Investigating the Impact of LMS Quality, Technical Support and Perceived Usefulness on Student Satisfaction in Saudi Universities

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Abstract

Educational technology, particularly Learning Management Systems (LMS), has seen significant growth in recent years. As LMS platforms have evolved rapidly, managing them effectively has become crucial for the success of online courses. Many institutions and organizations now focus on developing LMS solutions as part of their e-learning strategies. LMS platforms are used in various educational contexts, including campus-based, distance, classroom, online, traditional, modern, and massive open online courses. They integrate numerous technological tools to support and enhance each stage of the learning process. In this context, user satisfaction is often discussed as a critical measure of LMS success. This study examines the primary factors influencing user satisfaction and the overall impact of LMS usage. It examines how these factors relate to student satisfaction and assesses LMS effectiveness. Data was gathered using a questionnaire based on previous research. The findings reveal that all identified factors positively impact student satisfaction, suggesting that greater user

satisfaction leads to improved benefits for students.

Keywords: Information quality, Distance learning; User satisfaction, and LMS.

1. Introduction

A significant advancement in technology that has enhanced teaching and learning in the 21st century, especially in the field of distance education, is online learning. This approach involves sharing information through the internet [1] and includes the use of various digital tools, although it has not entirely replaced traditional methods of instruction [2]. In this century, online learning has experienced considerable expansion, with many institutions creating dedicated online campuses in addition to their traditional offerings. The term online learning refers to the use of software, CDs, the internet, online courses, and other electronic or interactive formats to present educational content [3]. This system enables students and educators from around the globe to engage in learning activities and access educational resources at their convenience. Both instructors and learners benefit from a more streamlined educational experience, particularly through the implementation of open-source learning management systems, which are cost-effective and feature-rich [4, 5].

The COVID-19 pandemic has brought about a major shift in education, pushing universities to embrace new methods such as online and mobile learning. These technologies are designed to improve accessibility, cater to diverse student needs, enhance tracking capabilities, and be cost-effective [6]. However, this transition has also exposed disparities in internet access and technological resources, creating a digital divide among students [7]. Online learning platforms have become essential due to their flexibility, adaptability, and scalability, enabling students to pursue their education despite physical barriers [8].

In the literature, various terms such as course management systems, online learning platforms, and virtual learning environments are commonly associated with learning management systems [9]. A learning management system aids both learners and educators by providing an alternative method to study, communicate, and save time, thus enhancing accessibility to online educational materials [10]. At its core, a learning management system is a digital environment that allows educators and learners to exchange information and access both content and administrative tools for courses within a unified platform [11]. It serves as a comprehensive solution that addresses an organization's diverse needs [12]. Organizations utilizing a learning management system, as highlighted by Obadara, benefit from a centralized online repository for course materials, which are accessible to specific users. This integration of traditional and online learning formats enriches the educational process [13].

Features offered by learning management systems include tools for course management, online discussions, assignment submissions and grading, documentation, tracking academic performance, and reporting classroom activities. One well-known example of such a system is Moodle. Developed by Martin Dougiamas at Curtin University in Western Australia, Moodle stands for Modular Object-Oriented Dynamic Learning Environment [14-16]. It consists of

features categorized into six primary areas, including Course Design and Curriculum, Administrative Tools, and Educator Tools [17]. However, there are growing concerns, particularly in regions like Southwest Nigeria, about the heightened expectations of distance learners regarding the use of learning management systems. To understand the significance of these systems in education, it is crucial to explore undergraduates' perceptions of their usefulness, ease of use, attitudes, and overall engagement with learning management systems. Individuals who recognize the value of a technology are more inclined to adopt it than those who do not [18].

Universities in Saudi Arabia have increasingly embraced distance learning methods [19]. Nevertheless, existing distance learning systems still exhibit notable shortcomings and require enhancement. A primary advantage of distance learning in Saudi institutions is that it promotes greater participation of women in higher education [20]. Alsmadi [21] examined the elements influencing the adoption of learning management systems and assessed their appropriateness for distance learning, particularly in higher education.

Improving the distance learning systems in Saudi Arabia is essential for several reasons, with one of the most significant being the rising enrollment in various educational programs, especially among women [20]. Both traditional education methods and distance learning strategies should be utilized. A study by Al-Sultan indicated a substantial increase in student enrollment alongside the number of individuals unable to pursue higher education. The report stated that out of 70,000 students who graduated in 1993, 2,000 could not continue their education. By 2003, despite more than 200,000 graduates, around 12,000 encountered similar obstacles [22]. The findings pointed to an increasing ratio of higher education graduates compared to high school graduates, underscoring the need for greater attention to this issue [22].

