Critical Success Factors of E-Learning Systems: A Quality Perspective

Shahid Farid[*]
Mubashra Qadir[**]
Moiz Uddin Ahmed[***]
Muhammad Daud Khattak[****]

Abstract

E-learning is becoming mainstream and novel driving force for the learning and training. Industry and educational institutions are investing heavily in this electronic mode of training and education because of its accessibility, ease of training, up-to-the-minute learning, effectiveness of cost and flexibility. Besides its advantages, low level of uptake in this mode of learning is perceived due to lower quality of these systems. Therefore, this work intends to gather the proposed Critical Success Factors (CSFs) from state-of-the-art literature regardless of the dimension and/or perspective in which these CSFs have been proposed. Moreover, this study scrutinizes the coverage and effect of CSFs on the quality of e-learning systems according to their severity and importance for higher education institutions. Intensive literature review has been done for identification and collection of CSFs regardless of their perspective. Empirical investigations were conducted to extract the CSFs influencing quality of e-learning systems. Cronbach's Alpha and factor analysis method has been utilized to ensure the reliability and ranking the identified factors.

Keywords: E-learning, e-learning implementation, e-learning quality, critical success factor

[*]Department of Computer Science, Bahauddin Zakariya University, Multan, Pakistan
Email: shahidfarid@bzu.edu.pk
[**]Department of Computer Science, Bahauddin Zakariya University, Multan, Pakistan
Email: mubshraqadir@gmail.com
[***]Department of Computer Science, Allama Iqbal Open University, Islamabad, Pakistan
Email: moiz.ahmed@aiou.edu.pk
[****]Regional Director, Allama Iqbal Open University, Peshawar, KPK, Pakistan
Email: daud.khattak@aiou.edu.pk

Introduction

E-learning, which is sometimes also called as virtual or flexible learning, includes as any type of learning that is executed using electronic mode of communication based on the Internet or intranet technology (Abdelaziz, Kamel et al. 2011). Various synonyms have been reported in the existing literature for this novel mode of learning and training. These synonyms include flexible learning, internet-based learning (French, 1999; Gerbic, 2004; Chang, 2016), online learning, technology based learning, borderless learning (Latchem, 2005), electronic learning or web based learning and is occasionally also termed as e-learning (Forman, Nyatanga et al. 2002; Puri, 2012; Khan, 2003; Selim, 2007; Sajja, 2008). In other words, e-learning systems facilitate learners by providing an environment (e-learning environment) for enhancement of teaching and learning activities amongst instructors, learners and various institutes (Hassanzadeh, Kanaani et al. 2012). E-learning environment comprises of various e-learning tools like Learning Management System (LMS), Knowledge Management System (KMS), Content Management System (CMS), or content authoring tools (Babu, 2005; Wilen-Daugenti, 2009;Abdellatief, Sultan et al. 2011; Moore, Dickson, Deane et al., 2011; Farid, Ahmad et al., 2018). Basically e-learning emerges from distance learning, which facilitates learners to improve their qualification(s), knowledge and skills without affecting their jobs and/or other activities with the flexibility of time and place (Wong, 2007; Chang, 2016; Naveed, Muhammad et al., 2017).

It has been observed that more than 1000 institutions in almost 50 countries are getting benefits from this new paradigm of online learning and training (Sharma & Kitchens, 2004; Bhuasiri, Xaymoungkhoun et al., 2012) at the rate of 35.6% in the arena of e-learning (Shahid, 2016).This growth rate of e-learning adoption is not as much as compared to the investment in market of e-learning in developed as well as under developed countries due to enormous factors (Alhabeeb & Rowley, 2017). Numerous researches have been devised for identification of the most crucial factors influencing adoption and implementation of e-learning systems (Soong, Chan et al. 2001; Selim 2007; Bhuasiri, Xaymoungkhoun et al. 2012; Sun, Tsai et al. 2008 & Puri 2012) in various contexts. These important factors are considered as Critical or Crucial Success Factors (CSFs) to address and resolve for the successful deployment of quality e-learning system (Alhabeeb & Rowley, 2017). As there are numerous stakeholders (i.e., learners, administration, instructors, instructional designers, institutions, software

