INFORMATION & COMMUNICATIONS TECHNOLOGY IN EDUCATION | RESEARCH ARTICLE

Investigating the effects of quality factors and organizational factors on university students’ satisfaction of e-learning system quality

Ahmed Al Mulhem1*

Abstract: E-learning systems have become widely recognized tools for university learning over the world, identifying the factors affecting students’ satisfaction has always been a major interest both in academia and in practice. Thus, this study aims to develop a research model extending from the Delone and Mclean information system success model in order to investigate the effects of quality and organizational factors on students’ satisfaction of e-learning system quality. The data collected from 250 university students at King Faisal University and were examined using the structural equation modeling technique as a means of validating the research model. The results of the data analysis revealed that a strong relationship between organizational factors (top management support and change management) with e-learning system quality, which has never been known before. In addition, the results show that quality factors (course content quality, system quality and service quality) have a positive and significant effect on students’ satisfaction of e-learning system quality. Therefore, educational institutions seeking to achieve greater benefits from e-learning systems should pay considerable attention to the quality factors and organizational factors during the design and implementation process of their systems, because of the important role of these factors in enhancing e-learning system quality and e-learning service quality.

ABOUT THE AUTHOR

Ahmed Al Mulhem had his PhD of e-learning and training from the University of Plymouth in the UK in 2014. He had his Master degree in ICT in Education and Training in 2008 from the University of Wollongong, Australia. He works as an Assistant Professor at the Educational Technology Department, Faculty of Education at King Faisal University in Saudi Arabia. He worked as Head of the Educational Technology Department, Faculty of Education at King Faisal University. He also was the Supervisor of the Center of Measurement and Evaluation at King Faisal University. He works as a Consultant of the Vice-President of Academic Affairs at King Faisal University. He is an active researcher in the field of e-learning and his areas of interest are e-learning systems, e-learning and training, online learning, blended learning, and professional development.

PUBLIC INTEREST STATEMENT

The main purpose of this study was to develop a model for investigating the effects of quality and organizational factors on students’ satisfaction of e-learning system quality from students’ perspective. To achieve that objective, this research extends the D&M model with adding new factors for examining how quality and organizational factors can affect the quality of e-learning systems. The SEM technique was used to evaluate the research model empirically. The findings showed strong support for the research model. All proposed hypotheses in this study were supported, which offering significant insights into understanding the effects of organizational factors on e-learning quality.
Subjects: Educational Research; Open & Distance Education and eLearning; ICT

Keywords: E-learning system quality; students’ satisfaction; quality factors; organizational factors; Saudi Arabia

1. Introduction
With rapid developments in the information technologies, universities have reshaped their educational systems with integrating new technologies like e-learning and mobile learning (Almaiah & Al mulhem, 2018a; Almaiah et al., 2020). In addition, with the swift increase of Internet usage, e-learning has become extremely widespread and many higher education institutions have incorporated it into their educational programs (Cheng, 2012) seeking to derive several benefits from it, such as: increasing accessibility in education, better meeting students’ needs, improving tracking capabilities, cost effectiveness, learner flexibility and interactivity (Almaiah, 2018; Almaiah, Jalil & Man, 2016a).

In fact, e-learning is considered one of the most advanced and significant web-based systems in the education sector (Almarashdeh, 2016). E-learning refers to the delivery of educational resources and services through digital technologies is becoming an indispensable tool for improving teaching and learning quality (Almaiah & Jalil, 2014; Shawai & Almaiah, 2018). As a result, universities over the world are investing considerable amounts of money and resources into enhancing the quality of their e-learning systems. For example, in Saudi Arabia, over 69% of universities use e-learning systems, according to Alharbi et al. (2015). The global market for e-learning was estimated to be over 176 USD billion in 2017 and is set to exceed 398 USD billion by 2026. Despite significant investments in e-learning systems, some universities still fail to achieve the anticipated benefits of e-learning system (Alharbi & Sandhu, 2019). Therefore, in recent years an increase has been observed in the number of empirical studies intended to examine the factors affecting e-learning quality and the students’ satisfaction from e-learning (Almaiah & Alyoussef, 2019). However, the majority of these studies have considered instructors’ perceptions (Alhabeeb & Rowley, 2017; Alharbi & Sandhu, 2019; Alharthi et al., 2017; Alotaibi, 2019; Quadri et al., 2017), while few have paid attention to students’ perceptions. This approach ignores the fact that students serve as the primary users for the usage and evaluation of e-learning systems, and, therefore, their opinions and concerns are essential for examining such factors.