Several institutions in Saudi Arabia, including King Saud University (KSU) in Riyadh, King Abdulaziz University (KAU) in Jeddah, King Faisal University in Al-Hasaa, have adopted the distance learning model (KFU). Initially, distance learning systems depended on printed materials sent through standard mail. These universities aim to integrate new distance learning technologies for both students and staff [2, 20]. To support the main goals of distance learning, dedicated offices for distance learning and e-learning were set up at these institutions: KAU in 2006, and KSU and KFU in 2010. According to their websites, these offices are tasked with supplying students with online training materials and resources and integrating virtual classrooms into the curriculum. Additionally, Imam Abdulrahman Bin Faisal University (IAU) established its own office for distance learning and e-learning in 2012, beginning its initial curricula in this field [20, 21].

The aim of our project is to create an effective learning management system for remote education that can be utilized by administrators, educators, and students. However, developing a learning management system would be ineffective if the technology is not widely adopted and if the critical success factors remain unclear. Prior to this, the acceptance criteria and effectiveness of learning management systems among stakeholders were evaluated, resulting in the formulation of an Educational Technology Model. Therefore, the goal of this project is to design and validate this model to assess or construct a LMS.

2. METHOD AND RESEARCH MODEL

This section presents the conceptual framework for the investigation and outlines the hypotheses to be tested. The suggested framework combines a widely recognized technology acceptance model (TAM) with a model focused on the success of Information Systems (IS). Within the realm of technology adoption, the notion of perceived benefits is utilized to assess user interactions. This study emphasizes the importance of effective Learning Management Systems from the perspective of information systems. The elements examined are based on ongoing enhancements in the development, design, and delivery of essential resources for users engaged in remote learning. The characteristics of the proposed framework are illustrated in the figure 1.

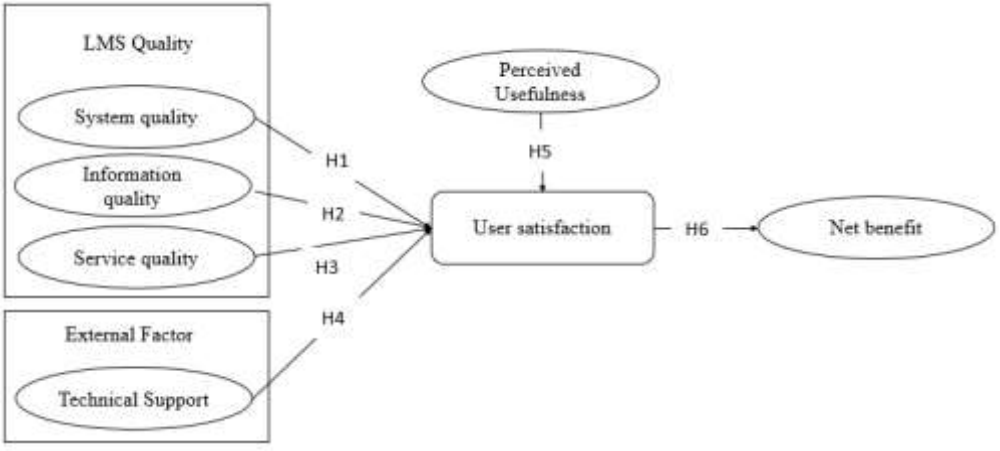

Figure 1: The suggested research framework.

3. RESEARCH HYPOTHESIS AND MODEL COMPONENTS

The effectiveness of educational technology plays a crucial role in how well it is utilized and the level of satisfaction it brings to the learning experience. Therefore, examining how the quality of educational technology influences learner behavior is a valuable area of study. Additionally, user satisfaction is influenced by various factors, including user attitude, system output, task difficulty, system type, expectations, and Perceived Usefulness (PU). Research indicates that satisfaction may be influenced by factors such as system performance, effectiveness, and PU. It can also be assessed through dimensions like Service Quality (SVQ), SQ, Information Quality (IQ), and This research will extend the TAM to develop a model that examines how the external Technical Support (TS) factor may influence the use of Learning Management Systems (LMS). This study explores student satisfaction with LMS use in distance learning courses, concentrating on constructs such as SVQ, SQ, IQ, PU, and TS. The proposed theoretical framework, known as the User Satisfaction Evaluation Model (see Figure 1), illustrates the relationships among these constructs—SQ, SVQ, IQ, PU, TS, and student satisfaction. The following sections will offer a comprehensive discussion of the model's components and related hypotheses.