developers, system managers, multi-media designers, online facilitators, learning objects developers etc.) of an e-learning system (Olsina, Lafuente et al. 2001; Selim 2007,Abdellatief, Sultan et al. 2011 & Dubey, 2012). Hence, quality standards of e-learning systems vary amongst various stake holders due to their diverse requirements regarding quality of e-system. The above discussion concludes that CSFs vary according to the diverse needs and roles of e-learning stakeholders. Various researchers have identified the CSFs of e-learning in specific perspectives but still a gap remains that is necessarily required to be addressed (Dutta, Mosley et al. 2011). Collective identification of CSFs of e-learning system developers, managers, instructors and students is still a milestone yet to be achieved. Thus this study contributes in a fashion to pinpoint various CSFs of e-learning system irrespective of any specific perspectives. The broad spectrum of this study enlightens an extensive list of 80 CSFs. In addition to identification, CSFs affecting quality of various e-learning systems are also delineated. This study will contribute to bring light to the collective impact of CSFs from various perspectives. The need of taking into account various perspectives of e-learning will diminish.

This study aims to bring into light the CSFs affecting quality that can play dynamic role in enhancing the quality of e-learning from state-of-the-art literature. Moreover, the identified CSFs have been prioritized on the basis of their prominence for the implementation of a quality e-learning system in context of evolving countries like Pakistan. This study is structured as described underneath; the perception of electronic learning and existing efforts in the arena of CSFs is delineated in section II. Research method adopted to conduct the study is illustrated in section III. Section IV depicts results highlighting the ranking of the factors according to their criticality which are vital for amplification of quality in e-learning systems in the milieu of Pakistan. Section V summarizes the results of this study.

Literature Review

Electronic learning (e-learning) is a very broad but not a very old term; it has been used to describe the wide variety of technologies involved in attaining the concept of "learning beyond the limits". As this mediated learning is mixture of latest technologies including web, which enables to switch to the modern digital classrooms from our traditional mode of learning. Moreover, e-learning is resulted from the merge of various disciplines including IT, CS, pedagogy and etc. (Anggrainingsih,

Nugroho et al. 2016). Therefore, a single comprehensive and precisee-learning definition is hard to find so far (Meredith & Newton, 2003). A typical e-learning system is presented in Fig. 1, mentioning how goal of e-learning quality can be achieved. Before going ahead, it is necessary to explore the concept of e-learning defined by numerous researchers in the literature. Wong (2007) has defined e-learning as the activities of learning based on computers their networks and usage of multi-media technologies. It is stated in Shee and Wang (2008) that e-learning is actually the adoption of various electronic devices for learning purposes via electronic media. According the opinion of Freire (1994) e-learning is new concept which takes exception to the conventional "bucket theory" or banking concept of education, in which role of an instructor is like a bucket which holds all the knowledge and transferred only to those students who attended the class. Furthermore, similar concept of Freire (1994) is argued by Khan (2003) that the courses offered in the boundary of the class rooms can be called the closed learning, because physical presence of students in class is obligatory for getting benefit from the material delivered by the instructor. Khan (2003) further defined e-learning as open, flexible and distributed learning. Open learning can be defined as the learning according to the suitability of learners' time, pace and place (Calder 1998; Khan 2003). Sloman (2001) described e-learning by using the vantage of the connectivity i.e. *"eLearning is emerging as the term referring to the learning technology that takes advantage of connectivity. Learning delivered or received mainly through the internet, intranet, extranets or the web"*(Meredith &Newton, 2003). As a conclusion, one can state e-learning is the learning with that utilizes latest information and communication tools anywhere and anytime, at the ease of the learner with cost effectiveness and desired quality.
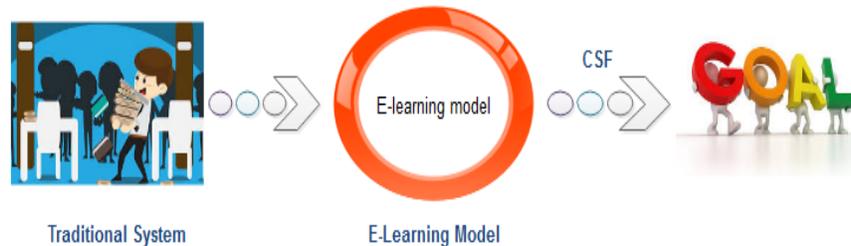

