

A REVIEW ON THE SUCCESS FACTORS OF E-LEARNING

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ABSTRACT

E-learning as a network of sharing knowledge has changed dramatically the traditional concept of learning. To develop and implement a successful e-learning system, it is vital that institutions recognize the success factors of e-learning systems. This study reviewed the success factors and identified the most important technological aspects of e-learning. E-learning technological aspects were described and grouped into six categories, which are ease of access, interface design, level of interaction, system quality, service quality, and internet quality. A survey instrument incorporating these aspects was developed and was pilot-tested on a sample of thirty students. The results from the pilot study revealed that the survey instrument is highly reliable and thus would be useful to researchers who intend to develop and implement e-learning systems.

KEYWORDS

Critical success factors, E-learning, Information technology, Technology-related factors, Reliability analyses, and Content validity.

1 INTRODUCTION

E-learning has emerged as a type of distance learning in American education system in the middle of nineteenth century. Since then, e-learning has changed higher education pedagogical approach and has resulted in numerous changes in previous learning concepts [1], [2]. Solid understanding of user acceptance processes and giving learners encouragement to utilize these technologies could lead to successful adoption and implementation of an e-learning system [3]. Current technology makes it possible to deliver knowledge anywhere at any time beyond a physical space. For example, adopting new e-learning technologies such as instant messaging, video conferencing, chat rooms, email, and file sharing for student group

assignment enables work to be completed remotely.

The Technology Standard Committee defines e-learning system as an electronic device which facilitates teaching and learning processes by using web browsers to establish interaction between learners and others [4]. The interest to adopt e-learning within higher learning institutions as a learning device is growing. Many institutions use e-learning because it facilitates training, saves time and reduces costs such as travelling, printed materials, and laboratory costs.[5], [6], [7].

Many developing countries are now interested to implement e-learning [8] but they encounter difficulties in online communication, instructional design and many other technological aspects [9]. The success in using e-learning is defined in terms of reducing the time and costs of training students and e-learners. Besides that, ease of access for students and lecturers, learner's satisfaction and the provision of a variety of other services are also defined as e-learning success factors. Some studies have shown that problems related to e-learning variables and factors will affect e-learning efficiency and learning objectives achievement. More in-depth studies are needed to identify the success factors of an e-learning system to ensure its successful implementation. Apart from the studies conducted on the most important critical success factors for e-learning, there is a growing need to identify information technology (IT) related factors and their effects on the adoption of an e-learning system.

In developing countries, the main aim of an e-learning system is to provide education for poor students [10]. The political, cultural and economic issues in developing countries have influenced the usage of technology within the education systems [11]. On the contrary, the main aim of e-learning in developed countries is

to cultivate an operative knowledge economy and increasing lifetime of the education system [12]. “The efficient and effective use of IT in delivering the e-learning based components of a course is of critical importance to the success and student acceptance of e-learning” [13]. Also the capability, reliability and richness of university IT infrastructure to deliver the courses as smooth as possible are critical to the success of e-learning [14].

The rapid growth in the use of web-based technologies in education has prompted institutions of higher education to take steps to ensure effective implementation of e-learning. Our study was conducted to identify the most important success factors and the technological related factors that affect the usage of e-learning. The results of this study on the important technological factors may give insight on successful implementation of e-learning systems.

2 CRITICAL SUCCESS FACTORS OF E-LEARNING

Instructor, student, information technology, and university support are four groups in the classification of e-learning critical success factors (CSFs) within a university environment [14]. The three main CSFs in e-learning which have been identified by a study on students at an Australian University are: technology (ease of access and navigation, interface design and level of interaction); instructor (attitudes towards students, instructor technical competence and classroom interaction); and previous use of technology from a student’s perspective [15]. Student prior IT experience, having a computer at home and attitude towards e-learning is critical to e-learning success [14].

E-learning is a result of merging information technology with education. The CSFs for e-learning in developing countries include motivation toward e-learning, awareness and

ability of basic technology, good university support, computer training, and quality learning materials [10]. Learner attitudes, instructor quality, system quality, information quality, service quality, and support are important factors for learners’ satisfaction [16].