- System Quality

SQ refers to the effectiveness of an information system's functionality. A high level of SQ can result in more convenient use of the technology. Consequently, individuals can better identify and understand the practical functions of an information system when its quality is sufficiently high [23]. Previous research has shown that the quality of the system directly influences student satisfaction [24]. Therefore, the following hypothesis is proposed.

H1: SQ is positively associated with user satisfaction in LMS usage.

- Information quality

The quality of information pertains to the essential attributes of a system's outputs, including relevance, accuracy, clarity, timeliness, completeness, usability, and accessibility. Numerous researchers have emphasized that the quality of information is a crucial factor influencing the perceived ease of use and usefulness of the information provided [23]. Previous research has shown that the quality of the information directly influences student satisfaction [24]. As a result, the following hypothesis is put forward.

H2: IQ is positively linked to user satisfaction with LMS usage.

- SVQ

SVQ is understood as the presence of support channels that assist lecturers in resolving issues related to the Learning Management System (LMS) [25]. Numerous studies highlight the importance of the SVQ delivered by IT staff in the successful adoption of an LMS [26, 27]. Abdallah and Ahlan [28] explored SVQ by focusing on factors such as empathy, reliability, and responsiveness. The study's findings suggest that SVQ is a key element in shaping lecturers' attitudes and behaviors toward using the LMS. As a result, the following hypothesis is put forward:

H3: SVQ has a significant effect on user satisfaction with LMS usage.

- Technical Support

One of the key organizational factors that can influence LMS usage among faculty members is TS. This includes assistance from IT staff to help users resolve software and hardware issues, as well as providing necessary services to enable effective LMS use. Thus, TS within an organization is crucial for successful adoption of the technology [29]. Based on this, the study proposed the following hypotheses:

H4: TS significantly impacts user satisfaction with LMS usage.

- Perceived Usefulness

PU refers to users' expectation that using the system will enhance their work performance. Relevance and usefulness are the key factors in assessing students' perceptions. Studies indicate that PU has a significant impact on student satisfaction. Therefore, the following hypothesis is suggested.

H5: PU significantly affects user satisfaction with LMS usage.

- User Satisfaction

User satisfaction includes the overall assessment of the learning management system's effectiveness and the user's experience with it. Two key factors that shape user satisfaction are the user's initial expectations of the LMS and the confirmation of those expectations [24]. Research indicates that user satisfaction influences the benefits or overall outcomes of using an LMS [24]. Based on this, the following hypothesis is proposed.

H6: User satisfaction is positively associated with net benefit.

4. DATA COLLECTION

This study collected data using a questionnaire developed based on previous research findings. A pilot test was conducted to confirm the reliability of the questionnaire. Feedback and suggestions from participants during the pilot phase were addressed, and the questionnaire was reviewed by two experts. The finalized version included 32 items measuring various aspects: SQ (6 items), IQ (6 items), SVQ (5 items), PU (3 items), TS (6), student satisfaction (3 items), and net benefit (4 items). The study's sample consisted of 400 distance learning students from four universities, with the sample size adhering to recommended guidelines for surveys. Except for the background items, the questionnaire used a 5-point Likert scale with ranges starting from “5 strongly agree” to “1 strongly disagree” to measure responses.

5. DATA ANALYSIS

The data was analyzed using SPSS and Structural Equation Modeling (SEM). The initial step in the analysis involved assessing reliability, where a coefficient alpha of .80 or .90 typically indicates a well-constructed scale [24, 30]. In this study, the questionnaire's reliability was measured at .898, confirming the scale's robustness. The specific reliability values for each construct are detailed in Table 1. Descriptive statistics were employed to summarize the results, both graphically and numerically, for easier comprehension and interpretation [31]. Frequency distributions and descriptive statistics provided an overall view, highlighting the properties of the collected data. Means and standard deviations for the scaled variables are also presented in Table 1.