Figure 1: Typical e-learning model to achieve goal

E-learning has created new opportunities for the industry and educational institutions to adopt this latest tool for switching towards e-

learning for the enhancement of their business. Universities all around the world are keeping an eye on innovations in ICT to tackle the issues of cost and quality (Selim, 2007).Universities are now making use of ICT for efficient, enhanced, flexible and effective learning (Selim, 2007).

ICT are major driving force behind creation of competition among educational institutes irrespective of their boundaries and as well as ICT cast global impact (Phipps & Merisotis, 1999; Burkle & Sayed, 2001; Laurillard, 2001; Meredith & Newton, 2003). Hence, industry and educational institutions are investing heavily in this electronic mode of training and education due to its vantages. Besides its advantages and popularity, low level of uptake in e-learning systems is perceived (Alhabeeb & Rowley, 2017) due to poor quality of e-learning systems (Sun, Tsai et al. 2008; Masoumi & Lindström, 2012; Farid, Ahmad et al. 2018).In order to cope up with this emerging challenge, different researchers have devised various e-learning approaches and models to enhance the quality of e-learning systems by limiting the growing demand of various educational institutions and industries in the arena (Meredith & Newton 2003; Farid, Ahmad et al. 2018). Issues of technology regarding the effective quality e-learning delivery are being addressed by these models (Dutta, Mosley et al. 2011). Varied number of core technologies are evolving that can facilitate the design and deployment of e-learning system. A far-reaching influence on e-learning is accomplished in this new era (Cidral, Oliveira et al. 2017).

Quality of E-Learning Systems

According to Institute of Electrical and Electronic Engineer (IEEE), quality can be defined as "The degree to which a system, component or process meets the specified requirements". IEEE further explained quality as the degree to which a system, component, or process meets customer or user needs or expectations". Quality of a system reflects its effectiveness; similarly, quality of education system can be assessed by its effectiveness (Sajja, 2008). Hence, quality is crucial for e-learning system as numerous analyses concluded that the future of e-learning based on its quality (Ehlers, 2004). Furthermore, a precise measure of quality of e learning systems is still not lacking (Pawlowski, 2003).Thus, a breach lies between actual practices and theoretical grounds of quality assessment and assurance of e-learning (Chua & Dyson, 2004; Ozkan& Koseler, 2009; Abdellatief, Sultan et al., 2011). For gaining acceptance among instructors and learners, maintenance of quality of e learning system is creditworthy. Therefore, identification of CSFs that affect

quality of e-learning system is emerging as a widespread obstacle in facilitation of learners by enhancement of availability, usability, performance of instructor and as well as lessening of the cost of education (Masoumi & Lindström, 2012).

Critical Success Factors (CSFs)