Vital success factors for e-learning also include the environment of e-learning [1] and the knowledge management dimension of e-learning [17]. Students are the preliminary data sources of CSF studies [1], [14], [15], [17], [18]. System quality and information quality are the technological aspects of e-learning which could influence e-learner satisfaction and could consequently lead to e-learning success [19], [20]. Service quality is another technology-related aspect that affects ease of use and success in e-learning [2].

System quality raises the efficiency of learning management systems (LMS) whilst content quality brings value and learner satisfaction [16]. Previous experience in adopting new technology affects the learning success for learners [21]. E-learning CSFs are related to e-learning course, intellectual property, student’s performance, instructor, technology, and previous use of technology [22]. Studies in examining the framework of CSFs are briefly summarized in Table 1.

3 TECHNOLOGICAL RELATED FACTORS OF E-LEARNING

From Table 1, based on previous researches, information technology was identified as the most important factor among all success factors in an e-learning system.

In this section, we identify the technological related aspects that affect the use of e-learning. The relevant references on the technological related aspects of e-learning success are shown in Table 2.

Table1. Critical Success Factors of E-learning

Factors	Bhuasiri et al., 2011	Chiu et al., 2007	Masrom et al., 2008	Mosakhan y & japorzmy 2010	Ozkan & Koseler, 2009	Roca et al., 2006	Selim, 2007	Selwyn et al., 2005	Sun et al., 2008	Volery & Lord 2000	Wang & Wang, 2009	Total
Instructor	✓		✓		✓		✓		✓	✓		6
Student	✓		✓	✓	✓		✓		✓			6
Information Technology	✓	✓	✓		✓	✓	✓		✓	✓	✓	9
University Support	✓						✓		✓			3
Basic Technology Knowledge	✓		✓				✓	✓	✓			5
Course Learning Materials	✓	✓	✓		✓	✓			✓			6
E-learning Environment									✓			1
Level of Collaboration	✓											1
Knowledge Management				✓								1
Effective Support	✓								✓			2

3.1 Ease of Access (EA)

Ease of access as one of the technology related elements in e-learning refers to the easy access and usability of the website for students. This feature would enable students to log in the system at any time to take full advantage of the access flexibility offered by website [15]. Ease of access is also a technological factor that influences the e-learning success [14].

3.2 Interface Design (ID)

Interface design is related to the visual structure and design of the Internet course to make it appealing and well-structured [15]. Screen design or visual technology interface has an important effect on successful implementation of e-learning systems [14].

3.3 Level of Interaction (LI)

The interactive communication in the e-learning course between students and the instructor

promotes a virtual classroom environment in which there is no need for students to be in a classroom to experience interaction with classmates and the instructor [15].

3.4 System Quality (SQ)

System quality represents availability, ease of use, reliability, and response time [2]. So system quality is positively related to learners' satisfaction with web-based learning, higher learning, personalization and interactivity [1], [16], [19], [20].

3.5 Service Quality (SEQ)

Service quality affects positively learners' satisfaction in web-based learning [15], [16], [19], [20]. Service quality also increases perceived ease of use [2].

Table2. Technology Related Aspects of E-learning

Authors	Chiu et al., 2007	Ozkan & Koseler, 2009	Roca et al., 2006	Selim, 2007	Sun et al., 2008	Volery & Lord, 2000	Wang & Wang, 2009
Technology factors							
Ease of access				Perceived usefulness.		Site access & software usability so logged in at any time.	
Interface Design				Perceived usefulness.		visual structure and design of the Internet	
Level of interaction						To have a truly virtual classrooms.	
System quality	Learner's satisfaction.	Higher learning effects.	Learner's satisfaction, Higher learning, Personalization and Interactivity.		Satisfaction in e-learning.		
Service quality	Learner's satisfaction.	Learner's satisfaction	Learner's satisfaction			Affects positively learners' satisfaction.	Increase perceived ease of use.
Internet quality		E-learner's satisfaction			Satisfaction in e-learning.		

3.6 Internet Quality (IQ)

Internet quality is network quality as perceived by learner, and this factor is found to affect perceived e-learner satisfaction [1], [16].

4 METHODOLOGY

In order to do more deep analyses of the technological aspects of e-learning that influence successful implementation of e-learning, we conducted a pilot study involving thirty diploma students. The responses to the survey were analyzed using the Statistical Package for the Social Sciences (SPSS) v20 Windows software program.

