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Are Critical Success Factors Always Valid for Any Case? A Contextual Perspective

WEAM ALKARNEY AND MAJED ALBRAITHEN
Information Systems Department, Al-Imam Muhammad Ibn Saud Islamic University, Riyadh 13318, Saudi Arabia
Corresponding author: Weam Alkarney (waalkarney@sm.imamu.edu.sa)

ABSTRACT The critical success factor (CSF) concept systematically highlights the key areas which management should carefully consider in order to realize its performance goals. By understanding the CSFs for the implementation of a system, an organization can successfully determine the issues that critically affect the process, enabling it to eliminate or avoid any problems that might contribute to its failure. The purpose of this paper is to investigate whether the CSFs presented in the literature are always valid for any case. It reports an exploratory case study which adopted a qualitative methodology to achieve a deep understanding of the CSFs for learning management system (LMS) implementation in Saudi Arabia from the students' perspective. Having identified these CSFs, it compares them with those reported by other studies in the literature. The results indicate that such CSFs are not similar in all contexts. Studying the change in its context is in fact found to be significant and information system success is determined to be not a purely technical issue but a socio-technical one. Accordingly, the widely recognized CSFs are undeniably beneficial but not sufficient to ensure the success of LMS implementation.

INDEX TERMS Change management, critical success factors, information system development, learning management system, socio-technical theory.

I. INTRODUCTION

Rapid developments in technology and communications have transformed the processes of teaching and learning [1]. Numerous opportunities, plans, and platforms have emerged globally which offer vital support for education [2]. One of these is the adoption by higher education institutions of learning management systems (LMSs) such as Blackboard and Moodle [3].

An LMS or electronic learning (e-learning) system is "a software application designed with the specific intent of assisting instructors in meeting their pedagogical goals of delivering learning content to students" [3]. These systems can be utilized to improve traditional methods of learning and to support distance education [4]. To do this, LMSs have many features and tools that contribute to organizing students' activities and uploading course materials [5]. They also facilitate the submission of assignments and the taking of online tests [6]. Another major contribution of LMSs is to improving students' communication with instructors and amongst themselves. Thus, teachers and learners can share instructional materials and announcements related to any course, while various facilities such as chatting tools and wikis allow active online engagement between users [7].

Despite heavy investment in both developed and developing countries and regardless of how advanced in information and communications technology (ICT) they are, LMSs face a number of constraints on their success [8]. Generally, the likelihood of systems failure is high [9]. Indeed, very many information system (IS) projects are unsuccessful and they are more often subject to failure than most other projects, with many failing to realize their objectives [10]. A common issue with LMSs is a low level of utilization by learners. A number of researchers have addressed this by endeavoring to identify the factors most critical to the successful adoption and use of LMSs, in other words, the critical success factors (CSFs) [11]. The first step toward the successful implementation of an LMS in educational institutions appears to be the uptake of the system by the academic staff [8]. It is also important to note that e-learning is "a student-centered approach in which students are the main stakeholders and perceived beneficiaries" [12]. Hence, the benefits of investing in an LMS cannot be realized if there is a low level of utilization by these stakeholders and this is regarded as constituting a system failure [13], [14].

The term 'CSF' first appeared in the late 1980s, when some firms were found to be more successful than others

in similar situations, prompting research to identify the reasons for these differences [15]. The purpose of CSFs is to systematically highlight the key areas which management should carefully consider in order to realize performance goals [16]. Thus, CSFs are defined as ''those things that must be done if a company is to be successful'' [17] or conversely as ''the limited number of areas in which results, if they are satisfactory, will ensure competitive performance for the organization'' [18]. A higher education institution which identifies and understands the factors that critically affect the implementation of a new LMS will thereby be enabled to eliminate or avoid the causes of poor uptake by the system's stakeholders, namely the students and academic staff.

On the whole, past research studies have recognized diverse CSFs rather than sets of similar factors, reaching no consensus on the key factors underlying system success. One possible reason is that these studies have been conducted in different countries that vary in cultural, legal, regulatory and economic terms [19]. Significantly, the supposed CSFs examined in those studies that have been conducted in developing countries have tended to be factors identified in the context of developed countries [20], while few published studies have explored the CSFs of e-learning in the Middle East generally and in Saudi Arabia specifically [11].

The context of this study is LMS use in higher education establishments in Saudi Arabia, a developing country in western Asia. The Saudi government has provided $125 million to support e-learning adoption by educational institutions [11], but it has been noted that this large public investment in educational technology is not proportionately reflected by the effective implementation of e-learning in many Saudi Arabian universities [21].

The motivation of this work originated when the researchers reviewed the literature and found that past research studies had recognized diverse CSFs rather than sets of similar factors. Therefore, we confronted a challenge in determining the key factors underlying system success. Identifying the reason for the lack of consensus on these success factors would contribute to raising awareness of how these factors should be handled, thus reducing the rate of failure of ISs. Consequently, we raised the question of the relationship between the CSFs and the context in which they are applied. This study aims to answer one question: are CSFs always valid for any case? To date, few studies have investigated how the CSFs for LMSs are ranked through the various phases of implementation or sought to determine the weight of these factors in each phase. Furthermore, there is a lack of clarity as to how these factors interact with each other or are handled during LMS implementation. A number of other researchers have recognized these limitations when investigating the CSFs for different ISs (e.g. [19], [22]–[24]). Accordingly, the objectives of this study are: first, to critically review the literature on the CSFs for ISs generally and LMSs specifically; second, to identify these factors and classify them by their priority at each phase of implementation; third, to build a conceptual model of the CSFs for LMS implementation; and fourth, to investigate whether each of them is always valid for any case, by comparing the CSFs emerging from this study with those discussed in the related studies. The contributions made by this study are as follows:

- This paper has contributed to the literature on the implementation of ISs generally and of LMSs in particular, having revealed the socio-technical nature of the process. It has confirmed that an IS cannot be implemented successfully without consideration of the context and environment.
- This study has also expanded the body of knowledge in the field of IS success and failure generally and in reference to LMSs particularly, making a contribution by identifying how the CSFs for LMSs are ranked through the various phases of implementation, by determining the weighting of these factors in each phase, and by explaining how they interact with each other during implementation.
- The study has found change management to be critical to LMS success before, during, and after implementation. This has added to the knowledge established in the existing literature, which indicates that change management is essential to system success in the business context, whereas studies in the educational context have discussed the factor generally, but have not treated it as critical to successful LMS implementation.
- It has contributed to the body of knowledge and to the literature on the CSFs for LMS implementation in the context of developing countries in general and Saudi Arabia specifically, by developing a model that other researchers and practitioners may successfully apply to the implementation of LMSs.
- Regarding its methodological contribution, this study has adopted a qualitative methodology, as the studies reviewed were found to have typically used quantitative or mixed data collection methods, whereas very few studies of LMS CSFs have previously used qualitative methods.

This paper reports an exploratory study taking the case study approach and using a qualitative methodology to attain an in-depth understanding of the CSFs for LMS implementation in Saudi Arabia from the students' perspective. It then compares the CSFs identified here with those discussed in the literature in order to determine whether CSFs are always valid for any case.

The paper is organized as follows. Section II discusses IS success and reviews prior studies on the CSFs of ISs in general and of LMSs in particular, noting any important gaps. An initial conceptual model of LMS CSFs is proposed in Section III, then Section IV describes the research method. The results are presented in Section V, before Section VI concludes the paper by discussing the findings, clarifying

implications, noting limitations, and making suggestions for future research.

II. LITERATURE REVIEW

A. INFORMATION SYSTEMS SUCCESS

Investment in various ISs is essential for organizations to meet their business needs and to seize opportunities. Regardless of their economic status, organizations seek to ensure that such investments are successful [25]. Over the years, measuring IS success has strongly concerned researchers, managers, and practitioners alike [10], [26], making it a significant aspect of practice and research in the IS field [25].

However, simply defining IS success has proved to be challenging [27]. A review of the literature identified many different definitions of the term. According to Grover *et al.* [28], the stakeholders of the same organization will often view the success of IS differently. On one hand, developers may define it as the delivering of the IS within the agreed time, budget, and functions, while the organization may find the system successful if it offers it the required competitive advantage or enhances corporate profits. On the other hand, users will consider a system successful if it improves their performance or satisfaction.