Several studies have been conducted on e-learning systems adoption by many researchers (Alhabeeb & Rowley, 2017; Alharbi & Sandhu, 2019; Alharthi et al., 2017; Alotaibi, 2019; Quadri et al., 2017). However, little empirical research focused on determining the success factors of e-learning systems as far as university students view them. There are a limited number of examples, which look at this, including the study by McPherson and Baptista Nunes (2006), which identified various organizational e-learning success factors in educational institutions. These authors conducted a focus group and identified 66 success factors, which were then subdivided into the following categories: delivery issues; technological issues; cultural, structural and leadership issues; and design issues. On the other hand, Graham, Woodfield, and Harrison (2013) conducted semistructured interviews with administrators at six universities and pointed out that institutional strategy, structure, and support are vital for successful implementation of blended learning at different stages. None of previous studies has empirically examined the effects of quality and organizational factors have on students’ satisfaction and e-learning system quality based on students’ perceptions. Consequently, this study will have the following two primary objectives: (1) What are the main factors affecting students’ satisfaction and e-learning system quality? and (2) What is the model which integrate multiple factors to study the effects of quality factors and organizational factors on students’ satisfaction and e-learning system quality?
2. Literature review

2.1. E-learning system in universities
Many universities in the world have been adopting several brands of e-learning systems like Blackboard, Moodle, and WebCT to facilitate teaching and learning. E-learning system is a type of information systems (ISs) specifically used in teaching and learning (Almaiah & Al mulhem, 2018b). E-learning systems in the universities are trending from supplementary to complimentary to be an integral part in curriculum delivery and later be infused in the curriculum. The usage of e-learning system offers several benefits for students, instructors, and universities such as increase the quality of teaching and learning, as well as an improvement in the interactions among students and instructors (Almaiah & Alyoussef, 2019). This study views the benefits derived from e-learning system. It investigates how e-learning systems help educational institutions facilitate student enrolment, enhance reputation of their educational system, respond quickly to change, and lower costs.

2.2. Factors affecting e-learning systems’ adoption in Saudi Arabia universities
According to the literature in Table 1, there are unlimited factors which affecting e-learning adoption and these factors differ according to the geographical position, users’ perceptions, type of organization, and self-efficacy (Almaiah & Al mulhem, 2018b; Almaiah, 2018). In fact, several researchers mentioned that e-learning system adoption is challenged by several factors (Almaiah & Alyoussef, 2019). Many studies addressed the adoption and usage of e-learning system in Saudi Arabian universities. For example, Almaiah and Alyoussef (2019) found that four important factors that significantly positively affect on e-learning system adoption that include course design, course content support, course assessment, and instructor characteristics Saudi Arabian universities. Mwakyusa and Mwalyagile (2016), in their research conducted in Tanzania, reported a number of factors, which challenge adoption and implementation of e-learning systems in Tanzania’s higher learning institutions for the past two decades, these include technologies, support, cost, institutional issues, and curriculum development. Abdullah and Ward (2016) also investigated factors influencing e-learning acceptance using technology acceptance model (TAM). Their findings revealed that self-efficacy, subjective norms, enjoyment, anxiety, and experience with using computers had a significant effect on students’ acceptance of e-learning. Similarly, Alhabeeb and Rowley (2017) found that academic staff knowledge of learning technologies, student knowledge of computer systems, and technical infrastructure, were significant factors in facilitating the successful acceptance of e-learning in Saudi Arabian universities. Naveed et al. (2017) suggested that technological readiness with system characteristics were significant factors influencing the acceptance of e-learning. Andersson and Grönlund (2009) reviewed research study, both in developing and developed countries, identified four themes of challenges facing e-learning systems, which include technological challenges, contextual challenges, users/individuals behavior, and course; in technological challenges it includes: software design, access, and cost; in contextual challenges it includes organization and cultural, in users’ characteristics it includes learners and instructors’ challenges; and in course challenges it includes course content, course design, and course delivery. Alharbi et al. (2015) revealed that service quality and student/instructor interactions with computers were sufficient with extended use of e-learning systems in Saudi Arabia. Similarly, Almaiah and Al mulhem (2018b) identified the most critical factors that will contribute to successful e-learning implementation at Saudi Arabian universities that include four factors are website quality factors, technological factors, top management support, and awareness. On the other hand, Alizadeh (2019) conducted a qualitative analysis of the students’ evaluation of using a learning management system (LMS) in teaching English. He classified the students’ needs into nine main factors including technical advantages, educational gains, logistical benefits, educational shortcomings, technical limitations, administrative problems, education development, LMS platform modifications, and logistics improvement. Al-Gahtani (2016) examined the factors affecting student acceptance of e-learning based on the third version of the TAM (TAM3). The study found the most significant determinants of e-learning acceptance are playfulness, self-efficacy, and anxiety, while using computers, perceptions of external control, subjective norms, and
Table 1. Previous studies on e-learning adoption