The purpose of the pilot study was to establish the reliability and validity of the survey instrument.

This study developed a survey consisting of two main parts. The first part consists of demographic questions on Gender, Age, Course, Type of study, Semester, Number of years' as an e-learning user. The second part is divided into six dimensions of CSFs and technological aspects of e-learning. The items as shown in Table 3 are divided into the six sections based on previous studies on e-learning. Some items are newly developed in this study based on the comments gathered from student interviews regarding their problems in using the university e-learning system. The survey consists of five-point Likert scale items (Strongly Disagree, Disagree, Slightly Agree, Agree, and Strongly Agree).

The initial draft of the survey instrument was reviewed by three experts with backgrounds in e-learning from the IT-management, Language and Technology Innovation departments to establish the validity of the instrument.

5 RELIABILITY AND VALIDITY ANALYSIS

5.1 Reliability

Reliability was evaluated by assessing the internal consistency of the items using

Cronbach's alpha. The 30-item instrument had a high reliability of 0.894, far exceeding the minimum standard of 0.80 suggested for basic research. Table 3 shows the Cronbach's Alpha reliability coefficient for each of the six factors: Ease of access=0.615; Interface design=0.818; Level of interaction=0.669; System quality=0.821; Service quality=0.642; and Internet quality=0.343 (see Table 3).

If the overall Cronbach's alpha coefficient of all items of a construct is greater than 0.7, the items are considered highly reliable [23].

Table3. Summary of the Results from the Items Used in Pilot Study

Items	Cronbach's alpha
Ease of access (EA)	0.615
EA1 E-learning system is easily accessible via Internet.	
EA2 I can easily access the e-learning system anytime I need to use it.	
EA3 I did not experience any problems while browsing.	
EA4 I have access to enough computers for the use of e-learning.	
EA5 I have access to all subjects on the e-learning.	
Interface Design (ID)	0.818
ID1 The information structure in e-learning is well organized in partitions.	
ID2 The Information used in e-learning is easily understandable.	
ID3 The screen design in e-learning is interesting.	
ID4 Web site of e-learning contains useful features.	
ID5 Fonts (style, color) are easy to read on screen.	
Level of interaction (LI)	0.669
LI1 I can interact with classmates through e-learning.	
LI2 I can easily contact the instructor through e-learning.	
LI3 The quality of class discussions was high throughout the course in e-learning.	
LI4 Interaction in class is very active when I use e-learning.	
LI5 E-learning system supports different kinds of tools for interactivity between learners and instructor.	
System quality (SQ)	0.821
SQ1 The Web-based learning site provides quick responses to my requests.	
SQ2 The Web-based learning site can quickly load all the texts and graphics.	
SQ3 I can find required information easily on Web-based learning site.	
SQ4 I feel the web-based learning system is user-friendly.	
SQ5 The web-based learning system is update.	
Service quality (SEQ)	0.642
SEQ1 I feel comfortable using the functions and services provided by the Web-based learning site.	
SEQ2 I did not experience any problems during registration.	
SEQ3 Employees of the information service department have sufficient professional knowledge.	
SEQ4 I can communicate with the employees of the information service department through multiple channels when I encounter technical problems and require quick responses.	
SEQ5 Employees of the information service department can quickly fix my technical problems.	

Items	Cronbach's alpha coefficient
Internet quality (IQ)	0.343
IQ1 I am satisfied with the speed of the Internet for e-learning.	
IQ2 I feel the connection quality is not good to use e-learning.	
IQ3 I feel the fee to connect to the Internet is very expensive.	
IQ4 I feel a connection to the Internet is easy to use e-learning.	
IQ5 I feel satisfy with the connection tools to internet to use of e-learning.	

Based on the results from our pilot test, the overall reliability of the survey instrument is acceptable and further changes to the instrument are not necessary. We maintain the low-reliability items because the survey was distributed to a small sample of students and furthermore, the experts opine that the items are relevant to the respective constructs.

Table 4 shows the data collected from pilot studies of previous studies.