An early student of IS success was Peter Keen, who noted in 1980 that management information system (MIS) research lacked a scientific basis and raised questions about the dependent variables in MIS. Since then, many researchers have sought to identify IS success factors [29]. In 1992, DeLone and McLean (D&M) reviewed the literature between 1981-1990 and identified six interdependent variables of IS success: system quality, information quality, use, user satisfaction, individual impact, and organizational impact [30]. Following the introduction of the resultant D&M model, many researchers proposed modifications to it. Accordingly, DeLone and McLean revised the model in 2003 after considering all such proposals and reviewing the empirical studies that tested the model [13].

Since the evolution of the D&M model, several research studies have investigated the CSFs of different ISs in the business context. Many of these studies have categorized the CSFs according to implementation phases or other classifications, or have investigated the factors affecting a particular phase or class, while others have generally prioritized them according to their significance. There is thus a rich body of research into the CSFs of ISs in the business context, whereas the scope of previous studies on the CSFs of LMSs in higher education is much narrower, taking little or no account of various significant issues [24]. Therefore, since an e-learning system is ultimately ''a special type of IS'' [31] and is implemented by an organization, albeit a non-commercial one, this review is not limited to the literature on the CSFs of LMSs in higher education but extends to that on IS success in the business context. However, the practical data from the field will ensure that the CSFs adopted from the business context are appropriate to the educational context.

B. PRIOR STUDIES ON IS CSFs

Studies of CSFs in the business context under the various implementation phases have tended to identify factors related to change management, top management support, project management, and training. For instance, Esteves and Pastor [32] classify the CSFs under five implementation phases and propose a CSF model with four perspectives, namely organizational, technological, strategic, and tactical. Their study assesses the relevance of each CSF to each phase of implementation. Some of the CSFs identified are change management, user involvement, management support, training, communication, and adequate infrastructure. A review by Shaul and Tauber [33] identifies 94 CSFs, which they categorize under 15 constructs and whose relevance they assess across six implementation phases. Some of the constructs that were recognized in all studies are top management support, change management, and training and education. Earlier, Somers and Nelson [67] had extensively reviewed previous studies and proposed a comprehensive list of 22 CSFs, including top management support, change management, training and education, and project management. The researchers then studied the impact of these factors among the implementation stages by using responses from 86 organizations. Sun *et al.* [34] classify CSFs by the five implementation stages, identifying factors including top management support, change management, and effective communication. Other studies have examined the CSFs applicable to a specific phase, such as post-implementation (e.g. [35], [36]). An alternative approach is to classify the CSFs by constructs such as change management, project management, training, and top management support. For instance, Ram and Corkindale [16] review the literature on four such constructs: organizational factors, technological factors, project factors, and individual factors. Some of the CSFs identified are: top management support, change management, training and education, communication, project management, and user involvement. Some of the 15 constructs under which Shaul and Tauber [37] group their 94 CSFs are: user involvement, change management, project management, and top management support. More simply, Ahmad and Cuenca [38] classify CSFs as either dependent, critical, or basic. Some of the factors that they recognize are management support and communication.

A different approach is to rank CSFs according to their importance. For instance, Tarhini *et al.* [39] identify 51 CSFs from a review of previous studies and prioritize them by their frequency of appearance in the literature. The three most important factors by this measure are given as top management support, training, and project management, while change management is ranked fifth, end user involvement 16th and information technology (IT) infrastructure 31st. Ngai *et al.* [19] reviewed the literature a few years earlier and recognize 18 CSFs in 10 countries and regions. They rank the most frequently cited factors overall as top management support, training and education, and a clearly defined project plan. Lastly in this grouping, a systematic review of

148 articles by Ahimbisibwe *et al.* [40] identifies 37 CSFs, which are again ranked by frequency of appearance. Some of those among the ten most cited are top-level management support, user participation, and change management skills.

C. PRIOR STUDIES ON LMS CSFs

Turning to more directly relevant studies of the CSFs of LMSs, these have recognized diverse factors related to students, instructors, courses, systems, and institutional support. For instance, Selim [42] reviews the literature and places the CSFs in four categories: student, instructor, IT, and university support, assigning several measures to each category. Having tested these empirically by surveying university students, the study identifies a total of eight resultant categories. Some of the CSFs that it recognizes are: instructor's attitude towards and control of technology, teaching style, students' computer competence, and infrastructure. Soong, Chan, Chua and Loh [1] categorize the CSFs under five dimensions: human factors related to instructors, instructors' and students' technical competency, instructors' and students' mindset (about learning), level of collaboration, and level of perceived IT infrastructure and technical support. In the specific context of developing countries, Bhuasiri, Xaymoungkhoun, Zo, Rho and Ciganek [20] recognize 20 CSFs for e-learning systems, in the following six dimensions: learners' characteristics, instructors' characteristics, institutional and service quality, infrastructure and system quality, course and information quality, and extrinsic motivation. Some of the CSFs that they found are learners' computer self-efficacy, instructor's attitude toward students, instructor's technology control, computer training, and internet access quality. Al-Busaidi [4] studied 512 learners to investigate LMS CSFs, which she places in six categories: the characteristics of learners, of instructors, of LMSs, of classmates, of courses, and of organizations. Some of the factors identified are these: learners' technology experience, instructors' attitude, system quality, information quality, service quality, and training.

Some researchers have used the D&M model to assess LMS success. For example, Mtebe and Raisamo [14] extended the D&M model to evaluate LMSs in higher education. They tested the validity of the model by surveying 200 students and found that course quality, system quality, and service quality affected LMS success. By integrating the D&M model with the technology acceptance model, Mohammadi [47] discovered that system quality and information quality impacted intention to use e-learning and the satisfaction of the users, while the relationship between ease of use and intention to use was positively affected by perceived usefulness.

Other studies have investigated the effects on LMS success of the various dimensions of the readiness factor. For instance, Mosa *et al.* [60] found readiness for e-learning to be composed of the readiness of the students, the lecturers, the technology and the environment. After reviewing the literature on the technological aspects of e-learning readiness, they report that there has been little investigation of or agreement on the factors comprising the technological aspects of e-learning readiness. However, Keramati *et al.* [61] had earlier examined the influence of readiness factors on the relationship between e-learning factors and e-learning outcomes. Their study categorized readiness factors as either technical, organizational, or social. They found that technical readiness problems such as low internet speed and poor bandwidth could impair e-learning outcomes, whereas outcomes could be positively impacted by organizational readiness factors such as organizational culture and by social readiness.

Of closest relevance to the present study are the few investigations of the CSFs of LMSs in Saudi Arabia. Alhabeeb and Rowley [11], for example, classify these in five categories: students' characteristics, instructors' characteristics, the learning environment, instructional design, and support. Some of the CSFs identified are students' knowledge of computers, instructors' knowledge of learning technology, instructors' attitude, technical infrastructure, training, communication tools, and help desk. Naveed *et al.* [46] identify 36 CSFs from a review of the literature, applying the fivefold classification of student, instructor, design and contents, system and technology, and institutional management services. Some of these factors, quantitively validated by means of a survey of students, instructors, and members of e-learning staff at Saudi Arabian universities, are students' computer competence, students' general internet self-efficacy, instructors' attitude, instructors' ICT skills, technical support for users, good internet speed, efficient technology infrastructure, infrastructure readiness, training for users, and proper feedback. From a technical point of view, Alhomod and Shafi [49] recognize just 11 CSFs as sufficient. These include user training, top management support, and technical support. A few other studies have also examined LMS CSFs in Saudi Arabia (e.g. [62], [63]).

D. CSFs for LMSs

The studies reviewed above have typically classified CSFs under a number of categories that affect LMS success. Typical categories that have been recognized by many studies and are therefore used in this study are: students, instructors, systems, and institutional support. The significance of these categories is shown by the fact that they have all appeared in many previous studies, which have agreed on their inclusion more often than on others. These studies nevertheless vary in the number of categories and of associated CSFs that they recognize. For instance, Selim [42] categorizes CSFs into four categories, while Naveed *et al.* [46] and Soong *et al.* [1] place them in five categories. Others have identified six (e.g. [6], [20], [4]) or seven categories of CSFs (e.g. [65]). This study has adopted change management as a CSF category because various research studies have recognized it as essential to system success in the business context, although studies in the educational context have discussed it generally but have not treated it as critical to successful LMS implementation. This point will be discussed further in the following section.