| Literature                        | Proposed model and factors                      | Results                                                                                                                                                                                                 |
|-----------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mwakyusa and Mwalyagile (2016)    | TAM with adding technologies, support, cost, institutional issues, and curriculum development | The results indicated that the technologies, support, cost, and institutional issues are the most important factors to enhance the adoption of e-learning in Tanzania.                                           |
| Abdullah and Ward (2016)          | TAM                                            | The findings revealed that self-efficacy, subjective norms, enjoyment, anxiety, and experience with using computers had a significant effect on students’ acceptance of e-learning.                                      |
| Alhabeeb and Rowley (2017)        | TAM model                                      | Researchers found that academic staff knowledge of learning technologies, student knowledge of computer systems, and technical infrastructure, were significant factors in facilitating the successful acceptance of e-learning in Saudi Arabian universities. |
| Naveed et al. (2017)              | TAM                                            | Technological readiness with system characteristics was significant factor influencing the acceptance of e-learning.                                                                                   |
| Andersson and Grönlund (2009)     | None                                           | They identified four themes of challenges facing e-learning systems, which include technological challenges, contextual challenges, users’ individuals behavior, and course, in technological challenges it includes: software design, access, and cost; in contextual challenges it includes organization and cultural; in users’ characteristics it includes learners and instructors’ challenges; and in course challenges it includes course content, course design, and course delivery. |
| Almaiah and Alyoussef (2019)      | UTAUT model                                    | They found that four important factors that significantly positively effect on e-learning system adoption that include course design, course content support, course assessment, and instructor characteristics.                                    |
| Alharbi et al. (2015)             | Delone and Mclean model                        | They revealed that service quality and student/instructor interactions with computers were sufficient with extended use of e-learning systems in Saudi Arabia                                                                 |
| Almaiah and Al mulhem (2018a)     | Proposed a new framework                      | Almaiah and Al mulhem (2018a) identified the most critical factors that will contribute to successful e-learning implementation at Saudi Arabian universities that include four factors are website quality factors, technological factors, top management support, and awareness. |

(Continued)
perceived usefulness. While, social influence, demonstrability, and perceived enjoyment were not related to the acceptance of e-learning systems in the context of Saudi Arabia.

From above literature, there is clear evidence that there are still unrecorded factors affecting adoption of e-learning systems in Saudi universities, such as quality factors, organizational factors, and students’ satisfaction (Almaiah & Al mulhem, 2018a; Almaiah & Alamri, 2018). Thus, this study aims to develop a research model extending from the Delone and Mclean (D&M) IS success model in order to investigate the effects of quality and organizational factors on students’ satisfaction of e-learning system quality.

2.3. The Delone and Mclean (D&M) information system success model
In the literature, there are several adoption models for technology adoption which have been well used such as TAM, UTAUT, TRA, and D&M IS success model. Most of them have been adopted and adapted separately into many researches and proved successfully. The model of DeLone and McLean (2003) was developed in 2003 with six constructs as shown in Figure 1. The causal-impact relationship was the main idea between the constructs relationship. The three exogenous quality factors (system quality, information quality, and service quality) affect the use and user satisfaction as intermediate constructs that in turn influence the immediate individual user of the system who ultimately impacts the whole organization. That shows the impacts of using IS and values are being measured in two standpoints as individual impacts and as organizational impacts. In this study, the DeLone and McLean (2003) model is adapted because it was developed for IS success. Dominance of DeLone and McLean (2003) model is well explained by stack it occupies in IS development, it is estimated that 38% of articles have used this model (DeLone & McLean,

| Literature          | Proposed model and factors | Results                                                                                                                                                                                                 |
|---------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Al-Gahtani (2016)   | TAM3                       | The study found the most significant determinants of e-learning acceptance are playfulness, self-efficacy, and anxiety, while using computers, perceptions of external control, subjective norms, and perceived usefulness. While social influence, demonstrability, and perceived enjoyment were not related to the acceptance of e-learning systems in the context of Saudi Arabia. |

