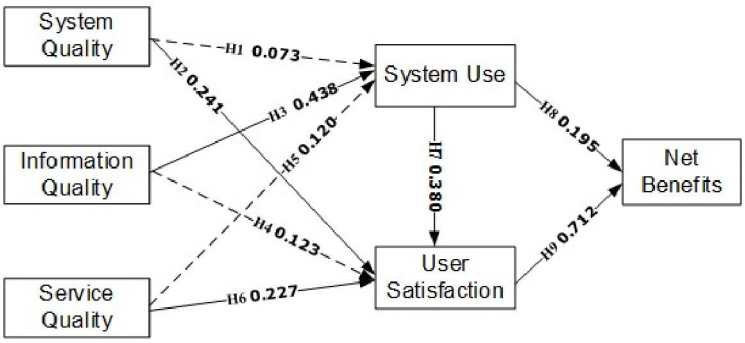

Figure 4: Results of model testing, path coefficients, and number of hypotheses for each path.

Table 4: Results of model testing

	R2	Path Coefficients	T Value	P-value	Sig.Level
System Use					
• System Quality	0.31	0.073	0.91	Ns	Ns
• Information Quality		0.438	4.18	P < 0.001	****
• Service Quality		0.120	1.53	Ns	Ns
User Satisfaction					
• System Quality	0.57	0.241	2.66	P < 0.01	***
• Information Quality		0.123	1.307	Ns	Ns
• Service Quality		0.227	2.82	P < 0.01	***
• System Use		0.380	4.13	P < 0.001	****
Net Benefits					
• System Use	0.72	0.195	2.42	P < 0.05	**
• User Satisfaction		0.712	11.18	P < 0.001	****

*p < 0.10 (not significant; NS); **p < 0.05; ***p < 0.01; ****p < 0.001

Conclusion

The Delone-McLean [9] model was used to evaluate the success of e-education system (LMS) of Saman Insurance Company. It was concluded that there was no significant relationship ($p< 0.100$) for the effect of electronic education system quality on use of the system. These results are in agreement with findings of previous studies [56,57] confirming the effects of system quality on use.

However; the effects of service quality on the amount of using LMS has no effect on the learner for usingthe system. The results of this hypothesis are not in agreement with the findings of previous research [58]. Figure 4 indicates that the quality of e-education system (LMS) had a significant effect on learner satisfaction ($p< 0.01$). That is, increasing the quality of the e-education system increased learner satisfaction. Hypothesis two is in agreement with the findings [59,60].

For the effect of the quality of the e-education system information on learner satisfaction, the results were no significant ($p < 0.100$). The results for this hypothesis are not in agreement with the findings of previous studies [57, 61]. It could be assumed that the majority of respondents were not interested in the electronic and online contents. Figure 4 indicates that the quality of the information produced in e-education system had significant relationship ($p < 0.001$) on the amount of use of the e-education system. This hypothesis is in agreement with the results of previous studies [58].

Analysis showed a significant relationship between quality of service and learner satisfaction ($p< 0.01$). This hypothesis is in agreement with the previous findings [62, 63]. There was no significant relationship for effect of service quality on use of e-education system ($p< 0.100$). This is not in agreement with the findings of previous research [64]. In addition, use of the e-education system had a significant effect on learner satisfaction ($p< 0.001$). The results showed that that use of the e-education system increased learner intention to use and satisfaction with the system. These results are in alignment with those of other studies [65].

There was a significant relationship ($p< 0.0.5$) for use of e-education system on net benefits; 10% of changes related to net benefits were the result of use of the e-education system.These findings show that high quality content in an e-education system ultimately affects the net benefits by increasing usage of the system. The results of the present study are similar to the results of previous studies [66].

There was a significant relationship ($p< 0.001$) for effect of user satisfaction on net benefits, as 70% of the changes in the net benefits related to the degree of user satisfaction with the e-education system. This finding shows that providing service and establishing a high quality e-education system effects the net benefits by increasing learner satisfaction. This finding is in agreement with findings of similar studies [67-69]. System quality, quality of information, and service quality all have indirect effects on the success of e-education system mainly by increasing user satisfaction. To improve student satisfaction and influence the success of the e-education system, accessibility to a user-friendly and interactive e-education system that is online, coherent, and desired by users and which provides suitable support services are very important.

