E-Learning Critical Success Factors Model: Empirical Investigation

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ABSTRACT

Recently, technology has been extensively used to facilitate our life. It is necessary to take advantage of it in the education field to take delivery of information in spite of distances. Consequently, a new figure of learning is used; e-learning. It is critical to put into practice a successful and effective e-learning that meets up the students' needs and achieves their requirements, therefore, researchers have tried to conclude many factors that donates in achieving such kind of education. This paper proposes an e-learning model that consists of nineteen critical success factors classified in five dimensions. The proposed model is empirically tested using a sample of 676 respondents from three different universities in Jordan.

Keywords

E-learning; Critical success factors; Success model.

1. INTRODUCTION

Technology has been entered more and more in all disciplines in Arab countries. Education is one of the most important domains where technology is significantly used. E-learning is considered the heart of the educational systems, and it is built by using an electronic and telecommunication technology to transfer the information to learners via the internet regardless of their geographical areas [1, 2, 3].

Governments have encouraged their educational institutions to apply the e-learning in their systems, and have noticeably supported them; this is because of the substantial benefits of such form of learning. E-learning systems are more flexible than traditional teaching since they enable learners to gain knowledge everywhere and at any time. It reduces cost and offers instance information delivery. E-learning activities may be synchronous or asynchronous which allows learners to organize their time as they like. Also, e-learning allows getting experience from people regardless of their geographical places, in addition to more and more advantages.

The main challenge of e-learning is how to implement a successful and effective system that meets all learners' expectations and matches their requirements. Researchers have proposed several approaches to assess and enhance the quality of using available courses on websites and e-learning techniques. In order to contribute in solving this regard, this paper proposes a model of the majority critical factors that affect the quality of the e-learning systems, and evaluates the proposed model by a sample of 676 respondents from three universities in Jordan, i.e. Hashemite University, Yarmouk University, and Al Balqa Applied University. The proposed model may be generalized over any e-learning environment, and its factors are expected to be considered to build a successful e-learning system, and to achieve the expected outcomes of the education process via electronic medium.

This paper is organized as follows. Section2 provides some related works. Section3 describes the general dimensions of the e-learning environments. Section 4 illustrates proposed hypotheses about e-learning success factors; Section 5 presents the methodology followed in this research. Section 6 introduces the proposed model of the main critical success factors of e-learning. Finally, Section7 concludes the research.

2. RELATED WORK

Information technology has a noticeable impact in the education process. Previous studies presented many frameworks to improve e-learning systems including a set of factors to meet learners' needs. For instance, Govindasamy [4] considered the pedagogical principles as a necessary condition for implementing a successful e-learning. Govindasamy believes that the pedagogical foundation helps educators to manage the content of e-learning while delivering it.

Moreover, Johnson et al. [5] presented an evaluation framework for the impact of social presence in e-learning. They developed a model for e-learning effectiveness which consists of five aspects, i.e. social presence, application-specific computer self-efficacy (AS-CSE), perceived usefulness, course interaction, and e-learning effectiveness. The researchers concluded that educators and trainers should be aware of the importance of developing shared social learning environments to enhance e-learning effectiveness.

Recently, Paechter et al. [6] spotted the light on the learners' and instructors achievement goals. They believed that these two aspects affect e-learning achievements and course satisfaction, and that the instructor's expertise and role is an important factor in
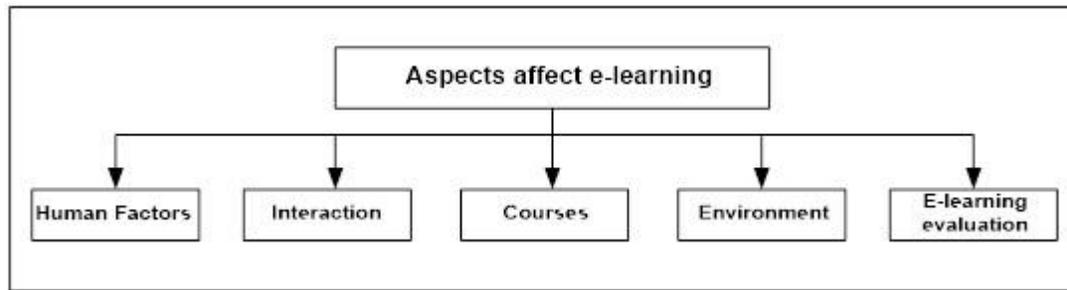
Figure 1. Insert caption to place caption below figure.