Figure 1. DeLone and McLean model (2003).
Because e-learning systems are a special type of IS in education (Abdullah & Ward, 2016), the D&M model, as one of the most often utilized models for IS success (Almaiah, Jalil & Man, 2016b; Almaiah, 2018; Almaiah & Man, 2016), has been broadly implemented as a means of evaluating success in e-learning systems and applied in several empirical studies. In one example, Wang et al. (2007) applied the D&M model to evaluate e-learning systems’ success and determined that service, information, and system quality positively impact on user satisfaction, which consequently has positive influence on learning results, either indirectly or directly, via the mediation of system use. In addition, Almarashdeh (2016) developed the user satisfaction evaluation model, which incorporates the TAM into the D&M model in order to measure the level of satisfaction experienced by instructors toward an e-learning system. His results suggest that perceived usefulness, as well as the three quality factors, impact positively on the satisfaction felt by users, which therefore mediate the effect to the net benefit of using a LMS. Mtebe and Raphael (2018) extended the D&M model, suggesting other significant factors that might influence user satisfaction: perceived usefulness and instruction quality. Their results show that demonstrable positive effects are caused to the satisfaction of learners by service, instructor, and system quality. Ozkan et al. (2009) in their studies investigate user satisfaction in the e-learning environment. The study concluded that content (information) quality, learner perspective, service quality, instructor attitudes, support, and system quality are important factors for learner satisfaction. Existing studies have greatly contributed to applying the D&M model in e-learning and identified the effects of service, information, and system quality.

Despite a number of studies in adopting of e-learning systems in Saudi Arabia, but none of them have investigated the impact of quality factors and organizational factors on students’ satisfaction of e-learning system quality based on students’ perceptions. This research study will develop a multifactors model using proposed seven constructs and test it on sample of 250 students from King Faisal University in Saudi Arabia.

3. The proposed model and hypotheses

As we mentioned above, although the D&M model places significant emphasis upon service, information, and system quality, which might play critical role in successfully designing and implementing e-learning systems. It has not considered the organizational aspects such as top management support and change management on e-learning system quality. This study, accordingly, attempts to address such limitation by considering the effects of quality factors and organizational factors on students’ satisfaction and e-learning system quality. The proposed model is presented in Figure 2 with seven constructs deduced from an extensive literature review. Components and scale development for each construct with associated hypotheses and measuring instrument are described in the next sections. Table 2 summarizes the hypotheses in the proposed model.

3.1. Course content quality

In the e-learning system, this construct refers to the information or output quality generated by the e-learning system, it is an information related to a course in which an instructor is in charge, and it is a measure of how meaningful the course is (Almaiah et al., 2019a, 2019b). Hassanzadeh et al. (2012) showed that course content quality relate positively with students’ satisfaction. Based on that, course content quality in this study is hypothesized to positively impact on students’ satisfaction. Hence:
Course content quality has positive and significant effect on students’ satisfaction of e-learning.

3.2. Educational system quality
This construct measures a quality of education features of e-learning, it includes features such as usefulness, flexibility, chatting, forum, video, and other collaborative features (Almaiah et al., 2020; Alksasbeh et al., 2019). Educational system quality is an essential component for accomplishing the targeted objectives set by organizations. System quality represents the extent to which the desirable characteristics of the IS itself in education environment. Previous studies on e-learning

Table 2. The proposed factors and hypothesis

| Factors                         | Hypothesis                                                                 |
|---------------------------------|-----------------------------------------------------------------------------|
| Course content quality          | H1: Course content quality has positive and significant effect on students’ satisfaction of e-learning. |
| Educational system quality      | H2: Educational system quality has positive and significant effect on students’ satisfaction of e-learning. |
| Service quality                 | H3: Service quality has positive and significant effect on students’ satisfaction of e-learning. |
| Top-level management support    | H4: Top-level management support has positive and significant effect on e-learning system quality. |
| Change management               | H5: Change management has positive and significant effect on e-learning system quality. |
| Students’ satisfaction          | H6: Students’ satisfaction has positive and significant effect on e-learning system quality. |

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Figure 2. The proposed model.
success have demonstrated that system quality has a positive impact on service students' satisfaction (Almaiah & Alismaiel, 2019). Hence, educational system quality has positive and significant effect on students' satisfaction of e-learning.