TABLE 1. CSFs for LMS based on literature review.

Category	Factor	Literature
Student	Technology experience Self-efficacy	Alhabeeb and Rowley [11], Al-Busaidi [4], Soong, Chan, Chua and Loh [1], Abdel-Gawad and Woollard [41], Bhuasiri, Xaymoungkhoun, Zo, Rho and Ciganek [20], Selim [42], John [43], Saba [44], Sun, Tsai, Finger, Chen and Yeh [45], and Naveed, Muhammad, Sanober, Qureshi and Shah [46].
Instructor	Attitude Knowledge of technology	Saba [44], Abdel-Gawad and Woollard [41], Soong, Chan, Chua and Loh [1], Naveed, Muhammad, Sanober, Qureshi and Shah [46], Selim [42], Bhuasiri, Xaymoungkhoun, Zo, Rho and Ciganek [20], John [43], Al-Busaidi [4], Alhabeeb and Rowley [11], and Sun, Tsai, Finger, Chen and Yeh [45].
System	System quality Service quality Information quality	Al-Busaidi [4], Bhuasiri, Xaymoungkhoun, Zo, Rho and Ciganek [20], Mtebe and Raisamo [14], Mohammadi [47], Selim [42], Saba [44], Sun, Tsai, Finger, Chen and Yeh [45], and Lwoga [48].
Institutional support	Top management support Technical support availability IT infrastructure	Soong, Chan, Chua and Loh [1], Al-Busaidi [4], Alhabeeb and Rowley [11], Selim [42], Sun, Tsai, Finger, Chen and Yeh [45], Alhomod and Shafi [49], Alsabawy, Cater-Steel and Soar [50], Naveed, Muhammad, Sanober, Qureshi and Shah [46], and Asoodar, Vaezi and Izanloo [51].
Change management	Awareness and communication Training and education provision Stakeholders' involvement	Nour and Mouakket [52], Ahimbisibwe, Cavana and Daellenbach [40], Al-Mudimigh [53], Hasibuan and Dantes [54], Schniederjans and Yadav [55], Al-Mashari, Al-Mudimigh and Zairi [56], Al-Mudimigh, Zairi and Al-Mashari [57], Fritzenschaft [58], and Rashid, et al. [59].

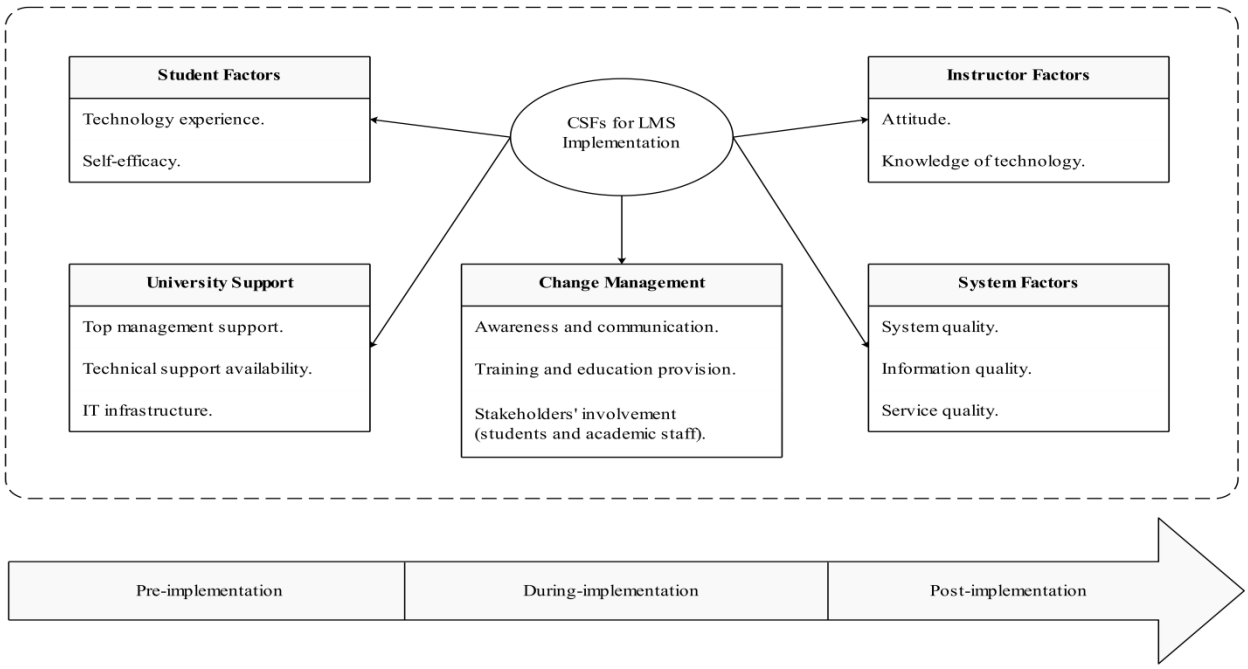

FIGURE 1. The initial conceptual model of the CSFs for LMS implementation © 2018 IEEE [24].

Table 1 summarizes the findings of a wide-ranging review of the relevant literature, placing the CSFs in their categories and listing the studies that have recognized or discussed them. These categories and CSFs were used as the basis of the development of the initial conceptual model (Fig. 1), as discussed in detail in Section III.

E. GAPS IN THE CURRENT LITERATURE

As stated earlier, the scope of previous studies of LMS CSFs in the higher education sector is narrow. Such studies have tended to focus on the specific dimensions of students, instructors, systems, and institutional support (e.g. [11], [20], [42], [64], [66]), whereas IS success studies in the business context were found to be rich and to consider a wider range of significant issues. The most critical among these is the recognition of change management as a CSF by various researchers (e.g. [19], [40], [52], [53], [67]). Indeed, a number of studies have found change management to be a critical factor in explaining IS failure [68]. It is vital to preparing an organization for the introduction of any new system [53]

and change management may account for 40.60% of variation in system success [54]. Given that an ''e-learning system is a special type of IS'' [31] which will be implemented by an organization, it follows that it is worthwhile investigating change management as a CSF for LMS implementation. However, studies of change management as a CSF are rare in the higher education sector and those which Alkarney and Albraithen reviewed were found to have typically used quantitative or mixed data collection methods, whereas very few studies of LMS CSFs have used qualitative methods [24]. Although the quantitative approach is useful in some cases, the data available for analysis lack richness of detail [69]. Additionally, the supposed CSFs examined in those studies that have been conducted in developing countries have tended to be factors identified in the context of developed countries [20], while few published studies have explored the CSFs of e-learning in the Middle East generally and in Saudi Arabia specifically [11]. What is more, few studies have investigated how the CSFs for LMSs are ranked through the various phases of implementation or sought to determine the weight of these factors in each phase. There is also a lack of clarity as to how these factors interact with each other or are handled during LMS implementation [24].

III. RESEARCH MODEL

Based on the research reviewed above, this study assigns LMS CSFs to five categories: student factors, instructor factors, system factors, university support, and change management. According to the reviewed literature and to the researcher's knowledge, no other comprehensive model has examined this set of categories in the higher education sector to investigate the weight of the factors, how to rank them within the implementation phases, how the factors interact with each other, or how they should be handled during the implementation process. The initial model of the CSFs for LMSs is presented in Fig. 1.

The CSFs within each category were selected because they were most frequently recognized by various research studies to affect LMS success in the higher education context, except for the change management category, which was recognized more in the business context. The student factors (technology experience and self-efficacy) and instructor factors (attitude and knowledge of technology) were recognized by [1], [4], [11], [20], and [42]–[45]. The university support CSFs (top management support, technical support availability, and IT infrastructure) were recognized by [1], [4], [11], [42], [45], [49], and [50]. The system factors (system quality, service quality, and information quality) were recognized by [4], [14], [20], [42], [44], [45], and [47]. Finally, factors related to change management (awareness and communication, training and education provision, and stakeholders' involvement) were recognized by various research studies in the business context (e.g. [40], [52]–[54], [56], [57]). Table 1 summarizes the findings of a wide-ranging review of the relevant literature.