The term Critical Success Factors (CSFs) was first time coined in 1980s when an interest was developed that why some organizations achieving their goals more successfully than other organizations. A research regarding the identification of the key factors of success was carried out by Ingram, Biermann et al., (2000). CSFs could be stated as *"those things that must be done if a company is to be successful"* (Freund, 1988). For better control and measure, the CSFs should be limited in number. Tom De Marco advocated it in another way as *"you cannot control what you cannot measure"*. It is clearly evident that CSFs should be less in numbers so that to measure and assess them easily. It is urged by Selim (2007) that CSFs can be grouped into various categories within university environment. These categories can be instructor, student, information technology and university support. Various researchers identified different CSFs according to diverse perspectives (like technology, contents, learners, institutions, administration, instructors, managers, software developers, online facilitators, designers of multi-media, instructional designers, developers of learning objects and etc.) of e-learning system. Volery and Lord (2000) indicated three CSFs of e-learning on the basis of a survey amongst 47 students of e-learning management course of arenowned Australian university. CSFs proposed by (Volery and Lord 2000) are *technology* (navigation, ease of access, design of interface and interaction level); *instructor* (instructor technical competence, attitudes of instructor towards students and interactions of classroom) and *prior usage of technology* from the students' perspective. After applying a multiple case study method by Benson Soong, Chuan Chan et al. (2001) a number of CSFs identified including human factor, technical competency of instructor as well as student, collaboration level of student, technological infrastructure of perceived information and e-learning mindset of instructor and student. It has been identified by Frankola (2001) that lack of motivation, lack of student time, failure of management and supervision are antecedent of low satisfaction rate of e learning. However, Helmi (2001) indicated three driving initiatives to drive e-learning that are market demands, information technology (IT) and educational advisors like universities. A comprehensive study was carried out by Bhuasiri, Xaymoungkhoun et al. (2011) proposing six dimensions of e-learning system including instructors'

characteristics (self-efficacy, timely response, focus on interaction, technology control, attitude towards students and fairness of interaction), Learners' characteristics (internet self-efficacy, computer efficacy and attitude towards e-learning), course and information quality (quality of course, relevancy of content and flexibility of course)infrastructure and system quality (quality of internet, system functionality, reliability, ease of use, system response and system interactivity), extrinsic motivation (perceived usefulness and clarity of direction) following prioritization of the proposed dimensions. Three main characteristics that influence the efficacy of an e-learning environment are characteristics of instructor, characteristics of students and technology as indicated in different studies (Leidner & Jarvenpaa, 1993; Dillon &Gunawardena, 1995). It is reported in literature that user's attitude, user's satisfaction, user's usefulness, subjective norms, user's concentration and perceived behavioral control tremendously influence the continuation of e-learning (Lee, 2010). Levy (2007) delineated that student satisfaction is key indicator of successful e-learning. Instructional design, friendly electronic environment, interaction between students, interaction among students and teachers, cognitive and emotional outcomes play imperative role in successful e-learning system (Paechter, Maier et al. 2010). Lin and Bhattacherjee (2010) highlighted that perceived usefulness, perceived ease of use and attitude are crucial for success of e-learning system. Quality educational system and compliance objective were included in critical success determinants by (Hassanzadeh, Kanaani et al. 2012). Student preparedness was also marked as imperative for e-learning success (Parkes, Stein et al., 2015).

State of the art literature is deficient to address the CSFs affecting quality of tools used in e-learning in spite of their importance in determining quality and their influence on user satisfaction. Therefore, this study contributes to identify the CSFs encountered by the quality assurance of various e-learning systems. Furthermore, this study also subsidizes in ranking the CSFs according to their criticality for a quality e-learning system in Pakistani context which has never been done before. For the efficacious implementation of e-learning model from traditional model, the educational institutes require adequate knowledge about impact of CSFs for achievement of e-learning goal (Asalla, Putri et al., 2017).

Methodology

Adoption of fitting research model is vital for efficient conduction of every research study. In this study, quantitative research methodology was adopted for accomplishment of formulated research objectives.

Entire population or targeted group of people is chosen randomly for generalization of quantitative research findings (Rahman, 2016). Once the data is collected then less time is required for analysis of data as it employs novel statistical software like SPSS (Connolly, 2007). The process espoused to conduct this study is illustrated in Figure. 2.
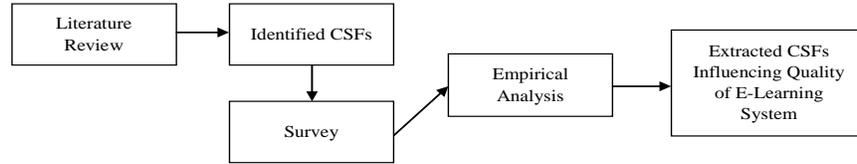

Figure 2: Process Adopted to conduct the study

Sample

Pilot-testing was conducted before conducting the survey to ensure the content validity and consistency of the items of the survey instrument by administrating it to 4 experts of the domain. These experts were selected from academia, research and software development industry, acquiring more than 5 years of experience in respective domain. Comments from the experts were incorporated in order to finalize the instrument. 130 survey questionnaires were distributed among targeted population of this study, out of which 97 responses were received at the rate of 75%. The demographic profile of respondents is tabulated in Table 1.