**H2:** Educational system quality has positive and significant effect on students' satisfaction of e-learning.

### 3.3. Service quality

Service quality is often described as how far service levels meet user expectations in terms of empathy, assurance, responsiveness, reliability, and tangibility. In the area of e-learning, service quality represents the quality of support the e-learning department delivers to the users in the e-learning environment or who use its platform (Cheng, 2012). A service which is delivered via a system will interface with users, so its quality is important for e-learning system success. For instance, Almaiah and Al mulhem (2019) argued that service quality is critical to ensure educational institutions achieve and retain competitive advantages. Gorla and Somers (2014) study on IS success, reported a positive direct effect of service quality on user satisfaction. Therefore, service quality, in this study, is hypothesized to impact positively on students’ satisfaction of e-learning. Hence:

**H3:** Service quality has positive and significant effect on students’ satisfaction of e-learning.

### 3.4. Top-level management support

Top-level management support refers to the participation and involvement of universities managers at the most senior level in implementation e-learning projects. It is a reflection of the opinion of top managers surrounding the importance of e-learning systems for the universities in achieving competitive advantages. When top management recognizes the benefits of e-learning systems, it is more likely that they will identify business needs, provide adequate resources, streamline decision-making processes, and ensure that the e-learning system is utilized effectively in the planned fashion, elements which are required for IS planning and implementation. In a study performed by Singh and Hardaker (2014) exploring the barriers and enablers of e-learning in the higher education context, conclusions were drawn indicating that top management support and commitment was essential for e-learning technologies to be successful adopted and diffused. Several past studies have indicated that support from top management is a critical factor in enhancing e-learning system quality (Almaiah & Al mulhem, 2018a; Singh & Hardaker, 2014). Therefore, full support from top management, including sufficient financial and technological resources, is expected to lead to enhancements in e-learning system quality.

**H4:** Top-level management support has positive and significant effect on e-learning system quality.

### 3.5. Change management

Change management is defined as a structured and systemic approach to achieving a sustainable change. Allison et al. (2008) consider change management as “developing a process for handling IT changes that are made on a regular basis (e.g., patches, upgrades, replacements).” In the context of this study, the transitioning from traditional teaching methods to adopting e-learning technology will entail inevitable changes, and introducing these changes into the universities requires an inclusive change management plan, highlighting the nature of the changes, and the procedures that would be used in the teaching environment (Allison et al., 2008). According to Cheng (2012), rapid and continual technology changes can make e-learning systems become outdated within a short space of time, and suggest that universities adapt changes through a systematic change management process that guide and direct e-learning department to not only, for example, improve system functionality and response time, but also ensure the availability of the system at the same time, allowing for a more accessible e-learning system with better
e-learning system quality (Hassanzadeh et al., 2016). Based on that, this study will investigate the relationship between change management and e-learning system quality. Hence:

H5: Change management has positive and significant effect on e-learning system quality.

3.6. Students’ satisfaction
This construct measures the expectation of the students on the adopted e-learning system that is due to comparison between a system’s performance (or outcome) in relation to his or her expectations. DeLone and McLean (2003) model shows that user satisfaction is one of the important keys to ensure the success of any system. In the context of e-learning system as a type of ISs in educational settings, thus, students’ satisfaction of the e-learning system quality is very important. Therefore, this study will investigate the relationship between students’ satisfaction and e-learning system quality. Hence:

H6: Students’ satisfaction has positive and significant effect on e-learning system quality.

4. Research methodology

4.1. Sample and survey method
In this study, we tested the proposed research model and hypotheses using quantitative method, namely a survey questionnaire targeted toward university students (educational technologies department students), who play a key role in the use and evaluate the success of e-learning system at King Faisal University in Saudi Arabia. Using the convenience sampling technique, the students were invited to participate in the questionnaire based on their availability during the classroom. All participants in this study were briefed on the academic research purpose and confidentiality of the survey, in which they voluntarily agreed to participate.