E-learning. Therefore, they suggested enhancing learners' motivation and goals by adapting instructions accordingly and emphasize the importance of continuing education and training for the instructors.

Wang et al. [7] provided a multi-dimensional model to measure success of e-learning systems in the context of an organization from the perspective of the e-learner. Their model consists of six factors with thirty four items. The researchers evaluated their model empirically with a sample of 206 e-learner respondents by demonstrating 34 items in order to produce acceptable reliability estimates.

Moreover, Holsapple and Lee-Post [8] presented a model to evaluate the success of e-learning from an information systems perspective. They believed that e-learning success depends on the success of its development lifecycle: system design, system delivery, and system outcome. The proposed model consists of six dimensions categorized under the three stages of e-learning systems developments; system quality, information quality and service quality; under system design; use and user satisfaction under system delivery; net benefits under system outcome.

Furthermore, Goi and P.Y. Ng [9] attempted to identify factors that affect the implementation of a successful e-learning program in Malaysia. They tested eight factors to see whether they were important in e-learning program implementation or not; the tested factors were: program content, web page accessibility, learner's participation and involvement, web site security and support, institution commitment, interactive learning environment, instructor competency and presentation and design.

In addition, Alhomod and Shafi [10] identified the success factors of e-learning programs from the engineer's and technician's point of view. They evaluated eleven factors from the literature in King Saud University. The considered factors were: sufficient users training, organization commitment management support, technical support, positive attitude of users, the ease of using tools, sufficient training to engineers, sufficient e-learning initiatives, sufficient manpower, availability of information on e-learning websites, support from other departments. The result was: 10 factors were considered to be important by the respondents, and only 1 factor was considered less important.

Finally, Mbarek and Zaddem [11] investigated social presence, computer self-efficacy, perceived usefulness, ease of use and interaction between trainers and trainees on e-learning effectiveness. In addition, they assessed the relationships between the proposed factors independently. They validated their model on the Tunisian context using data from 410 employees.

3. DIMENSIONS OF E-LEARNING ENVIRONMENTS

In order to solve their cost and quality problems, universities and educational institutions have used information technology in the learning process [12]. There are many aspects that influence the development process of e-learning systems which should be taken into account in order to implement a high e-learning system quality. By examining several e-learning environments, it can be concluded that there are five main dimensions that are generally shared among all e-learning environments as follows:

- Human factors; characteristics of the participants in the e-learning process including learners, instructors and technicians manage e-learning process.
- Interaction; whether it is among the participants themselves [6] or between the participants and e-learning tools. This interaction should ensure the ability of information exchanging between all participants in the e-learning process.
- The courses conducted via e-learning.
- The environment surrounding e-learning process.
- E-learning evaluation; users' view of the e-learning environment they deal with.

From the previous mentioned dimensions, this study proposes a meta-model that describes the main dimensions of e-learning environments. Figure 1 presents this meta-model.

4. E-LEARNING SUCCESS FACTORS

The previously mentioned aspects were analyzed and nineteen hypotheses were suggested. The researchers believe that the following hypotheses are factors affect e-learning success; thus, they should be taken into account to obtain a successful e-learning system:

H1. Participants' readiness; the physical and psychological readiness of both learners and instructors affect the e-learning process. For example the learners' willingness to learn and receive information via modern information technology tools, and the instructors' willingness to teach their learners using modern information technology means affects the success of the e-learning process. In addition, the participants in e-learning should be able to use information technology means easily with their bodies.