Following the same logic as outlined above to justify the consideration of factors identified in contexts beyond that of higher education, the researcher referred to research studies in a range of contexts in identifying the phases of implementation, because of the narrow scope of published studies on LMS implementation [24]. Kwon and Zmud [70] assert that the implementation process comprises the initiation, adoption, adaptation, acceptance, routinization, and infusion phases, while for Deshmukh and Kumar [71], the six phases are adoption decision, acquisition, implementation, use and maintenance, evolution, and retirement. Al-Mashari *et al.* [56], offer the alternative threefold categorization of these phases as setting up, implementation, and evaluation. The setting up phase is about planning activities, the implementation phase is concerned with deployment activities, and evaluation refers to measuring and improving the performance of the system. Likewise, Nour and Mouakket [52] view implementation as proceeding in three phases: pre-implementation, main implementation, and post-implementation, which deal successively with planning tasks, with execution activities, and with preparing the system's stakeholders and providing ongoing support for the system and its stakeholders.

Accordingly, the implementation part of the proposed model is divided into the pre-implementation, during-implementation, and post-implementation phases. The first comprises a set of planning activities, the second is about execution and going live with the system, and the last is concerned with closing activities and with providing support for the system and users.

IV. METHODOLOGY

The aim of this paper is to determine whether CSFs are always valid for any case. It reports an exploratory study taking the case study approach and using a qualitative methodology to attain an in-depth understanding of the CSFs for LMS implementation in Saudi Arabia from the students' perspective and then to compare the CSFs identified here with those discussed in the literature. Yin defines a case study as ''an empirical inquiry that investigates a contemporary phenomenon (the 'case') in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident'' [72]. Hence, the case study approach is suitable for this study, since the aim was to obtain a deep understanding of the contextual conditions related to the case, if any. Although the single case study has some limitations, it also has many benefits. It helped the researcher to explore the topic and study setting more deeply and was found to be appropriate for answering the research question.

The students involved were recruited from one university in Saudi Arabia, which was selected because the researcher was easily able to access the university to obtain the data and because of the circumstances limiting the researcher's ability to travel. These two points affected the choice of the university in that the data were collected qualitatively to ensure in-depth understanding of the phenomenon, while

the interviews were conducted face to face to capture non-verbal cues, such as body language, which could influence the quality of the collected data.

The students' perspective was considered because they constituted the population from which the researcher could collect data suitable for the study and whose members would be likely to give the most useful answers to the questions. Those selected to participate were studying between levels three and five. It was felt that the opinions of students at these levels would be beneficial because of their relative maturity, their familiarity with university life and their superior knowledge of what could benefit them, compared with students at lower levels, while those at higher levels, who would soon graduate, might feel less engaged with the usefulness of an LMS. The participating students also all attended colleges which had not yet implemented an LMS.

Prior to the main interviews, quick pilot interviews were conducted with 26 students and instructors. These contributed to ensuring that no LMS had been implemented in these colleges, investigating the reasons for not using the system, understanding the students' and instructors' perceptions of such systems, designing the interview protocol for the main fieldwork, and building rapport and trust with the interviewees. The researcher next critically reviewed the literature on CSFs for various ISs generally and LMSs specifically, in order to develop an initial model (Fig. 1) to be used only as a guide in focusing and directing the interview questions, while remaining open to any new factors that might emerge during the interviews. In other words, the initial conceptual model and the literature contributed to formulating the initial questions for the interviews. The interview questions were then trialed in a further pilot interview with one of the students, on the basis of which they were revised and modified.

The main interviews were conducted individually and face to face, in order to elicit rich and comprehensive data and to allow the discussion of any unanticipated insight emerging during the interviews. This technique also allowed the researcher to determine whether the interview data were invalidated, such as by the interviewee being impatient to finish. The interviews were generally semi-structured, but the researcher also asked unstructured questions when a new topic that had not been discussed in the previous interviews emerged, in order to deepen the understanding of that topic. Any such new topics were then considered in the subsequent interviews. Thus, the interview data were gathered incrementally until the researcher judged that saturation had been reached, which occurred after 20 students had been interviewed. The sampling process began with the selection of an initial student interviewee at each of the levels (three, four, and five) considered appropriate, as explained above. The sampling process was affected by the notes taken during interviews and the daily verification of the data collected. The sample size was based on reaching the saturation point, i.e. where adequate data had been accrued for a detailed analysis.

According to Lichtman [73], the qualitative approach is dynamic and the protocols to be followed are not fixed, but subject to modification as the research progresses. Thus, after analyzing the data gathered in the first round of interviews, the researcher was driven by the results to collect additional data by conducting a second and a third round, as clarified in the following paragraph. The first round of interviews was the main round, while the second and third served to verify the model. In all, 20 students and two instructors were interviewed.

During the first round of interviews, the researcher recorded interviewees' responses electronically while simultaneously taking notes, in order to ask the students after each the session to assign each CSF that they had mentioned to one of the three phases of LMS implementation: pre-implementation, during-implementation, and post-implementation. The second round of interviews was conducted with three of the 20 students who had been interviewed in the first round, selected systematically by assigning a number from 1 to 20 to each student, then choosing three of those assigned an odd number. The objective of this second round was to confirm the accuracy of the first-round data and to discuss with interviewees some of the points that had emerged from its analysis. Two instructors were also interviewed during the second round. They were selected because their names were mentioned by the students as having used some LMS applications to supplement their traditional classes. It is important to note that these tools had not been officially implemented by the university; rather, the instructors had voluntary utilized some open-source LMSs such as Edmodo to improve the learning of the students enrolled in their classes. The reason for interviewing these educators was to discuss their motives for using the LMSs and how they had motivated their students to use them. The third and final round of interviews were conducted with another three of the 20 students interviewed in the first round, this time systematically selected as having been assigned an even number. The objectives were to introduce them to the final conceptual model of the CSFs for LMS implementation (Fig. 2) and to explain it to them in detail. The three interviewees all confirmed that they understood the model and agreed that this was what they really wanted.

Before conducting each interview, the researcher explained to the students the purpose behind the study, why they were being interviewed, how their participation would contribute to obtaining significant results for the study, and how the study would benefit them and improve their education. The researcher made it clear that participation in the project was entirely voluntary and that any interviewee could stop the interview at any time. All interviews were electronically recorded with the permission of the participants, unless they declined. The researcher also took notes during each interview, so that any significant issues raised by the interviewees could be discussed with them or investigated further in later interviews, in order to protect the study from bias. In addition,

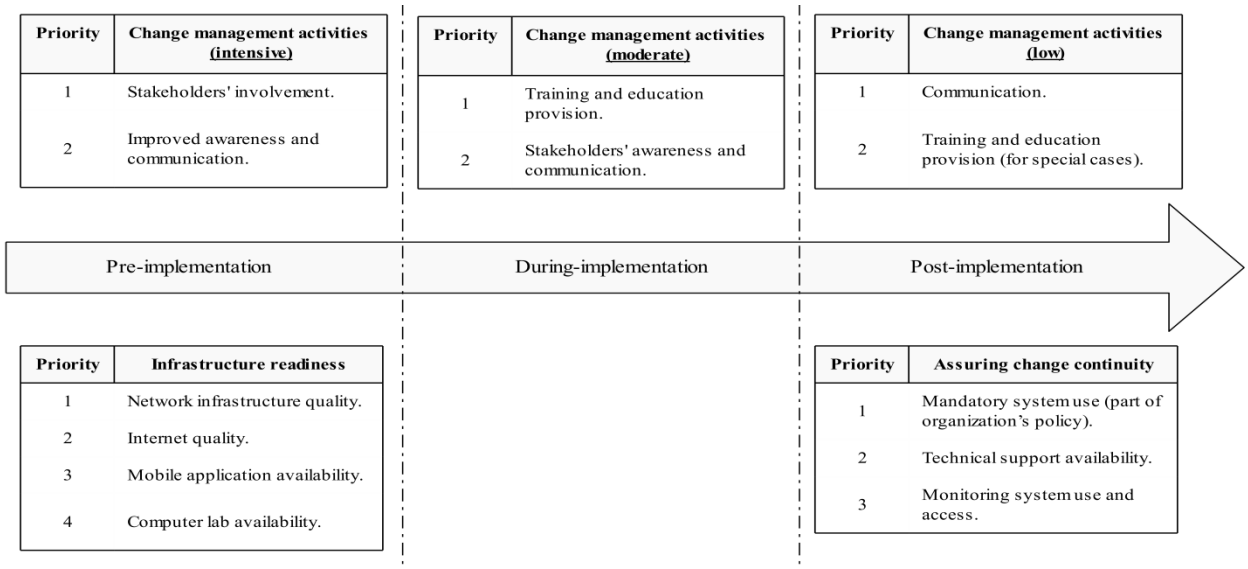

FIGURE 2. The final conceptual model of the CSFs for LMS implementation.

to ensure confidentiality, each interviewee and the researcher read and signed a consent form before starting the interview and both of them kept a copy of it. To ensure the anonymity of the interviewees, they are referred to as Interviewee 1, 2, etc. and Instructor 1 etc.