The descriptive statistics in data analysis offer a concise overview of the results. In this context, data are displayed in both graphical and numerical formats, which enhances understanding and interpretation [31]. Frequency distributions and descriptive statistics provide a general summary while highlighting the characteristics of the collected data. Measures such as standard deviation and mean are calculated for the scaled variables, as detailed in Table 1.

The results from the descriptive statistics show that the mean values for all factors are above 3.69, with consistent means across all factors, indicating close clustering of the results around

the mean and similarity in students' opinions. The standard deviation values range from 0.79 to 1.00, reflecting minimal variation in students' opinions.

Table 1: Cronbach's Alpha.

Item Reliability	Item Reliability	Mean	SD
PU	0.882	3.81	0.893
SVQ	0.887	3.70	0.831
TS	0.804	3.69	0.853
SQ	0.828	3.78	0.883
User satisfaction	0.845	3.71	0.781
IQ	0.883	3.70	0.805
Net benefit	0.802	3.87	0.835

6. DEMOGRAPHIC INFORMATION

The background information is presented in Tables 2 through 6. Notably, 45% of the participants are female, and 55% are male. The majority of respondents were between the ages of twenty and forty. About 35% of the participants have over ten years of computer experience, with most having used one for over a year. Additionally, most have been using the LMS for over a year. About 15% of the participants are in the education field. The demographic data is shown in Tables 2 through 6.

Table 2: Gender

Gender	Frequency	Percentage
Male	220	55%
Female	180	45%
Total	400	100%

Table 3: Age

Age Range	Frequency	Percentage
20-24	80	20%
25-29	100	25%
30-40	130	32.5%
41-50	60	15%
Over 50	30	7.5%
Total	400	100%

Table 4: Computer Usage

Usage Duration	Frequency	Percentage
less than 1 year	20	5%
1-3 years	60	15%
3-7 years	140	25%
7-10 years	100	20%
more than 10 years	80	35%
Total	400	100%

Table 5: LMS Usage

Usage Duration	Frequency	Percentage
less than 1 year	50	12.5%
1-3 years	80	20%

3-7 years	150	37.5%
7-10 years	70	17.5%
more than 10 years	50	12.5%
Total	400	100%

Table 6: Field of Study

Field	Frequency	Percentage
Art and Humanities	45	11.25%
Social Sciences	41	10.25%
Natural or Physical sciences	35	8.75%
Mathematic or computer Sciences	51	12.75%
Engineering	30	7.50%
law	31	7.75%
Medicine and health sciences	57	14.25%
Education	60	15.00%
Business	50	12.50%
Total	400	100%

7. MEASURE OF FIT

Assessing the model is likely to be one of the most challenging aspects of Structural Equation Modeling (SEM) [32]. It is crucial to understand how to assess the model before analyzing the structural model. Confirmatory Factor Analysis (CFA) in SEM is divided into various types, each with a distinct role in model assessment, such as evaluating population discrepancy, measures of parsimony, minimum sample discrepancy function, population discrepancy, comparison to a baseline model, and goodness of fit index [33]. Previous studies suggest that a minimum of 10 participants should be available for every free parameter. In this investigation, five parameters were analyzed with a sample size of 400.

The initial step in developing a structural model involves leveraging empirical research and theoretical understanding to outline the relationships between observed variables, followed by applying statistical methods to test the hypothesis. Confirmatory factor analysis (CFA) is a statistical method used to validate the structure of variables, allowing researchers to test the model's hypothesis. The accuracy of CFA is affected by various factors, including an adequate sample size, missing data, the specific research hypothesis, multivariate normality, the presence of outliers, the quality of measurement instruments, the interpretation of model fit indices, and parameter identification [33].

The statistic (χ^2) is the most prevalent fit index in SEM. The chi-square value indicates the extent to which the actual data diverges from the proposed theories. A chi-square minimum discrepancy (CMIN) with a higher probability (P) value suggests a closer alignment between the ideal fit and the hypothesized model. The calculated chi-square value for the proposed model is 14.988 with a P value of 0.010, indicating that the model is appropriate and shows no significant difference when compared to alternative models.

The overall fit assessment shows a chi-square per degree of freedom (Chi-sq/df) of 2.998 with 5 degrees of freedom, indicating an excellent fit. Table 7 presents a summary of the fit measures

for the User Satisfaction Evaluation Model. This analysis confirms that the proposed model is well-aligned with the data. The fit measures discussed in this study are consistent with previous recommendations, suggesting that the model's hypotheses are valid and serve as strong predictors.