Table4. Previous Pilot Studies

Literature	Pilot study description
Wang & Wang, 2009	Pilot study on 20 instructors of higher education. The overall Cronbach's alpha of all items is greater than 0.7. Based on the feedback from the pilot test, the questionnaire was further refined.
Ozkan & Koseler, 2009	Pilot study was applied to 90 undergraduate level1 students. All the factors had high values of Cronbach's alpha. Based on the findings from the pilot study and expert's comments, the survey was revised.
Sun et al., 2008	Pilot test using 36 MBA students. Based on the feedback from pilot study, some items were revised and deleted. Reliability for 295 students was above 0.72, which is acceptable.

5.2 Content Validity

The survey instrument was sent and reviewed by three quality experts to check on the following issues:

- A. The representativeness and relevance of the items to the e-learning success factor constructs.
- B. The degree of the difficulty, clarity and semantic content of the items.

The experts agree that the items are appropriate based on the study objectives and that the items

are representative of the important factors for e-learning effectiveness.

Table 5 shows the experts' rating on the content validity of each item.

Only items rated by the experts as "Agree" or "Strongly Agree" are considered in calculating the content validity index (CVI). As all three experts rated "Agree" or "Strongly Agree" on all of the items in the survey, the overall content validity index is 1.00.

Table5. Content Validity Index

Items	Expert 1	Expert 2	Expert 3	CVI
EA1	√	√	√	1.00
EA2	√	√	√	1.00
EA3	√	√	√	1.00
EA4	√	√	√	1.00
EA5	√	√	√	1.00
ID1	√	√	√	1.00
ID2	√	√	√	1.00
ID3	√	√	√	1.00
ID4	√	√	√	1.00
ID5	√	√	√	1.00
LI1	√	√	√	1.00
LI2	√	√	√	1.00
LI3	√	√	√	1.00
LI4	√	√	√	1.00
LI5	√	√	√	1.00
SQ1	√	√	√	1.00
SQ2	√	√	√	1.00
SQ3	√	√	√	1.00
SQ4	√	√	√	1.00
SQ5	√	√	√	1.00
SEQ1	√	√	√	1.00
SEQ2	√	√	√	1.00
SEQ3	√	√	√	1.00
SEQ4	√	√	√	1.00
SEQ5	√	√	√	1.00
IQ1	√	√	√	1.00
IQ2	√	√	√	1.00
IQ3	√	√	√	1.00
IQ4	√	√	√	1.00
IQ5	√	√	√	1.00
Average CVI				1.00

6 FINDINGS

The findings as displayed in Table 1 show that IT factors are the most important success factors for e-learning success. Thus, we conducted this study to identify the technological aspects of e-learning that influence the use of e-learning.

The findings from Table 2 are that most of previous researches identified system quality and service quality as the technological aspects of e-learning.

The findings from the reliability and content validity analysis of the instrument indicate high reliability and validity. Thus, researchers may want to use or adapt this instrument to assess the technological aspects of e-learning systems.

The data collected from the pilot study of this research and previous researches reflect differences in Cronbach's alpha values. This may be due to the respondent's background, curricula, culture, facilities, or the items used in the instrument.

This study considers all six technological aspects of e-learning, which are EA, ID, LI, SQ, SEQ, and IQ in a survey instrument.

7 CONCLUSIONS AND FUTURE WORK

This study reviewed the success factors of e-learning and developed a survey instrument incorporating the technological-related success factors critical for e-learning systems effectiveness.

We conclude that information technology (IT) is the most important success factor that influences the usage of e-learning systems. Technological-related factors that affect the usage of e-learning include ease of access, interface design, level of interaction, system quality, service quality and internet quality. Thus we recommend that institutions give more attention to IT and technological-related factors of e-learning to ensure more successful implementation of an e-learning system. The questionnaire used in this study focuses on the perceived effect of each technological dimension on overall e-learning effectiveness from students' perspective. We recommend researchers to use this instrument in various contexts for the purpose of developing, implementing, and assessing e-learning systems.

The reasons for low reliability of some survey items will be investigated in future studies by distributing the survey forms to a larger sample of students to obtain more reliable results.

Another prospective work is to propose an e-learning model that incorporates all the six technological aspects (EA, ID, LI, SQ, SEQ, and IQ). The objective of the study could be to develop the model, implement it, and investigate its learning effectiveness.

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