To test the validity of the findings, the researcher compared the results of this study to those of previous studies and assessed the extent to which they were congruent, as suggested by Shenton [74]. According to Silverman [75], one of the fundamental criteria to evaluate a qualitative study is the ability to link its findings to the existing body of knowledge. The present results were found to be similar to those of some published studies and to differ from others in different fields. The issue of the transferability of case study findings is related to analytic generalization, which can be in form of lessons learned [72]. This study therefore started by developing an initial conceptual model (Fig. 1), based on the literature review, to form the groundwork for the analytical generalization. Additionally, new generalizations emerged from the findings of the case study alone. Yin states that analytical generalization may be based on ''corroborating, modifying, rejecting, or otherwise advancing theoretical concepts that you referenced in designing your case study, or new concepts that arose upon the completion of your case study'' [72]. Here, the researcher recognized lessons learned from the case study.

To increase the quality of the study, one of the interviews was eliminated from the coding process because the interviewee appeared impatient and inattentive to the questions being asked. The rest of the interviews were transcribed and then sent to each interviewee to confirm the accuracy of transcription. In the event, only two of the 19 interviewees asked for some points they saw as significant to be added to their answers. The transcripts were then analyzed using the NVivo computer-assisted qualitative data analysis software, to help the researcher in managing the large volume of data and to increase the quality of the research. Two-cycle coding was used in the analysis, as suggested by Saldaña [76]. This process generated three major themes or categories.

V. RESULTS

A. PARTICIPANT PROFILE

All 19 participating students attended the same university in Saudi Arabia and none was at a college which had officially implemented an LMS, in order to investigate how such a system could be successfully implemented from their perspective. Approximately 58% were level four students, 26% were at level five, and 16% at level three. About 89% reported using technologies in their daily lives and 95% said they used social media daily. A third (32%) had attended computer training courses and three-quarters (74%) had experience of the open-source LMSs that some instructors used to enhance their teaching. The two participating instructors had earned both their bachelor's and master's degrees in Saudi Arabia. Neither of them had studied in colleges that used LMSs. Neither of the instructors and none of the students had attended training on using LMSs. Note that instructors were not part of the main study sample and were only interviewed during the second round of the interviews to help in clarifying some points related to their LMS usage.

B. CSFs for LMS IMPLEMENTATION

1) CATEGORY CLASSIFICATIONS AND RANKINGS

This section explains how the categories of CSFs were classified and prioritized under the three implementation phases of LMS: pre-implementation, during-implementation, and post-implementation.

Firstly, the analysis of the interviews resulted in three major categories classified under the three implementation phases. The categories, shown in Fig. 2, are change

management, assuring change continuity, and infrastructure readiness.

Two of these categories, change management and infrastructure readiness, applied to the pre-implementation phase. All of the interviewees identified critical factors related to change management in this first phase, while 37% recognized factors in the infrastructure readiness group. The during-implementation phase involved only one category, namely change management, significant factors of which were identified by all but two (89%) of the interviewees in relation to this phase. Both change management and assuring change continuity were found to apply to the final post-implementation phase. Critical factors related to change management were recognized by 58% of the participants, while 79% identified factors in the assuring change continuity category. It is notable that interviewees recognized CSFs in the change management category as relevant to all three implementation phases and that the weighting of this category differed from one phase to another. More specifically, the proportion of students focusing on activities related to change management diminished successively from 100% in relation to the first phase to 89% in the second and only 58% in the third.

The results in Fig. 2 for the two phases to which more than one category of CSFs were found to apply show a corresponding diminution in the priority assigned to change management. Thus, CSFs in this category can be seen to be accorded priority during the pre-implementation phase, being recognized by all of the interviewees, while little more than a third of students mentioned factors related to infrastructure readiness. By contrast, participants accorded overall priority to factors related to assuring change continuity during the post-implementation phase, indicated by the fact that four-fifths of them identified these factors as critical, compared to just over half who mentioned change management factors.

2) CSF CLASSIFICATIONS AND RANKINGS WITHIN CATEGORIES

This section reports how the individual CSFs were classified and prioritized within each of the three categories above and in relation to each of the implementation phases, beginning with the CSFs related to pre-implementation and with the most important category: change management.

Within the change management category, 89% of students identified improved awareness and communication as a factor influencing LMS success during the first phase. Comments on this factor include:

" *In the first phase, increasing awareness about the system could ensure its success. I want them to talk about the system and how it is going to benefit me and all.*" (Interviewee 1)

"In the first phase, communication with the students should be done to clarify the importance and benefits of the system." (Interviewee 15)

Awareness of the system could be improved by using various methods of communication including meetings, email, and social networking sites. A third of students suggested email as a communication method, while a quarter (26%) preferred social networking sites, and over a third (37%) thought that awareness could be raised through meetings:

"I think that communication should be done using various ways, not only one way. And I prefer social networking sites."(Interviewee 1)

"... the university should consider more than one method of communication because there is a huge number of students. And they should benefit from the students' presence in social media." (Interviewee 9)

The data show that the students and the younger generation in general were sufficiently aware of e-learning systems and would have no problems in using them, contributory factors being the ubiquity of social networking sites, extensive IT experience, and the internet revolution. The following interview extracts illustrate this:

"... either we fully use the system and you apply it for us in the right way and we use it for everything related to the courses, so it would be useful for us, or else do not apply it at all." (Interviewee 5)

"...for me, training is not important ... I mean, we are familiar with using technology and have the required skills to do so..." (Interviewee 13)

"Technology has affected us. We are not like the previous generations. The earlier generations had difficulty even in printing documents. As for us, we handle technology easily and such systems are easy to use for us." (Interviewee 5)

Communication with students should nevertheless be handled carefully, notwithstanding the high technological awareness of their generation, because LMSs are complex systems with many features that non-users would be unfamiliar with. Therefore, there is still a need to raise their awareness of the special functions of such systems and how they would be applied.

Interviewees confirmed during the second round that the process of enhancing communication and awareness should be well organized, because if not, they would have negative perceptions and feel that those responsible for implementing the system were not sufficiently well informed themselves:

"... constant communication is fine but it depends on what they will communicate with me about. I do not want them to communicate with me on every single point, because I am aware of how to use technology. It would be so annoying." (Interviewee 5)

"...I would have a negative perception [...and it would] make me feel that whoever was responsible for the system did not really understand what they were doing." (Interviewee 15)

A related point which emerged during the first round of student interviews concerned the instructors' role in helping the LMS to succeed by imposing a disciplined use of the system:

"There should be discipline in using the system. I mean that if a student for example submitted an assignment on paper, the instructor should not accept it, so that students would be forced to use the system." (Interviewee 13)

Consequently, careful attention should also be given to communicating with the instructors themselves, to raise their awareness of the LMS, thus helping to ensure the continuity of the system.