H2. Motivation of learners; learners should be motivated towards using e-learning. This might be achieved if they feel that they get all what they need from the learning process [13]. Learners should also enjoy using modern information

Table I. Collected data about 676 respondents who participated in the questionnaire.

Collected Data	Gender		Age			Role in e-learning			Experience with modern technology		
	Male	Female	< 20	20 - 35	> 30	Learner	Instructor	Technician	Initial	Medium	High
Frequency	392	284	274	317	85	412	252	12	38	427	211
Percentage	57.9	42.01	40.5	46.8	12.5	60.9	37.2	1.77	5.62	63.1	31.2

technology means in learning. Competition among learners is also important to improve their motivation to use e-learning.

H3. The learners' and instructors' experience of using e-learning and modern information technology means.

H4. Several disabilities and special needs of learners. It must be taken into account that not all learners can use modern information technology means effectively since some of them may face some problems because of their special needs and handicaps.

H5. Skills of technicians who manage the e-learning process. In order to get a successful e-learning management process, technicians should be chosen carefully from those who have more experience, as initial technicians may impede the e-learning process and may not be able to solve faced problems effectively.

H6. Local culture and politics of the e-learning environment.

H7. Social factors. The relationships between participants in e-learning environments affect the e-learning process, for example, when an e-learning mean is complimented by many people, learners and instructors will desire to use it.

H8. Interaction among learners. Learners should be able to communicate with their colleagues and exchange information. When this is done easily, freely and effectively the e-learning quality may increase.

H9. Interaction between learners and their instructors. Learners should be able to access their instructors when they need and communicate with them to receive information without complicated restrictions.

H10. Interaction between both learners and instructors with technicians. When all participants on e-learning can solve faced problems in cooperation and can learn from each other, quality of e-learning might be enhanced. It must be noted here that interaction differs from social factors; interaction is concerned with information exchange between all the participants in the e-learning process whereas social factors are concerned with the ability of an environment to provide shared and effective learning to the participants [3].

H11. Quality of tools used in communication and interaction processes. Whether communication tools are perceptible (e.g. personal computers, headphones, microphone, etc.), or not perceptible (e.g. internet speed, network protocol, etc.), they should be modern, sensitive and compatible with e-learning outcomes.

H12. Nature of courses. Not all kinds of courses can be explained via e-learning means, for example, practical courses; e.g. anatomy will not be valuable via e-learning since it needs to be explained in sight of learners traditionally.

H13. Quality of courses. Contents and material of e-learning courses should be explained obviously and interestingly to encourage learners to get them.

H14. Extent of achieving outcomes of the e-learning courses. In order to achieve most of the e-learning courses outcomes, the previous two factors should be taken into consideration, in addition to organizing the course time and place that suit all the participants.

H15. The environment where the e-learning process is conducted in. For example, companies differ from universities; and universities are not as schools. Learners should feel that they are in a comfortable and friendly environment. Johnson et al. [5] suggested developing a shared social learning environment to enhance e-learning effectiveness.

H16. E-learning technology. There are different technologies that can be used for e-learning. For instance, e-learning may be a web-based learning (WBL), internet-based training (IBT), advanced distributed learning (ADL), web-based instruction (WBI), online learning (OL) or open/flexible learning (OFL) [14]. Educational institutions should be aware when choosing an e-learning technology to conduct a course because the chosen one should meet e-learning participants' requirements to make them satisfied and willing to reuse e-learning again.

H17. Cost of e-learning. While the cost of resources and equipment is not high, people might like trying. Also governments should support e-learning and work on always making e-learning resources available to encourage using them.

H18. Evaluation of e-learning [4]. When developing e-learning, developers should ensure that all users can access, use and evaluate the e-learning resources, and they should be concerned with providing users with tools to assess the e-learning process, and evaluate how much they benefit from it. Taking users' evaluation into account is important to keep meeting their expected requirements and satisfying their needs.

H19. Learning from previous experiments in e-learning projects.