Table 1

Demographic profile of respondents

Demographics	Frequency	Percentage
Gender		
Male	41	42.27
Female	56	56.56
Age		
20-30	6	6.18
31-40	23	23.71
41-50	43	44.33
51-60 and above	24	24.74
Qualification		
Masters	38	39.18
MS	47	48.45
Doctorate	22	22.68
Designation		
Software developers	20	20.62
Researcher	22	22.68
E-learning administration	42	43.29
Academia	13	13.40

Data Collection

81 critical success factors of e-learning were identified by conducting an extensive literature review. More than 60 research publications from well renowned journals, conferences and case studies were reviewed critically in order to gather CSF regardless of the dimension or perspective in which these were proposed.

Moreover, data was gathered by requesting the respondents to rate each CSF using five-point Likert scale ranging from 1 (Not Critical) to 5 (Most Critical) relates to criticality impact of the factors on quality of e-learning systems. The scale values in accordance with the level of agreement are illustrated in Table 2.

Table 2

Five Point Likert Scale

Level of agreement	Scale value
Most critical	5
Slightly critical	4
Normal	3
Least critical	2
Not critical	1

An exhaustive list of critical success factors of e-learning was formulated by collecting data State-of-the-art literature was intensely investigated to trace out distinctive CSFs of e-learning. Furthermore, respondents were requested to add various challenges in the list and then the list was evaluated. This strategy enhanced the consent of the respondents. Major sources of data collection are shown in Figure 3.
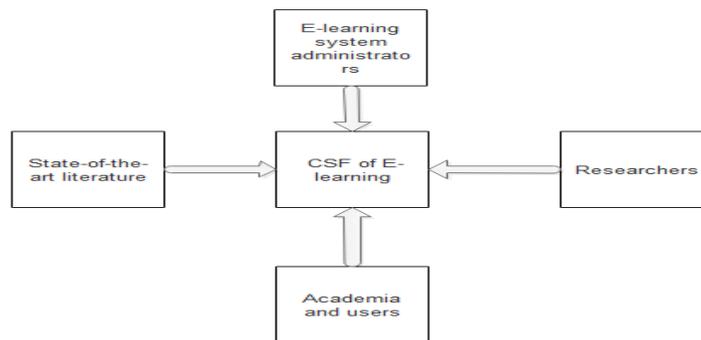

Figure 3: Sources of data collection

Empirical Analysis Tools

Data gathered from survey questionnaire was analyzed to attain the objectives of the study. Different tools like Cronbach's Alpha and Factor Analysis were deployed in order to analyze the data collected from survey questionnaire.

Reliability and Internal Consistency

Cronbach's alpha is one of the widely utilized objective methods to gauge the internal consistency and reliability of the instrument (Cronbach, 1951; Pallant, 2010). Cronbach's alpha generally expressed in numeric value ranging from .00 to 1.0 (Tavakol and Dennick 2011). Where .00 reflects no consistency and 1.0 means perfect consistency among the items of the instrument. However, acceptable range is considered from 0.7 to 0.9 or higher. Hence, values greater than 0.7 represents the better reliability and consistency (Jum & Ira 1978). Cronbach's alpha of this instrument was 0.86 which indicates higher consistency and reliability between the items of the formulated instrument.