The interviews with students also made the researcher aware of the informal and unofficial use of open-source LMSs by some instructors. Therefore, the researcher decided to interview two of them in the second round. Their responses indicated that the instructors were ready to change and that the problem did not concern the technical aspects of change. Instructors were well aware that e-learning was important for the education process, as evidenced by their use of open-source LMSs. One of the instructors explained:

"I was looking for a system that would make the learning process easier for the students." (Instructor 1)

A second change management factor that interviewees regarded as significant was stakeholders' involvement, which was in fact identified by all 19 students. 'Involvement' refers here to having students on the project team as representatives responsible for handling the awareness and communication activities during the pre-implementation or planning phase, when the composition of the project team would be decided:

"...I think it would be great to make students responsible for communicating with other students and for raising awareness of the system among the student body." (Interviewee 13)

Their voluntary use of open-source LMSs, as stated earlier, shows that at least some instructors felt the need for change, especially considering that neither of those interviewed had studied in colleges that used such systems. This emphasizes the need to pay careful attention to the distinguishing features of the new generation and to involve them in LMS implementation. It also indicates that the instructors would need to increase their awareness of the system's special functions and of the consequences for their teaching:

"We have the background in how to deal with technology, and this will reduce the effort needed by 70%, leaving the university with educating us on the special characteristics of the system only." (Instructor 2)

In fact, during the second round of interviews, the instructors showed an interest in participating in this change and in being representatives, as long as the college administration provided them with the appropriate conditions:

"We as instructors are willing to help, but in return the college administration should provide us with appropriate conditions to do so." (Instructor 2)

Furthermore, the instructors confirmed the importance of the increasing awareness and communication with the students by mentioning that they were able to attract the students to use the open-source LMSs by clarifying the importance of these systems and how it would benefit them:

"I was able to attract students to the system by telling them that this system will benefit them and they will find all the materials related to the course on it, so they wouldn't have to ask their fellow students." (Instructor 2)

The second category of factors relevant to the pre-implementation phase was infrastructure readiness. It was noticeable that although the students had no professional background in technology, because of the context, the revolution in technology, and the use of social networking sites, the new generation had a different mentality from earlier one, as evidenced by their willingness to talk about IT and their raising of issues related to IT infrastructure. For example, internet quality was recognized by 37% of the interviewees as likely to influence the success of LMS implementation:

"The internet quality should be high and it should cover every college at the university." (Interviewee 15)

The availability of a mobile application for the LMS was regarded as important by 16% of the interviewees:

"It is important that the system is compatible with all devices, so if my laptop was not working I could use it for example on my mobile phone or iPad."(Interviewee 18)

Two of the interviewees (11%) also saw computer lab availability at the college as a significant factor:

"There should be computer labs at each college that we could access at any time." (Interviewee 20)

The only major category of CSFs related to the during-implementation phase was change management. Within this category, 16 interviewees (84%) identified the provision of training and education as significant. Comments on this factor included:

"Offering training courses is important so when the system is implemented the students will know how to use it." (Interviewee 18)

As to the various possible training methods, it was found that seven (37%) of the interviewees preferred workshops, three (16%) preferred videos, and four (21%) thought that workshops and videos should be used together, while just one student (5%) opted for workshops, videos, and a user manual and one other preferred workshop and a user manual. Thus, most of the students (a total of 16, i.e. 84%) considered workshops to be a useful method of training:

"I prefer workshops, because I want something practical for training." (Interviewee 14)

"The training method should allow me to experience the system. I want a practical method." (Interviewee 2)

However, the students did not want step-by-step training in operating the system, preferring to be left to explore it for themselves:

"I do not want to be trained in how to use the system step by step. This would be tedious. We are university students, not children." (Interviewee 15)

It was suggested that the students and instructors who were involved in the project team during the pre-implementation phase could handle the training sessions and would be able to offer help and support if needed, since they all had experience of such systems. It was actually the students who raised this point during the first round of interviews:

"It would be a great idea if they offered places on the team based on conditions and knowledge of the students' previous experience [...]. Our youth are ambitious and have great abilities. They look at things differently and more accurately

and that may benefit the other students, since they are students just like them." (Interviewee 9)

The instructors who participated in the second round of interviews confirmed that they were willing to help:

"The administration of the college should provide the instructors with the appropriate conditions to participate in the training process, but on condition of reducing the workload, such as the reduction of teaching hours or administrative work." (Instructor 2)

Another factor under the change management category during the second phase of LMS implementation was stakeholders' awareness and communication, which was recognized by ten (53%) of the participants, one of whom said:

"In the first and also the second phase they should communicate with us to create awareness of the system." (Interviewee 4)

The responsibility for raising awareness and for communicating during the second phase would still lie with the students and instructors who were involved in the first phase as part of the project team.

As noted earlier, the two categories of factors emerging from discussion of the post-implementation phase were change management and assuring change continuity. Within change management, the communication factor was regarded as important by 42% of the interviewees. At this stage, communication would be needed to announce that the system was ready for use and to deal with any urgent needs:

"In the final phase, communication will be necessary to inform us that the system is ready to be used." (Interviewee 6)

Almost as many participants (37%) considered the provision of training and education to be critical during the third phase, explaining that some students might not have had an opportunity to try the system during the second phase and that some might need additional training:

"Training should be a continuous process, even after implementing the system." (Interviewee 15)

"Training is important in the final phase because it is possible that some students might not have been trained in the second phase [and might still] need it." (Interviewee 12)

Communication and training during post-implementation could again be considered the responsibility of the students and instructors who were involved in the first phase as members of the project team. This is discussed below in Section VI.

Moving to the assuring change continuity category, 63% of the students stated that provision of the system should be a matter of organizational policy and that its use should be mandatory. In other words, both students and instructors must be disciplined in using the system to ensure its continuity:

"I think that the system should be mandatory and there should be discipline in the use of the system. I mean that if a student for example submitted an assignment on paper, the instructor should not accept it." (Interviewee 13)

A second change continuity factor was the availability of technical support, identified as significant by almost half (47%) of the students. These interviewees expressed the view that providing technical support would be important in order to help them if they faced problems with the system or with the Internet, for example:

"There should be in each college an office such as a technical support service to refer to whenever I face a problem." (Interviewee 6)

Monitoring system use and access was identified by a quarter of participating students as a critical change continuity factor that would influence success during the last phase. An example given was that rewarding students and instructors for using the LMS, based on their usage of the system, would encourage them to continue using it:

"For example, there should be a competition so that the first class that used the system and was disciplined in using it (they should have information about the usage of the system) would get a reward, such as bonus marks." (Interviewee 13)

It is notable that awareness and communication among both students and instructors was recognized as important during all three phases. In the first and second phases, this factor was ranked second, while during the last phase, communication was ranked first. The interviewees explained this difference in priority during the third round of interviews by noting that use of the system would become mandatory once it had been implemented. Therefore, all students would eventually try the system, so the need for communication would be increased in order to help them solve any problems that they might encounter while using the system, or to address the need for more training:

"The system would become mandatory, so it would affect me if I encountered a problem and could not find anyone to help me solve it."(Interviewee 2)

"Because the system is mandatory, all students will use it, and this will lead to the need for more communication and also they may need to communicate for training." (Interviewee 12)

Finally, the training and education factor was recognized as critical during the second and last phases. It was ranked first during implementation and second during post-implementation. Participants in the third round of interviews explained that they would have to be ready to use the system and experience it before it become mandatory:

"Training in the second phase is more important so that we are ready to use the system before it becomes mandatory to use." (Interviewee 6)

VI. CONCLUSION

A. DISCUSSION OF RESULTS

The aim of this research was to investigate whether CSFs are always valid for any case. Having critically reviewed the literature on the CSFs for ISs generally and for LMSs specifically, the study used fieldwork data to identify, classify, and prioritize the CSFs for each of the three phases of the implementation of an LMS in a Saudi university. From this, a model of the CSFs for LMS implementation was developed (Fig. 2). This section addresses the research question by

comparing the CSFs identified in this study with those discussed in the relevant literature.

Based on interviews with students, the study identified ten CSFs in three major categories. Six CSFs were found to apply to the pre-implementation phase, in two categories: stakeholders' involvement, improved awareness and communication (in the change management category), network infrastructure quality, internet quality, mobile application availability, and computer lab availability (under infrastructure readiness). The during-implementation phase was seen to be characterized by two change management CSFs: training and education provision and stakeholders' awareness and communication. Finally, post-implementation featured five CSFs in two categories: training and education provision, communication (under change management), mandatory system use, technical support availability, and monitoring system use and access (under assuring change continuity).