5. RESEARCH METHODOLOGY

After proposing the previous hypotheses, they were tested by a sample of 676 respondents to determine whether they affect e-learning success or not. Respondents ranged in age between 15-55 years who have experienced using e-learning systems in one of three universities in Jordan, i.e. Hashemite University, Yarmouk University, and Al Balqa Applied University. Table I illustrates the collected data about respondents.

In the questionnaire we prepared, a number of testing points were posited for each hypothesis. The hypothesis was considered as a real factor if participants agreed on at least half of the proposed testing points. The results were as expected positive for all hypotheses. All respondents agreed that the proposed hypotheses in section2 affect e-learning success.

Then, respondents were asked to determine the impact of each factor on the e-learning success using metrics of; (never affect, little important, important and very important).Table2 shows how the 676 respondents looked at the impact of each factor on e-learning success.

6. MODEL OF CRITICAL SUCCESS FACTORS OF E-LEARNING

Regarding the tested hypotheses in Table II, the hypothesis was considered as a success factor in our proposed model if more than 50% of respondents considered its impact on e-learning success as important or very important.

Next, the model of e-learning critical success factors was proposed; the model consists of nineteen factors categorized under main five aspects discussed previously in section3.

All hypotheses were considered as critical success factors for e-learning except H5; such a result might be attributed to the reason that most of the e-learning projects are not managed by specialized technicians; where instructors usually play their role, contrary to large-scale e-learning projects. So, for its importance we consider it in our model. Figure 2 shows the proposed model.

The proposed model may be generalized over all e-learning environments, and it might be used in order to develop a high quality e-learning systems. In addition, applying the proposed model on an e-learning system can ensure meeting users' expectations and requirements. Thus, these factors should be taken attentively in order to develop a successful e-learning environment.

7. CONCLUSION

This paper proposed a model of nineteen success factors for improving the e-learning systems. It examined different environments of e-learning systems to conclude the general shared aspects of e-learning environments; human factors, interaction, courses, environment and e-learning evaluation.

After that, the previous mentioned aspects of e-learning environments were analyzed and nineteen hypotheses about factors that may affect e-learning success were proposed.

To ensure that the proposed hypotheses are real e-learning success factors, 676 respondents from three universities in Jordan were involved in a case study. Respondents ensured that the hypotheses are real factors that affect the e-learning process success.

Table II. The impact of proposed factors on e-learning success from 676 respondents' point of view.