In total, 270 self-administered questionnaires were distributed, with 250 university students being returned, indicating a 92.5% response rate. About 20 responses had incomplete or invalid answers and therefore were excluded. Hence, 250 responses were considered valid for further analysis. Among 250 valid responses, 68.0% of respondents were female, while 32.0% were male. Moreover, most of respondents (80%) were between 18 and 20 years; and 20% were between 20 and 22 years.

4.2. Instrument measurement items
The survey instrument consists of two parts: the first part includes demographic information (e.g., gender and age). The second part includes seven main constructs (course content quality, system quality, service quality, top management support, change management, students’ satisfaction, and e-learning system quality). The items for measuring the constructs in this study were derived from existing prior research. For example, the measurement items for the three constructs (course content quality, system quality, and service quality) were adopted from the study conducted by Almaiah, Jalil, and Man (2016b). Top management support and change management were measured through items adapted from Almaiah and Al mulhem (2018a). The items measuring students’ satisfaction and e-learning system quality were adapted from the study of Delone and McLean (2003). A five-point Likert scale was used for measuring every item, ranging from “strongly disagree = 1” to “strongly agree = 5.”

4.3. Fit-model testing
The model testing involved determining how well suited the research instrument was to the study data. For this study, the goodness of fit (GoF) method was used. Tabachnick and Fidell
Table 3. Model-fit indices analysis

| Fit index   | Research model | Recommended values |
|-------------|----------------|--------------------|
| x²/d.f.     | 4.01           | <5.00              |
| GFI         | 0.921          | >0.90              |
| AGFI        | 0.876          | >0.80              |
| RMSEA       | 0.033          | <0.06              |
| SRMR        | 0.072          | <0.08              |
| NFI         | 0.932          | >0.90              |
| NNFI        | 0.941          | >0.90              |
| CFI         | 0.923          | >0.90              |
| IFI         | 0.911          | >0.90              |

(2013) believed that GoF is an important stage of testing. In this study, a confirmatory factor analysis was used to identify the model-fit indices of the research model, as shown in Table 3.

5. Data analysis and results

5.1. Data analysis for pilot test

The main purpose of the pilot test was to test and rectify the data collection instrument (questionnaire) in order to improve it before proceeding into the actual data collection (Hair et al., 2010). The pilot study for this research was conducted in King Faisal University. In the pilot test, the questionnaire was sent to three university professors, each holding significant expertise in the e-learning field in order to test the appropriateness and validity of the questionnaire. After that, the questionnaire was tested by 29 students who were selected randomly. The reliability of each item was analyzed using IBM SPSS version 21 in this pilot study (pretest study) and the result table of 0.91 prove that the items were consistent measuring what they supposed to measure. Hair et al. (2010) stated that a value of above 0.7 was required to be classed as highly reliable, and values between 0.6 and 0.7 were deemed to be acceptable. Table 4 shows the reliability values for all constructs, the Cronbach alpha (α) found for majority of constructs were more than 0.8, which was above the required threshold of 0.7 according to Hair et al. (2010), which indicated how consistently the constructs were.

The validity of all constructs was assessed for convergent validity and discriminant validity. For the convergent validity, the results in Table 4 show that the average variance extracted (AVE) was above 0.5. For the discriminant validity analysis, the square root of AVE was taken to correlate the

Table 4. Results of reliability and convergent validity analysis

| Constructs                                      | Cronbach’s alpha (α > 0.7) | Average variance extracted (AVE > 0.5) |
|------------------------------------------------|----------------------------|---------------------------------------|
| Course content quality (CCQ)                   | 0.93                       | 0.78                                  |
| System quality (SQ)                            | 0.90                       | 0.75                                  |
| Service quality (SEQ)                          | 0.88                       | 0.73                                  |
| Top-level management support (TLMS)            | 0.83                       | 0.65                                  |
| Change management (CM)                         | 0.85                       | 0.68                                  |
| Student satisfaction (SS)                      | 0.81                       | 0.60                                  |
| E-learning system quality (ESQ)                | 0.87                       | 0.71                                  |
| Variables                                      | CCQ  | SQ   | SEQ  | TLMS | CM  | SS  | ESQ |
|------------------------------------------------|------|------|------|------|-----|-----|-----|
| Course content quality (CCQ)                   | 0.89 |      |      |      |     |     |     |
| System quality (SQ)                            | .445 | 0.91 |      |      |     |     |     |
| Service quality (SEQ)                          | .482 | .377 | 0.87 |      |     |     |     |
| Top-level management support (TLMS)            | .473 | .560 | .439 | 0.82 |     |     |     |
| Change management (CM)                         | .384 | .445 | .445 | .473 | 0.80|     |     |
| Student satisfaction (SS)                      | .566 | .408 | .482 | .408 | .377| 0.90|     |
| E-learning system quality (ESQ)                | .338 | .502 | .473 | .445 | .560| .377| 0.86|
latent constructs. Table 5 shows the square root of the AVE for all constructs is higher than the pairwise correlations. Therefore, the psychometric characteristics of the instrument were acceptable in terms of discriminant validity (Fornell & Larcker, 1981).