The change management category of CSFs was found to have priority over infrastructure readiness during pre-implementation, whereas assuring change continuity had priority over change management during post-implementation. It is notable that change management CSFs were associated with all three phases, but with an intensity that diminished with each successive phase, from high to moderate and then to low during post-implementation.

The reasons for the changing priorities among the factors were discussed during the third round of interviews, which served as a second stage of model verification. The interviewees explained that communication would be more critical after implementation because use of the system would now be mandatory, meaning that all students would be using it, increasing the likelihood of problems being encountered and training needs being identified, all of which would increase the need for communication. Similarly, the difference in priority of the training and education factor between the second and third phases was explained by the requirement to be ready to use the system and experience it before its use became mandatory. Fig. 2 shows the priority of the factors by category and by phase. The tripartite classification of the implementation phases was found to give a clear picture during data collection and we recommend using it in similar cases.

The first phase should start by recruiting both students and instructors to the project team, with responsibility for handling awareness and communication with other students and instructors. One way of doing this would be to send videos to clarify the importance of the system and to show how it would benefit users. Although the current generation of students and instructors is well versed in ICT, the LMS in question is a complex system and both students and instructors will undeniably seek additional benefits from using it. Therefore, there remains a need to enhance their awareness of its special functions and their understanding of its use. While the official announcement that the LMS will be used should also be made during the first phase, it is important to ensure that communication is well organized during all phases. The study revealed that both today's students and their instructors are well aware of the latest technology and its importance in improving the education process and that they would have no problems in using such systems, given their experience of social networking, IT, and the Internet. This suggests that the failure of an LMS should not be blamed on its users, but that the problem sometimes lies rather in ignoring them during implementation. According to Heravi *et al.* [77] and Beringer *et al.* [78], continuance communication is critical to ensure stakeholders' involvement throughout the project lifecycle. If stakeholders feel uninvolved because of poor communication, this may cause the project to fail [79].

During the first phase, the infrastructure should be checked for its readiness, including its technical aspects. The internet quality should be high and a version of the LMS should be available as a mobile application. Each college should have computer labs where students can use the system, because a mobile app will sometimes not be suitable for all coursework and because some students may simply prefer the desktop version of the LMS. The network infrastructure quality should also be checked for its readiness. Although this factor was not mentioned by the interviewees, it is included here because it is essential for internet quality, which participants said was important for the effective use of the system on campus. Selim [42] identifies IT infrastructure, whose vital aspects include network bandwidth, network security, and network access, as a CSF for e-learning. Network reliability was ranked as the second most critical IT infrastructure factor. Wild *et al.* [80] concur that network infrastructure is essential to support e-learning, while Arabasz and Baker [81] assert that the significant challenge is not the students' ability to use technology but the provision of a network infrastructure that is adequate for them to make good use of the e-learning technology. Similarly, Baron *et al.* [82] argue that when implementing an e-learning platform, it is necessary to take into consideration the network infrastructure, including the IT infrastructural components of server, switches, and routers. Accordingly, this study ranked the quality of network infrastructure as the most important factor in the infrastructure readiness category and found that it included ensuring the quality of the servers, routers, switches, hubs, network bandwidth, network security, etc. Importantly, checking the infrastructure for readiness will contribute to making system acceptable to the students and instructors, because although they may be well aware of the technology, most do not have a professional IT background; therefore, they may judge the system as inadequate because of poor infrastructure, which in turn could affect the system's success and its continuity, despite its overall quality actually being high. According to Tarus *et al.* [83], 92% of respondents recognized that IT infrastructure is significant in ensuring e-learning success. Indeed, the efficiency and effectiveness of an e-learning project depends significantly on technological readiness [60], including the availability of computers, fast and easy access to the network, and high levels of security and reliability [84].

Alsabawy *et al.* [50] assert that IT infrastructure positively affects user satisfaction and thereby influences LMS success.

The second phase should start with the students and instructors being trained to use the LMS via a sandbox version running in the computer labs of each college. The older instructors should be provided with additional support and involved in the implementation process to facilitate their acceptance of the new system. Students and academic staff serving on the project team should run training sessions and provide the support required by their colleagues and fellow students, thus reducing the cost of training. The use of training videos on using the system would allow both students and instructors to become familiar with the basics. According to Schniederjans and Yadav [55], training is an important aspect of the implementation process. It is considered one of the most critical factors in ensuring the success of the system and in realizing its benefits [85]. Finally, the communication and awareness process should continue during the implementation phase, again led by the students and instructors who are members of the project team. Both training/education and awareness and communication have been identified (e.g., [58], [86], [87]) as critical to the implementation phase.

As to the final phase, the interviewees emphasized the importance not merely of completing the implementation of the system, but also of ensuring its continuity. Therefore, there should be post-implementation communication to announce that the system was ready to be used and to discuss any urgent needs. Training and education would be conducted only in the special case of any students or instructors who needed them. Again, these functions would be the responsibility of the students and instructors who were chosen during the first phase, before being passed to the technical support team. Other researchers have also recognized training/education and communication as CSFs during the post-implementation phase (e.g., [32], [58], [87]). Moreover, to ensure the continuity of the system, the organization's policy would have to be updated to make use of the system mandatory once it had reached the stability stage and the top management would be responsible for this. The availability of technical support would also be essential. Lastly, use of the system and access to it should be monitored by the quality team to reward instructors for using it and encourage students to do so. Assuring change continuity and the new methods of working and thinking is essential [58] to prevent stakeholders from reverting to the old ways of working, thus increasing the probability of realizing the project's objectives [88].

The system's users generally and the new generation in particular have become more conscious of technology, thanks in part to the increasing use of social networking sites, which have become a large part of their lives, while technology is now the engine behind everything. All in all, the context has changed and this change has influenced the system's users, as evidenced by the extent to which the interviewees talked about IT. Therefore, the context in which the system will be implemented should be taken into consideration. The users should not be ignored or treated as if they were unaware of technology; instead, their broad technical background should be considered. LMS implementers should not work in isolation. Change management is important during all phases of implementation and the technology should not be treated as something to switch on and off by simply implementing the system without communicating with users. Failure to organize this communication well would have negative consequences for users' perceptions of those responsible for the system, making them appear ill prepared for the undertaking, thus restricting users' acceptance of the LMS. Consequently, as mentioned earlier, the context in which the LMS is to be implemented must be taken into consideration.

The fact that in interviews potential users concentrated on change management, on assuring change continuity, and on their own involvement in the implementation process suggests that they felt neglected and that they may have had experience of implementers treating technology as something to simply switch on and off; in other words, switching from an old method of conducting a business process to a new one without paying due attention to the needs of the users. Furthermore, since the students appeared to have no problems using such systems and, in the interviews, showed a strong familiarity with technology, it would be unreasonable to blame users alone for any system failure; rather, it must be acknowledged that ignoring users during implementation is often where the problem lies. Indeed, the empirical data indicate that change management is critical to LMS success before, during and after implementation. This adds to the knowledge established in the existing literature, which indicates that change management is essential to system success in the business context, whereas studies in the educational context have discussed the factor generally, but have not treated it as critical to successful LMS implementation. Therefore, change management should be given careful attention when implementing an LMS, since it is a system like any other which has stakeholders. According to Al-Mashari and Al-Mudimigh [68], a number of studies have found change management to be a critical factor in explaining IS failure. It is vital when preparing an organization for the introduction of any new system [53]. What is more, the fact that interviewees were concerned not just with implementing the system but with ensuring its continuity indicates that system success should not be measured in purely technical terms, but rather as a socio-technical issue, as several researchers have recognized (e.g. [9], [89], [90]). It follows that the users of the system should not be ignored but should be fully considered. Change management is therefore vital.