| Factors		Freq. and percentage for each factor	Impact of factors on e-learning success				Total
			Never Affect	little important	important	very important	
H1	Readiness of Participants	Frequency	5	21	218	432	676
		Percentage	0.73	3.10	32.2	63.9	100%
H2	Motivation of learners	Frequency	43	32	482	119	676
		Percentage	6.36	4.73	71.3	17.6	100%
H3	Experience of Participants	Frequency	0	94	230	352	676
		Percentage	0.00	13.9	34.0	52.0	100%
H4	Several disabilities and special needs of learners	Frequency	49	127	157	343	676
		Percentage	7.24	18.7	23.2	50.7	100%
H5	Skills of technicians who manage e-learning process	Frequency	242	314	87	33	676
		Percentage	35.7	46.4	12.8	4.88	100%
H6	Local culture and politics of participants in e-learning	Frequency	165	152	270	89	676
		Percentage	24.4	22.4	39.9	13.1	100%
H7	Social factors	Frequency	73	86	196	321	676
		Percentage	10.7	12.7	28.9	47.4	100%
H8	Interaction of Learners with each other	Frequency	69	87	292	228	676
		Percentage	10.2	12.8	43.1	33.72	100%
H9	Interaction between learners and their instructors	Frequency	41	87	135	413	676
		Percentage	6.06	12.8	19.9	61.0	100%
H10	Interaction with technicians	Frequency	47	275	242	112	676
		Percentage	6.95	40.6	35.7	16.5	100%
H11	Quality of communication and interaction tools	Frequency	31	72	158	415	676
		Percentage	4.58	10.6	23.3	61.3	100%
H12	Nature of courses	Frequency	85	126	167	298	676
		Percentage	12.5	18.6	24.7	44.0	100%
H13	Quality of e-learning courses	Frequency	29	112	153	382	676
		Percentage	4.28	16.5	22.6	56.5	100%
H14	Outcomes of e-learning courses	Frequency	11	79	424	162	676
		Percentage	1.62	11.6	62.7	23.9	100%
H15	The environment e-learning conducted in	Frequency	7	50	517	102	676
		Percentage	1.03	7.39	76.4	15.0	100%
H16	E-learning technology	Frequency	63	156	290	167	676
		Percentage	9.31	23.0	42.8	24.7	100%
H17	E-learning cost	Frequency	83	114	63	368	676
		Percentage	12.2	16.8	9.31	54.4	100%
H18	Evaluation of e-learning	Frequency	15	75	373	213	676
		Percentage	2.21	11.0	55.1	31.5	100%
H19	Learning from previous experiments in e-learning	Frequency	23	49	143	461	676
		Percentage	3.40	7.24	21.1	68.1	100%
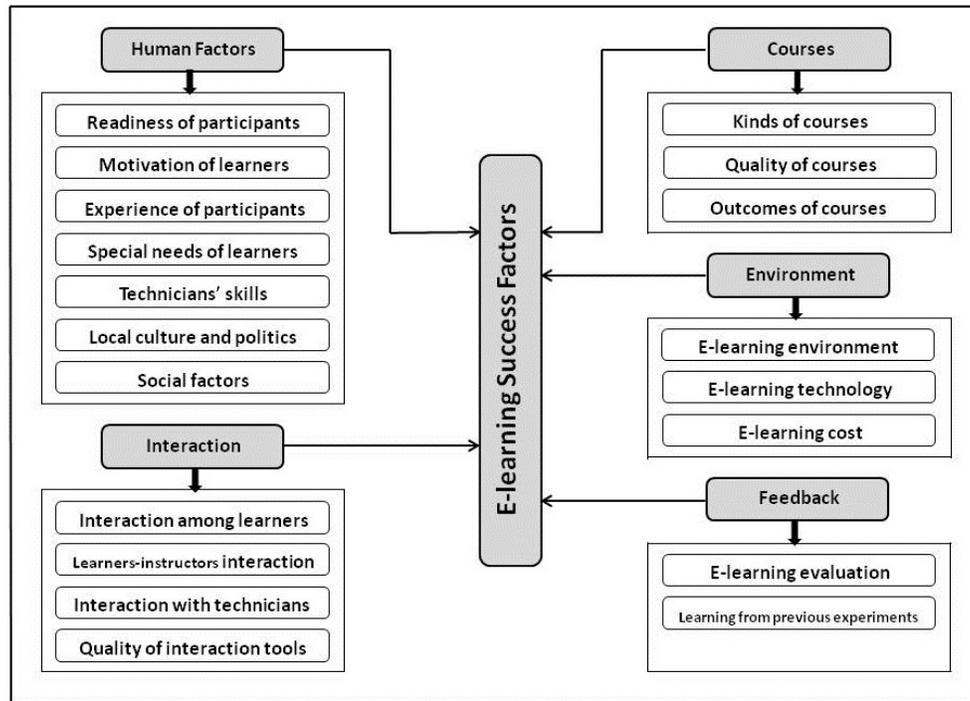
Figure 2. Critical Success Factors Model for E-learning.

Finally, respondents were asked to assess how much each factor affect e-learning success using scale that ranges from 1 to four (1= never affects, 2= little important, 3= important and 4= very important). More than 50% of respondents considered each factor as important or very important except for the hypothesis number 5 that is related to the skills of technicians who manage the e-learning process.

REFERNCES

[1] Piccoli, G., Ahmad, R., & Ives, B. (2001). Web-based virtual learning environments: A research framework and a preliminary assessment of effectiveness in basic IT skills training. *MIS quarterly*, 401-426.