Table 7: Summary of the fit measures employed in this study.

Fit measures	Model fit	Recommended value
CMIN/Df	2.998	<3
P value	0.010	>0.05
CFI	0.971	>0.90
RMSEA	0.135	<0.08

8. HYPOTHESIS TESTING AND ANALYSIS

The primary goal of this research is to assess the importance of various elements that enhance the effectiveness of Learning Management Systems (LMS) in remote education programs. The results reveal considerable effects among all measured variables. The model's validation was carried out through a specific analytical method, achieving a CMIN/DF value of 2.998, which suggests an excellent fit. Therefore, this approach is deemed appropriate for hypothesis testing through regression techniques.

The analysis shows that System Quality (SQ) significantly affects student satisfaction concerning the performance of LMS, with a critical ratio of 3.96, indicating a strong influence. Consequently, factors such as availability, usability, ease of learning, meeting user expectations, and quick response times are recognized as essential predictors of student satisfaction.

PU has been identified as having a significant impact on student satisfaction [34], with a critical ratio (C.R) value of 3.46. This suggests that improving the usefulness of Learning Management Systems (LMS) can lead to higher levels of student satisfaction. SVQ is another important factor, with a C.R of 3.51, indicating that offering high-quality services, such as round-the-clock availability and thorough training, can also enhance student satisfaction [35]. Additionally, IQ plays a similar role, significantly influencing student satisfaction with a C.R of 3.72. Key aspects such as understandability, accuracy, completeness, adequacy, relevance, timeliness, format, and accessibility of information are crucial for the effective utilization of LMS in online courses [36]. Interestingly, this finding differs from the conclusion of Green et al. [37], which found that the delivery format had no significant effect on student satisfaction. The findings also indicated that technical support was a significant factor, with a critical ratio (C.R) of 3.45. Technical support directly and positively influences student satisfaction. In other words, the better the technical support and assistance provided to learners in solving problems, the easier and more beneficial students find the use of LMS.

The findings reveal that five hypotheses—H1, H2, H3, H4, and H5—show similar values (C.R greater than 3.4) in their impact on student satisfaction. User satisfaction emerges as a crucial predictor of system outcomes [24]. Previous research suggests that student satisfaction significantly influences the overall benefits gained from LMS usage [36]. Specifically, H6, which examines the link between student satisfaction and net benefits, was tested and achieved

a C.R of 3.086, indicating a strong effect of student satisfaction on the outcomes or net benefits associated with LMS usage. In other words, higher satisfaction with LMS usage is likely to result in greater benefits for students, and it is also anticipated that students' willingness to use the system will increase [38].

As a result, factors like SQ, IQ, SVQ, TS, and PU are recognized as influencing user satisfaction, which in turn mediates the overall benefits. This study contributes by emphasizing the elements that impact user satisfaction. The analysis of the research model using SEM suggests that the relationships within the proposed model may capture both the effects and causes related to success factors, as well as success measures. It is likely that the proposed model influences the quality of the LMS, which subsequently affects both user satisfaction and net benefits.

This study focused on students enrolled in distance learning courses, so a larger sample size could enhance the validity of the research model. Additionally, measuring student satisfaction in varied contexts might improve result validity due to differing user perspectives. Future researchers might explore how factors like training, LMS usage experience, perceived self-efficacy, and instructional design influence the use of various applications across different sample groups.

9. Conclusion

The primary goal of this research was to develop a model based on the TAM for the utilization of LMS in the higher education sector of Saudi Arabia. To achieve this, the study established a TAM-based framework and identified key factors influencing distance learners' satisfaction, including IQ, SVQ, SQ, and PU. Additionally, the study demonstrated the impact of the external factor, TS, on students' usage and adoption of LMS. The evaluation of LMS confirms their positive impact and effective integration into distance learning courses. Additionally, user satisfaction and net benefit were examined as dependent variables. Data collected through surveys from distance learners revealed insights into their perceptions of LMS benefits and satisfaction levels, supporting all proposed hypotheses. Regression analysis demonstrated that these factors significantly influence user satisfaction, with SQ having the most pronounced effect on student satisfaction with LMS. As LMS usage continues to rise in universities, it is crucial to regularly assess and enhance their quality. Furthermore, incorporating lecturers' perspectives into LMS development and research is essential for ongoing improvement.

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