5.2. Data analysis for model and hypotheses testing
The structural model was examined for its fit before it was used for hypothesis testing. As presented in Table 3, the estimated values for all fit indices fell into the recommended range, showing that the structural model had a superior fit. When it had been shown that the structural model was adequate, the hypotheses were then tested.

The results of hypotheses testing, presented in Table 6, indicated that all hypotheses were supported. Course quality content had significant positive effects on students’ satisfaction of e-learning system quality, which supported H1 (H1: t value = 4.712, p < 0.001). In addition system quality (t value = 4.130, p < 0.001), supporting hypothesis H2, which indicated that system quality had significant positive effects on students’ satisfaction of e-learning system quality. In addition, the results indicated that there is significant positive relationship between service quality and students’ satisfaction of e-learning system quality, which supported H3 (H3: t value = 4.712, p < 0.001). Top management support and change management factors have significant effect on supporting to enhance the e-learning system quality, which supported H4 and H5 (H4: t value = 4.468, p < 0.001 and H5: t value = 4.543, p < 0.001). The results also indicated that students’ satisfaction, as hypothesized, had significant positive effects on e-learning system quality (t value = 4.324, p < 0.05), supporting hypothesis H6.

6. Discussion
The findings of the research demonstrated the various relationships between quality factors (course content quality, system quality, and service quality) and organizational factors (top management support and change management) with students’ satisfaction and e-learning system quality.

| Hypotheses                                                                 | Standardized coefficient (β) | SE (P) | t value | Supported |
|----------------------------------------------------------------------------|------------------------------|--------|---------|-----------|
| H1: Course content quality has positive and significant effect on students’ satisfaction of e-learning. | 0.570*                       | 0.008  | 4.712   | Yes       |
| H2: Educational system quality has positive and significant effect on students’ satisfaction of e-learning. | 0.498*                       | 0.005  | 4.130   | Yes       |
| H3: Service quality has positive and significant effect on students’ satisfaction of e-learning. | 0.532*                       | 0.010  | 4.712   | Yes       |
| H4: Top-level management support has positive and significant effect on e-learning system quality. | 0.503*                       | 0.005  | 4.468   | Yes       |
| H5: Change management has positive and significant effect on e-learning system quality. | 0.490*                       | 0.014  | 4.543   | Yes       |
| H6: Students’ satisfaction has positive and significant effect on e-learning system quality. | 0.421*                       | 0.011  | 4.324   | Yes       |

*p < 0.001.
quality. The results show that the achievement of a high e-learning system quality that fits student needs is not dependent only on appropriate computer software and hardware, which performs at high level, but also on the support of students’ satisfaction, top management support, and on well-structured change management by universities.

Moreover, the findings of this study show that there is clear evidence the fact that the students’ satisfaction of e-learning is influenced directly and significantly by the three types of quality factors. Course content quality has a positive and significant effect on students’ satisfaction of e-learning system quality. This finding is consistent with the previous study of Almaiah (2018). This result indicates that availability of course content anytime through e-learning system can potentially enhance the students’ satisfaction of e-learning system. Course content quality is revealed to have a significant effect on students’ satisfaction, which supports the studies in e-learning system and mobile learning carried out by Almaiah and Alismaiel (2019) and Mohammadi (2015). System quality has a positive and significant effect on students’ satisfaction (H2, supported). This finding is consistent with the study conducted by Almaiah and Man (2016). Corresponding with studies by Almaiah and Alismaiel (2019) and Mohammadi (2015), they found that system quality has a significant effect on satisfaction and intention to use of e-learning systems. This result suggests that improvements in system quality can potentially enhance the students’ satisfaction of e-learning system through the quality of services delivered via the system. This indicates that when student finds that the e-learning system is flexible, user friendly, easy to use, etc. This will enhance the effectiveness of the system for student and thus, increase their satisfaction.