The classification and the priority of the CSFs were found to be similar to some of the previous studies and to differ from others in different fields. For instance, Al-Mashari *et al.* [56] found that communication and training and education were important during the main implementation phase, while

Esteves and Pastor [32] identified the relevance of CSFs during five implementation stages. Their first two stages could be considered to fall under pre-implementation, the third and fourth stages under implementation, and the final stage to be equivalent to our post-implementation phase. They found that adequate infrastructure was the most relevant technological factor and that user involvement and participation was one of the most relevant organizational factors during pre-implementation. During the second phase, user involvement and participation remained one of the most relevant organizational factors, while adequate infrastructure remained the most relevant technological factor. Strong communication and user training were also identified as relevant during this phase, while strong communication remained among the most important organizational factors during the final phase. Selim [42] found that the availability of computer labs was the most critical factor related to IT infrastructure, while network reliability took second priority. By contrast, Sun *et al.* [45] found that the technology dimension, including internet quality and technology quality, was not significant in ensuring e-learning success.

Fritzenschaft [58] found that in the first phase, awareness and communication had priority and involvement was ranked fourth, while during the second phase involvement was ranked second, communication fifth, and training tenth. During the third phase, communication was again top ranked. For Gerdsri *et al.* [91], awareness and communication were classified under the first phase, while reinforcing the change (assuring change continuity) was classified under the third and last phase. Almajed and Mayhew [92] ranked communication fourth, training and education sixth, change management ninth, and IT readiness eleventh. According to Napitupulu and Sensuse [93], stakeholders' involvement was ranked first, training fourth, ICT infrastructure 17th, monitoring 23rd, change management 25th, and awareness 37th. More recently, *et al.* [87] found that communication was ranked tenth in pre-implementation, fourth in implementation, and seventh in the post-implementation phase. Change management was ranked 13th in the implementation phase, ninth in pre-implementation, and sixth in post-implementation. Adequate infrastructure was ranked eighth, fifth, and fourth respectively, while monitoring was 18th, 16th, and eighth. Finally, training and education were ranked first, fifth and eleventh respectively. According to Youngjin Kim [94], change management was ranked fourth, communication fifth, and training and education eleventh. Ijaz *et al.* [86] found that awareness was one of the most significant pre-implementation CSFs. In the implementation phase, involvement and effective training were recognized as two of the most significant CSFs, while communication, change management, and infrastructure were less significant. In the post-implementation phase, support availability was one of the most critical factors. Finally, Olugbara *et al.* [95] found that change management was ranked first, training and education fifth, involvement seventh, and communication tenth.

The overall conclusion to be drawn is that there are significant differences between the CSFs identified in this study and those reported by other studies, whether in terms of their priority, their classification, their relative importance at different points in the implementation process, or even in their existence, given that this study has identified some new CSFs that are not recognized in the literature. Thus, CSFs are not in fact similar in all contexts. According to Bhuasiri *et al.* [20], the context in which the system will be implemented is important and the implementation of the system cannot be explained by a one-size-fits-all approach. Ngai *et al.* [19] state that although CSFs have been intensively investigated by many researchers, these studies have identified diverse and dissimilar sets of CSFs, influenced by the cultural, legal, regulatory, and economic conditions pertaining in the countries in which systems are developed. Pettigrew underlines the significance when studying change of taking into consideration its inner and outer context [96]. Indeed, when ISs are implemented in an organizational context they become socially rather than technologically determined [97]. Therefore, even similar organizations may experience radically different outcomes when the same technology is applied [98]. The social life and culture of the organization and its people will affect the success of the system and the influence of each factor necessarily varies from one country to another. Hence, any investigation of IS CSFs must consider all local cultural and social factors that may affect successful implementation [99]. IS development should be seen as a social and technological phenomenon, whose analysis should address both aspects and the relationship between them [90]. IS implementation should be seen as a sequence of socio-technical events [89]. According to Doherty [9], one of the primary causes of the high level of system failure is the absence of the requisite socio-technical approach. He therefore calls for research into new ways of achieving a more effective relationship between ISs and the social contexts in which they operate. In sum, social factors and environmental conditions play a significant role in IS success. System failure is not always purely technical, because both external and internal contexts make significant contributions. Accordingly, while CSFs are undeniably beneficial, they are not sufficient to ensure success. The evidence for this is that the CSFs identified in this study differ from those which have been found to be applicable to other cases.

B. IMPLICATIONS

The findings have several implications for practitioners in the form of lessons learnt. First, CSFs should be carefully handled, taking into consideration the inner and outer contexts in which the system will be implemented. Second, system success should not be measured in purely technical terms, but rather as a socio-technical issue, taking account not only of technological conditions but also of social and cultural aspects of the environment and of the relationships between these factors. Third, LMS implementers should not work in isolation. Fourth, the users should not be ignored or treated

as if they were unaware of technology; instead, their broad technical background should be considered. Fifth, change management is important during all phases of implementation and the technology should not be treated as something to switch on and off; in other words, organizations cannot switch directly from an old method of conducting a process to a new one by simply implementing the system without communicating with its users. Sixth, it is essential to check the infrastructure for readiness. Finally, LMS success depends not merely on completing the implementation of the system, but also on ensuring its continuity.

We recommend that before implementing an LMS, intensive change management should be enacted by involving stakeholders (students and academic staff) as part of the project team responsible for handling the awareness and communication activities with other students and instructors. Technical infrastructure, including network quality, internet quality, mobile applications, and computer labs, should be checked for readiness. During implementation, change management should operate at a moderate level through the provision of training and education videos and workshops, including a sandbox version of the system, while awareness and communication should be maintained. All of these activities should be the responsibility of the students and instructors on the project team, which will contribute to reducing training costs. The older instructors should be provided with additional support and involved in the implementation process to facilitate their acceptance of the new system. After implementation, change management activities should be continued at a low level via continuous communication with the students and instructors, while training and education should be continued for special cases, with responsibility passing from students and instructors on the project team to members of the technical support team. The continuity of the change should be assured by updating the organization's policy to make use of the system mandatory once it has achieved stability; this would be the responsibility of the top management. The availability of technical support would also be essential. Lastly, the use of the system and access to it should be monitored by the quality team to reward instructors for using it and to encourage students to do so.

The above lessons learnt and recommendations could serve as a checklist and raise awareness of the significant issues that implementers should carefully consider when implementing LMSs, based on their context, to increase the likelihood of successful implementation. The model of the CSFs for LMS implementation developed here could be used by other researchers and practitioners to improve the way that LMSs are implemented in developing countries in general and in Saudi Arabia specifically. A higher education institution which identifies and understands the factors that critically affect the implementation of a new LMS will thereby be enabled to eliminate or avoid the causes of poor uptake by the system's stakeholders, namely the students and academic staff, thus realizing the benefits of the investment in the system.

C. LIMITATIONS AND FUTURE RESEARCH

This study has focused mainly on the students' perspective to investigate the CSFs of interest; further studies might investigate them from the instructors and ICT experts' perspectives. Another potentially useful line of research would be to investigate the CSFs using a different classification of LMS implementation stages. This research depended on a single case study; further research could investigate more CSFs through multiple case studies. Finally, it might be fruitful to empirically examine the model of LMS CSFs developed here in other contexts, in order to investigate the influence of socio-cultural factors.

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WEAM ALKARNEY received the bachelor's degree in IS from Princess Nora bint Abdul Rahman University, Saudi Arabia. She is currently pursuing the M.Sc. degree in IS with Al-Imam Muhammad Ibn Saud Islamic University, Saudi Arabia. Her research interests include change management, technology adoption, technology-enhanced learning, and IS success and failure.

MAJED ALBRAITHEN received the bachelor's degree in IS and the M.Sc. degree in IS–modern systems applications from King Saud University, Saudi Arabia, in 2002, and the Ph.D. degree in IS and strategic planning for organizations from the University of Salford, Salford, U.K., in 2011. He has supervised and involved in the development of several ISs with the King Fahd Security College and Alkasabi Company. Since 2017, he has been a Consultant for the Saudi Red Crescent Authority. He has conducted a study to evaluate the applications of IS in terms of success and failure, including the ambulance system in the city of London and the disaster of the year 1992 (LASDS). He has conducted an analytical study of the implementation of the enterprise resource planning system to manage the work of the Turkish Red Crescent Society. He is currently an Assistant Professor with Al-Imam Muhammad Ibn Saud Islamic University, Saudi Arabia. He has authored several journal and conference papers. His research interests include digital transformation of organizations, IS project management, business process reengineering and business process improvement, management and application of ERP systems, requirements engineering, and management information systems.