The high degree of user satisfaction ($R^2= 0.57$) indicates that the model was an initially effective in assessing the e-education system. The relatively low value for use of system ($R^2= 0.31$) and the low path coefficient (0.19), though positive and significant, show that the structure of the model requires further development. Hardware, software, and network problems beyond e-education system control could

have contributed to the less significant findings in the research model, especially for the variable of use of system. Another factor that possibly affected use of the system was the skill of students in the e-education environment. Students who are participating in e-learning course for the first time could have opinions that differ from those of the more experienced and skillful students in maximizing learning with minimum use of the system.

References

1. Ahmad A. Evaluation of the effectiveness of management information systems at the Institute of Jahad Nasr [Master thesis]. Tehran: The University of Tehra; 1997. [In Persian]
2. Arefnezhad M, Sobhani M, Amirkhani T. Explain the factors affecting the success of information systems, with emphasis on the role of organizational learning and organizational factors. Journal of Technology Management. 2012:4(13):89-114. [In Persian]
3. Wang YS. Assessment of learner satisfaction with asynchronous electronic learning. Journal of Information and Management. 2003;41(1):75-86.
4. Zhang D, Nunamaker JF. Powering e-learning in the new millennium: an overview of e learning and enabling technology. Information Systems Frontiers. 2003;5(2):207-218.
5. Marold KA, Larsen G, Moreno A. Web-Based Learning: Is It Working: A Comparison of Student Performance and Achievementin Web-Based Courses and Their In-Classroom Counterparts. In: Khosrow-Pour M, editor. Web-Based Instructional Learning. Hershey, PA.: IRM Press; 2002. p. 179-189.
6. Clyde W. Holsapple and Lee-Post. Defining, Assessing, and Promoting E-Learning Success: An Information Systems Perspective Decision Sciences. Journal of Innovative Education. 2006:4(1):67-85.
7. Sun PC, Tsai RS, Finger Chen, Y.-Y, Yeh D. What drives a successful e-learning? An empirical investigation of the critical factors influencing learner satisfaction. Computers & Education. 2008;50(4):1183-202.
8. Lee JK, Lee WK. The relationship of e-learner's self-regulatory efficacy and perception of e-learning environmental quality. Computers in Human Behavior. 2008;24(1):32-47.
9. DeLone WH, McLean ER. The Delone and Mclean model of information systems success: a ten-year update. Journal of Management Information System. 2003;19(4):9-30.
10. DeLone WH, McLean ER. Information systems success: the quest for the dependent variable. Information Systems Research. 1992;3(1):60-86.
11. Rai A, Lang S, Welker R. Assessing the Validity of Is Success Models: An Empirical Test and Theoretical Analysis. Information Systems Research. 2002;13(1):50-96.
12. Seddon PB. A respecification and extension of the DeLone and McLean model of IS success. Information Systems Research. 1997;8(3):240-53.
13. Eom S. Testing the Seddon Model of Information System Success in an E-Learning Context: Implications for Evaluating DSS. Liverpool, UK, April 12-13, 2012. Springer Berlin Heidelberg. 2013:164(1):19-33.
14. Pittinsky M, Chase B. Quality on the line: Benchmarks for success in Internet-based distance education.The Institute for Higher Education Policy.Washington, DC: National Education Association; 2000.
15. Byrne R. Web-based learning versus traditional management development methods. Singapore Management Review, 2002;24(2):59-68.
16. Wang LCC, Bagaka JG. Understanding the dimensions of selfexploration In Web-based learning environment. Journal of Research on Technology in Education. 2003;34(3):364-373.