Extracting Potential CSFs Quality

In order to extract the potential CSFs (affecting quality of e-learning system), factor analysis is utilized on the identified CSFs from state of the art literature. This method is applied to abridge the variables (CSFs in this study) from bigger set of data into confined number of items (Pallant, 2010). The process of extracting the potential items is generally adopted while conducting research activities in various arenas of social and applied science and is believed a way to interpret self-explanatory questionnaire (Tam &Tummala, 2001; Williams, Brown et al. 2012). Numerous variations in the method of factor analysis like Principal Component Analysis can easily be perceived from the literature (Tam & Tummala, 2001; Vizcaíno, García et al. 2013).

Results and Implications

Results of the survey conducted with the targeted population were summarized. Mean value of each of the CSF was calculated and arranged in descending fashion. The cutoff value i.e. 3.08 has been figured by computing the mean value of the max-mean i.e. 4.19 and min-mean i.e. 2.84. The cutoff was then deployed to ascertain the CSFs obtaining mean

value $\geq$ 3.08. However, CSFs having mean value < 3.08 were not considered crucial according the empirical data obtained from the experts.

Ranking of CSFs

Ranking of the CSFs have been conducted obtaining the results after applying factor analysis method. The CSFs having mean value greater than cutoff value has been arranged in descending order to device the ranks of the factor to enhance the quality of e-learning systems. Table 3 is illustrating the CSFs with respect to their significance for the quality of e-learning systems. Perceived usefulness, lack of learning objects in local languages, quality of educational system, Lack of instructional designer, lack of instructional designprocess and information quality have been emerged as top critical factors becoming hinders for the quality of e-systems crucially according to the opinion of the respondents of the study.

Table 3

CSFs affecting quality of e-learning Systems

CSFs	Mean
Perceived usefulness	4.38
Lack of LOs in local language	4.32
Quality educational system	4.21
Lack of instructional designer	4.19
Lack of instructional design process	4.14
Information quality	4.11
Lack of software quality assurance process	4.09
Service quality	4.05
Navigation	3.99
Lack of formal implementation process	3.94
Well-structured functionality	3.94
Interaction between students and students	3.90
Student satisfaction	3.88
Robust data protection system	3.86
Ease of access of software	3.85
Establishing suitable learning models	3.83
Interaction of students with instructors/teachers	3.83
Perceived ease of use	3.82
Perceived playfulness	3.81
Customization /adaption	3.75
Student interface	3.73
Good testing and piloting before release	3.73
Quality of interface	3.73

Implication

The study facilitates higher education institutions and government agencies working for the enhancement of e-learning in the country. Policy makers like Higher Education Commission of Pakistan should consider ranked factors to resolve on priority in order to achieve quality in e-learning systems.

Limitations

The study postulates some limitations regarding CSFs of e-learning systems. Primary focus of the study was to identify and rank CSFs reported in the existing literature so far regardless of the dimension or perspective in which there have been proposed. Further investigation is recommended by considering CSFs affecting quality of e-learning system in respective/appropriate dimensions. Furthermore, various stakeholders of e-learning systems can also be considered while categorizing the CSFs in to respective perspectives.

Conclusion and Future Work

E-learning is becoming main stream for education and training due to the opportunity of ease of access regardless of time and place. Due to this quality of digital learning, universities round the globe are investing heavily in this paradigm of learning to reap its benefits like cost effectiveness, access to the remote learners etc. However, student adoption of this computer mediated learning is not as much as it was expected especially in developing countries like Pakistan. As future of e-learning depends upon its quality which is being affected negatively due to various CSFs. 81 CSFs has been identified from state of the literature regardless of the dimension or perspective in which it has been proposed. Empirical investigations have been conducted following survey questionnaire with experts of the arena. This study reveals 23 CSFs on the basis of opinions of the respondents of the study. Perceived usefulness is considered as one of the top most factor hindering quality of e-learning systems. Identified CSFs need prompt attention by the government agencies monitoring quality of education in the country.

This exploratory study is first step towards identification of CSFs affecting quality of e-learning systems in the country. This study can be

enhanced by categorizing the potential factors with respect to the stakeholders' role in e-learning system.

In future, these CSFs shall be characterized in to appropriate dimensions on the basis of their relevance with the specific perspective. Qualitative mode of research shall be conducted in order to categorize the revealed CSFs of this study.

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