In addition, service quality has a positive and significant effect on students’ satisfaction of e-learning. The same result is previous obtained by Almaiah and Man (2016) and Almaiah and Al-Khasawneh, (2020). Corresponding with studies by Almaiah and Alismaiel (2019) and Mohammadi (2015), they found that service quality has a significant effect on satisfaction and intention to use of e-learning systems.

The results of this study actually, provided empirical evidence that top management support and change management are essential factors in supporting toward enhance the quality of e-learning systems in university environment. Top management support and change management were found to positively affect e-learning system quality. This study’s results provided quantitative support for these viewpoints. Taken together, the implication of the above findings is that universities that are interested in enhancing the quality of their e-learning systems should pay special attention to these factors, which effect e-learning system quality.

Top management support is necessary for enhancing the e-learning system quality; therefore, it is essential for the sustainability of e-learning system development and implementation (Almaiah & Alismaiel, 2019). Therefore, high-level managers should provide their full support by contributing to the IS analysis, decision-making, and monitoring process. They also should guarantees that adequate resources are available for system upgrade to match the rapid technological changes.

Change management was proved to have strong positive effects on e-learning system quality and service quality, reflecting the fundamental importance of change management in achieving e-learning success. The results observed from change management indicated that educational institution that have successfully implemented a systematic change management plan, which align efforts with introducing e-learning and facilitating the implementation, are more likely to reap the benefits of e-learning systems.

Finally, the findings of this research confirm that quality factors and organizational factors are essential to enhance and ensure e-learning systems’ quality indicating that emphasizing e-learning quality alone cannot guarantee e-learning’s positive contribution to institutional benefits. This implies that educational institutions should balance e-learning quality and organizational factors in order to achieve high quality of e-learning system.
7. Conclusions
The main purpose of this study was to develop a model for investigating the effects of quality and organizational factors on students’ satisfaction of e-learning system quality from students’ perspective. To achieve that objective, this research extends the D&M model with adding new factors for examining how quality and organizational factors can affect the quality of e-learning systems. The SEM technique was used to evaluate the research model empirically. The findings showed strong support for the research model. All proposed hypotheses in this study were supported, which offering significant insights into understanding the effects of organizational factors on e-learning quality. The model demonstrates a strong relationship between organizational factors (top management support and change management) with e-learning system quality, which has never been known before. In addition, the results show that quality factors (course content quality, system quality, and service quality) have a positive and significant effect on students’ satisfaction of e-learning system quality. Therefore, educational institutions seeking to achieve greater benefits from e-learning systems should pay considerable attention to the quality factors and organizational factors during the design and implementation process of their systems, because of the important role of these factors in enhancing e-learning system quality and e-learning service quality.

8. Research limitations and future work
Although this study makes a valuable contribution to the recent literature on e-learning, but there is still some limitations. First, the proposed model of this study is neither exhaustive nor closed model; hence, it is open to continuous development through adding new factors that could play an important role in enhancing the e-learning system quality like technological, trust, cultural, and behavioral factors. In future, studies may extend the model by adding other constructs to fit into different application domains and fast changing of e-learning technologies. It may further be tested in longitudinal studies or combined with qualitative study. Second, the data were collected from a limited set of King Faisal University. Therefore, additional studies in more universities in Saudi Arabia are required to improve the generalizability of the findings.

This research has some limitations that should be mentioned. First, this research covers only public Saudiian universities; thus, it only generalizes the results to public universities, not private. Number of the universities in Saudi Arabia are private universities containing many students; therefore, private universities should be taken into consideration in future studies. Second, the sample of this study is limited to only public universities in Saudi Arabia. Future studies should cover more populations of other Saudi universities, with different educational, psychological, and demographical attributes, to improve the generalizability of the research results.

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Author details
Ahmed Al Mulhem
E-mail: ahmulhem@kfupm.edu.sa
1 Educational Technology Department, King Faisal University, Al-Ahsa, Saudi Arabia.

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