17. McClelland B. Digital learning and teaching: Evaluation of developments for students in higher education. European Journal of Engineering Education. 2001;26(2):107-115.
18. Pitt FL, Watson RT, Kavan CB. Service Quality: A Measure of Information Systems Effectiveness. MIS Quarterly. 1995;19(2):173-187.
19. Lawhead PB, Alpert E, Bland CG, Carswell L, Cizmar D, DeWitt J, Dumitru M, Fahraeus ER, Scott K. The Web and distance learning: What is appropriate and what is not. ITiCSE'97 Working Group Reports and Supplemental ACM New York. 1997. 27-37.
20. Gable G, Sedera D, Chan T. Enterprise Systems Success: A Measurement Model. Seattle, Washington, Dec 14-17, 2003. Twenty-Fourth International Conference on Information Systems. 2003. p. 576-591.
21. Heo J, Han I. Performance measure of information systems (IS) in evolving computing environments: an empirical investigation. Information and Management. 2003;40(4):243-56.
22. Rai A, Lang SS, Welker RB. Assessing The Validity Of IS Success Models: An Empirical Test And Theoretical Analysis. Information Systems Research. 2002;13(1):50-69.
23. Etezadi-Amoli J, Farhoomand AF. A structural model of end user computing satisfaction and user performance. Information and Management. 1996;30(2):65-73.
24. Seddon PB, M-Y Kiew. A Partial Test and Development of the DeLone and McLean Model of IS Success. Australasian Journal of Information System. 1996;4(1):90-109.
25. Keshtegar A, Hamidreza J, Mohammadbagher K. Measuring the success of information systems education agency Fars using the modified model Delon and Maclean, The first National Conference on Accounting and Management; 2013 Sep 16; Iran, Shiraz. CIVILICA; 2013.
26. Petter S, Delone W, Mclean E. Measuring information systems success models, dimensions, measures, and interrelationships. European Journal of Information Systems. 2008;17(3):236-263.
27. Baroudi J, Olson M, Ives B. An Empirical Study of the Impact of User Involvement on System Usage and Information Satisfaction. Communications of the ACM. 1986;29(3):232-238.
28. Fraser S, Salter G. A Motivational View of Information Systems Success: A Reinterpretation of Delone & Mclean's Model. Proceedings of the 6th Australasian Conference on Information Systems; 1995 Sep 26-29; Australia: Curtin University. 1995. P. 119-140.
29. McGill T, Hobbs V, Klobas J. User-developed applications and information systems success: A test of DeLone and McLean's model. Information Resources Management Journal. 2003;16(1):24-45.
30. Chen LD, Gillenson ML, Sherrell DL. Enticing Online Consumers: An Extended Technology Acceptance Perspective. Information & Management. 2002;39(8):705-719.
31. Halawi LA, McCarthy RV, Aronson JE. An Empirical Investigation of Knowledge Management Systems. The Journal of Computer Information Systems. 2008;48(2):121-136.
32. Guimaraes T, Armstrong CP, Jones BM. A New Approach to Measuring Information Systems Quality. The Quality Management Journal. 2009;16(1):42-55.
33. Etezadi-Amoli J, Farhoomand AF. A structural model of end user computing satisfaction and user performance. Information & Management. 1996;30(2):65-73.
34. Teo T, Wong SH, Wong PK. An empirical study of the performance impact of computerization in the retail industry. Omega-The International Journal of Management Science. 1998;26(5):611-621.
35. Wixom BH, Watson HJ. An empirical investigation of the factors affecting data warehousing success. MIS Quarterly. 2001;25(1):17-41.