[2] Wilson, B. G. (Ed.). (1996). Constructivist learning environments: Case studies in instructional design. *Educational Technology. Educational Technology Publications, Englewood Cliffs, NJ.*

[3] Stonebraker, P.W., Hazeltine, J.E., 2004. Virtual learning effectiveness. *The Learning Organization* 11 (2/3), 209–225. Govindasamy, T. (2001). Successful implementation of e-learning: Pedagogical considerations. *The Internet and Higher Education*, 4(3), 287-299.

[4] Johnson, R. D., Hornik, S., & Salas, E. (2008). An empirical examination of factors contributing to the creation of successful e-learning environments. *International Journal of Human-Computer Studies*, 66(5), 356-369.

[5] Paechter, M., Maier, B., & Macher, D. (2010). Students' expectations of, and experiences in e-learning: Their relation to learning achievements and course satisfaction. *Computers & Education*, 54(1), 222-229.

[6] Wang, Y. S., Wang, H. Y., & Shee, D. Y. (2007). Measuring e-learning systems success in an organizational context: Scale development and validation. *Computers in Human Behavior*, 23(4), 1792-1808.

[7] Holsapple, C. W., & Lee-Post, A. (2006). Defining, Assessing, and Promoting E-Learning Success: An Information Systems Perspective*. *Decision Sciences Journal of Innovative Education*, 4(1), 67-85.

[8] Goi, C. L., & Ng, P. Y. (2009). E-learning in Malaysia: Success factors in implementing e-learning program. *International Journal of Teaching and Learning in Higher Education*, 20(2), 237-246.

[9] Alhomod, S., & Shafi, M. M. (2013). Success Factors of E-Learning Projects: A Technical Perspective. *Turkish Online Journal of Educational Technology-TOJET*, 12(2), 247-253.

[10] Mbarek, R., & Zaddem, F. (2013). The examination of factors affecting e-learning effectiveness. *International Journal of Innovation and Applied Studies*,2(4), 423-435.

[11] Selim, H. M. (2007). Critical success factors for e-learning acceptance: Confirmatory factor models. *Computers & Education*, 49(2), 396-413.

[12] Johnson, R. D., Hornik, S., & Salas, E. (2008). An empirical examination of factors contributing to the creation of successful e-learning environments. *International Journal of Human-Computer Studies*, 66(5), 356-369.

[13] Khan, B. H. (2001). A framework for web-based learning. Engelwood CliVs, NJ: Educational Technology Publications.

[14] Gattiker, U. E., & Hlavka, A. *Computer attitudes and learning performance: Issues for management education and training. Journal of Organizational Behavior*, 13(1), 89–101.

[15] Barbeite, F. G., & Weiss, E. M. (2004). Computer self-efficacy and anxiety scales for an Internet sample: testing measurement equivalence of existing measures and development of new scales. *Computers in Human Behavior,* 20, 1–15.

[16] Joo, Y. J., Bong, M., & Choi, H. J. (2000). Self-efficacy for self-regulated learning, academic self-efficacy, and Internet self-efficacy in web-based instruction. *Educational Technology Research and Development,* 48(2), 5–17.

[17] Arbaugh, J. B. (2000). Virtual classroom characteristics and student satisfaction with internet-based MBA courses. *Journal of Management Education,* 24(1), 32–54.

[18] Thurmond, V. A., Wambach, K., & Connors, H. R. (2002). Evaluation of student satisfaction: determining the impact of a web-based environment by controlling for student characteristics. *The American Journal of Distance Education,* 16(3), 169–189.

[19] Phipps, L., & Kelly, B. (2013). "Holistic approaches to e-learning accessibility" .*ALT-J: Research In Learning Technology*, 14(1), 69-78.

[20] Davis, F. D, (1989) "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, pp. 319- 340.

[21] Amoroso, D. L., & Cheney, P. H. (1991). Testing a causal model of end-user application effectiveness. *Journal of Management Information Systems,* 8(1), 63–89.