36. Guimaraes T, Staples S, McKeen J. Important human factors for systems development success: A user focus. Shayo C, editor. In Strategies for Managing IS Personnel. PA, USA: IGI Publishing Hershey; 2004. p. 300-320.
37. Guimaraes T, Armstrong CP, O'Neal Q. Empirically testing some important factors for expert systems quality. Quality Management Journal. 2006;13(3):28-38.
38. Swaid SI, Wigand RT. Measuring the quality of Eservice: Scale development and initial validation. Journal of Electronic Commerce Research. 2009;10(1):13-29.
39. Rossin Don, Young KRo, Klein BD, Maggie Guo Yi. The Effects of Flow on Learning Outcomes in an Online Information Management Course. Journal of Information Systems Education. 2008;20(1):87-98.
40. Eom S, Ashill N, Wen J. The determinants of students' perceived learning outcomes and satisfaction in university online education: An empirical investigation. Decision Sciences Journal of Innovative Education. 2006;4(2):102-115.
41. Cheney PH, Dickson W. Organizational characteristics and information systems: an exploratory investigation. Academy of Management Journal. 1982;25(1):170-184.
42. Srinivasan A. Alternative measure of systems effectiveness: Association and implications. MIS Quarterly. 1985;9(3):243-253.
43. Lawrence M, Low G. Exploring individual user satisfaction within user-led development. MIS Quarterly. 1993;17(2):195-208.
44. Chang MK, Cheung W. Determinants of the intention to use Internet/WWW at work: A confirmatory study. Information & Management. 2001;39(1):1-14.
45. Lucas HC. Empirical model for a descriptive model of implementation. MIS Quarterly. 1978;2(2):27-41.
46. Van der Heijden H. Hedonic information systems. MIS Quarterly. 2004;25(4):695-704.
47. Ives B, M Olson, and J Baroudi. The Measurement of User Satisfaction. Communications of the ACM. 1983;26(10):785-793.
48. Bharati P. People and information matter: Task support satisfaction from the other side. The Journal of Computer Information Systems. 2003;43(2):93-103.
49. Robey D. User attitudes and management information system use. Academy of Management Journal. 1979;22(3):527-538.
50. Schewe CD. The management information system user: an exploratory behavioral analysis. Academy of Management Journal. 1976;19(4):577-590.
51. Freeze, Ronald D, Alshare, Khaled A, Lane, Peggy L, Wen H, Joseph. I Success Model in E-Learning Context Based on Students' Perceptions. Academic Journal, June 2010. Journal of Information Systems Education. 2010;21(2):173.
52. Gill G. Asynchronous Discussion Groups: A Usebased Taxonomy with Examples. Journal of Information Systems Education. 2005;17(4):373-383.
53. Gholipour A. The pro-independence and job involvement among the employees of Tehran University: the mediating role of basic psychological needs. Research Enterprise Resource Planning (University of Madras). 2012:2(1):91-112.
54. Fornell C, Larcker DF. Evaluating structural equations models with unobservable variables and measurement error. Journal of Marketing Research. 1981;18(1):39-50.
55. Gefen D, Straub DW. A practical guide to factorial validity using PLS Graph: Tutorial and annotated example. Communications of the AIS. 2005;16(1):91-109.
56. Liu W, Cheok AD, Mei-Ling CL, Theng YL. Mixed reality classroom: learning from entertainment. Proceedings of the 2nd international conference on Digital interactive media in entertainment and arts; 2007 Sep 19-21; ACM, New York, NY, USA. 2007. p. 65-72.
57. Freeze RD, Alshare KA, Lane PL, Wen HJ. Is success model in e-learning context based on students' perceptions? Journal of Information Systems Education. 2010;21(2):173-184.

58. Wang Y, Liao Y. Assessing e-Government systems success: A validation of the DeLone and McLean model of information systems success. Government Information Quarterly. 2008;25(4):717-733.
59. Chiu CM, Chiu CS, Chang HC. Examining the Integrated Influence of Fairness and Quality on Learners' Satisfaction and Web-based Learning Continuance Intention. Information Systems Journal. 2007;17(3):271-287.
60. Lin H. Measuring online learning systems success: Applying the updated DeLone and McLean's model. Cyber Psychology and Behavior. 2007;10(6):817-820.
61. Lee JK, Lee WK. The relationship of e-Learner's self-regulatory efficacy and perceptionof e-Learning environment quality. Computers in Human Behavior. 2008;24(1):32-47.
62. Samarawickrema G, Stacey E. Adopting web-based learning and teaching: a case study in higher education. Distance education. 2007;28(3):313-333.
63. Landrum H, Prybutok VR. A service quality and success model for the information service industry. Eur J Operat. Res. 2004;15(6):628-642.
64. Mahmood MA, Hall L, Swanberg DL. Factors affecting information technology usage: A meta-analysis of the empirical literature. Journal of Organizational Computing and Electronic Commerce. 2001;11(2):107-130.
65. Sedera D, Gable G. A Factor and Structural Equation Analysis Enterprise Systems Success Measurement Model. In: Appelgate L, Galliers R, editors. Proceedings of the Twenty-Fifth International Conference on Information Systems; 2004 Des 12- 15; Washington DC. 2004. p. 449-464.
66. Almutairi HMF. Evaluating information system success in public organizations: A theoretical model and empirical validation [PhD Thesis]. Pennsylvania: Pennsylvania state university; 2001.
67. McGill Hobbs T, Klobas. User-developed applications and information systems success: A test of DeLone and M clean model. Information Resources Management Journal. 2003;16(1):24-45.
68. Livari J. An empirical test of the Delone-Mclean model of information system success. The DA TA BA SE f or Advances in Information Systems. 2005;36(2):27-28.
69. Roldán JL, Leal A. A validation test of an adaptation of the DeLone and McLean's model in the Spanish EIS field. In: Cano JJ, editor. Critical reflections on information systems. A systemic approach. Hershey, PA: Idea Group Publishing; 2003. pp. 66-84.