

Critical Factors to Learning Management System Acceptance and Satisfaction in a Blended Learning Environment

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Abstract. The main objective of this study is to provide a comprehensive examination of the crucial factors that effect students' acceptance (perceived usefulness and perceived ease of use) as well as satisfaction of Learning Management System (LMS) usage in a blended learning environment. These crucial factors are related to the main entities of LMS: technology experience, service quality, system quality, and information quality. A quantitative research approach by means of a questionnaire was used. A total 174 participants were surveyed using the questionnaire. A partial-least-squares structural modeling approach was employed. This study shows that these critical factors are fundamental predictors of students' acceptance and satisfaction, which directly impact their decisions about using LMS. System quality was the most significant positive factor affecting students' acceptance and satisfaction. Therefore, for students' satisfaction and acceptance, a higher education institution needs to consider all these critical factors before implementing a blended learning environment with LMS.

Keywords: Blended learning · Learning management system · Acceptance · Satisfaction

1 Introduction

In the current century, internet has become the most effective medium in human life. The vastly use of Information and Communication Technology (ICT) to develop human resources (people) is essential in order to develop a knowledge based economy, particularly in developing countries. Instruction can be on the form of traditional or blended learning or e-learning. Traditional learning is a face-to-face approach, blended learning is a combination of online learning with face-to-face, while e-learning uses ICT in learning without any face-to-face approach [1].

The blended learning has been offered as a favorable alternative instructional approach. The blended learning environment combines multiple methods for learning

events, contain often face-to-face traditional learning with asynchronous and/or synchronous online learning [2].

Learning management system (LMS) is an information technology system (IT) used by instructors to easily build, update and maintain online courses on websites. LMS is an online system that permits students to exchange, and share information, as well as to collaborate online [3].

LMS not only provides higher education institutions with effective and efficient means to teach and train individuals, but also enables them to effectively and efficiently codify and share their knowledge. The use of LMS is becoming crucial for institutions of higher education. Most institutions (68%) measure the use of LMS, but only 39% measure the factors influencing students' satisfaction and acceptance on LMS [4]. For those who measure the factors of satisfaction and acceptance, IT leaders report that 93% of their students and 92% of their faculty members are generally satisfied with the features and executive functions of the LMS. When the students and faculty members were directly asked about their acceptance and satisfaction with the LMS, they reported that their acceptance and satisfaction rates are much lower than the rates reported by IT leaders. A number of the best universities around the world have adopted LMS to improve the instructional process [5, 6]. LMS has been adopted by 95% of participating academic institutions in the UK [6] and 90% of all participating academic institutions in the USA [5]. In Africa and Middle East, the demand for e-learning systems will increase by annual growth rate of more than 10% a five-year from 2009 to 2014 [7].

Although several of studies have examined the success factors and discussed the benefits of online learning [8], some studies have reported several barriers to online learning encountered by students [9]. These barriers include social interaction, administrative issues, academic and technical skills, time, motivation, technical difficulties, and limited access to resources. By looking at the responses of participants in blended learning courses, it is potential to understand the critical factors influencing its acceptance and satisfaction, which will finally lead up to an improvement of learning processes in a blended learning.

Precisely, there is little empirical research that has tried to evolve a conceptual framework to study the acceptance and satisfaction of LMS usage in a blended learning [10]. Therefore, there is a need for a conceptual framework which can be used to determine the factors that led to the acceptance and satisfaction of LMS.

Thus, the main objective of this study is to investigate the critical factors affecting students' satisfaction and acceptance of LMS usage in a blended learning environment based on the conceptual framework adapted from Information Systems (IS) success model [11]. Through literature review, several critical factors have been identified, Technology Experiences, Service Quality, System Quality, and Information Quality.

2 Conceptual Model and Research Hypotheses Development

Based on the updated DeLone and McLean IS success model, three types of quality factors: system quality, information quality, and service quality, can be regarded as the main factors of acceptance and satisfaction of IS [11]. Consequently, this study categorizes critical factors for student satisfaction and acceptance of LMS usage in blended

learning as technology experience, system quality, information quality, and service quality [11, 12]. The acceptance and satisfaction of LMS in blended learning are assessed by two factors: (1) student acceptance which contains perceived usefulness and perceived ease of use, as suggested by [13], and (2) student satisfaction, as suggested by [11, 12]. Figure 1 explains the conceptual framework model of this study.

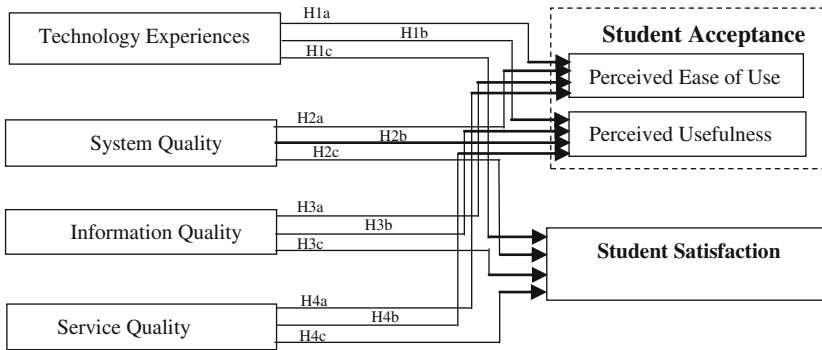


Fig. 1. Conceptual framework of the study

2.1 Technology Experiences

Students’ experience in using the technology plays an important role in the satisfaction and acceptance of technology [14, 15]. The more technology experience a student has with LMS in a blended learning, the more accustomed he/she will be to use technology in education and will perceive it as easy and useful and uses it. Furthermore, the experience of technology in long-term indicates that students are satisfied with the technology. Thus, the study proposed the following hypotheses:

- Hypothesis H1a:* Students’ technology experience positively affects their perceived ease of use of LMS in a blended learning environment.
- Hypothesis H1b:* Student’s technology experience positively affects their perceived usefulness of LMS in a blended learning environment.
- Hypothesis H1c:* Student’s technology experience positively affects their student satisfaction with LMS in a blended learning environment.

2.2 System Quality

System quality is a crucial factor of students’ satisfaction and acceptance of any technology, including LMS. In the e-learning system context, system quality was found to be significant for the satisfaction with e-learning systems [16, 17], perceived usefulness of e-learning systems [17, 18], and perceived ease of use of e-learning systems [18]. Thus, the study proposed the following hypotheses:

- Hypothesis H2a:* System quality of LMS positively affects their perceived ease of use of LMS in a blended learning environment.

Hypothesis H2b: System quality of LMS positively affects their perceived usefulness of LMS in a blended learning environment.

Hypothesis H2c: System quality of LMS positively affects their student satisfaction with LMS in a blended learning environment.

2.3 Information Quality

The information quality indicates the quality of course content delivered through the LMS. The general advantages of information quality include accuracy, completeness, sufficiency, accessibility, understandability, timeliness, and format. Some researchers showed that the information quality was important for students' perceived usefulness of e-learning systems [19]. Information quality may also improve students' perceived ease of use and satisfaction of LMS. Thus, the study proposed the following hypotheses:

Hypothesis H3a: Information quality of LMS positively affects their perceived ease of use of LMS in a blended learning environment.

Hypothesis H3b: Information quality of LMS positively affects their perceived usefulness of LMS in a blended learning environment.

Hypothesis H3c: Information quality of LMS positively affects their student satisfaction with LMS in a blended learning environment.

2.4 Service Quality

Service quality indicates the quality of support services provided to the system's end-users. Online service quality may also be a crucial factor for students' acceptance, and satisfaction with LMS in blended learning [16]. Several scholars indicated that service quality significantly predicted student satisfaction of e-learning systems [16, 20]. Thus, the study proposed the following hypotheses:

Hypothesis H4a: Service quality of LMS positively affects their perceived ease of use of LMS in a blended learning environment.

Hypothesis H4b: Service quality of LMS positively affects their perceived usefulness of LMS in a blended learning environment.

Hypothesis H4c: Service quality of LMS positively affects their student satisfaction with LMS in a blended learning environment

2.5 Students' Acceptance

According to the technology acceptance model (TAM), student acceptance can be assessed by perceived ease of use and perceived usefulness [15].

Perceived Ease of Use

Perceived ease of use of technology means the extent to which the user anticipates the target of the system is of without effort [21]. Thus, using LMS in blended learning enables the students to realize the easiness of the system and feels comfortable to use it [14].

Perceived Usefulness

Perceived usefulness of the technology is the degree of work advancement after an adoption of a system. Similarly, using LMS in blended learning enables the students to recognize the usefulness of the system in improving the learning performances and inspire them to adopt it for blended learning [16, 22].

2.6 Students' Satisfaction

Students' satisfaction indicates the happiness and the agreement of system use. It is a measure of the success of an information system [12], and used as a key factor of whether or not the students will continue to adopt a learning system [23].

3 Methodology

This study used a quantitative research approach. This study employed a questionnaire survey method, and it is conducted in the Faculty of Open Education (FOE) at one university in Yemen. The participants of this study involved the whole target population; i.e., the undergraduate students of the FOE at this university. In a 5-week period including one reminder, the total number of responses gathered was 178 resulting in approximately a 71.2% response rate for the survey. Among the 174 sets of questionnaires returned, there were 4 respondents ticking not having any online course and never used the computer, leaving 174 questionnaires for further data analysis. The participants of this study involving both male and female students.

The questionnaire consists of 31 items about the factors influencing the students' satisfaction and acceptance of LMS usage in a blended learning based on the conceptual model. The items of the questionnaire were adopted from prior studies (See Table 1). This study used a five point Likert-type scale of: 1 = SD (Strongly Disagree), 2 = D (Disagree), 3 = N (Not Sure), 4 = A (Agree) and 5 = SA (Strongly Agree). The survey was uploaded online in their social network environment, in which they are encouraged to respond.

4 Data Analysis and Results

4.1 Structural Equation Modeling (SEM)

This study used the Structural equation modeling (SEM) to examine to hypothesized model. The partial least squares (PLS) technique was used. The software package SmartPLS, Version 3.0 was used to analyze the data. There are two types of assessments supported by PLS: (a) the assessment of measurement model and (b) the assessment of the structural model.

4.1.1 Assessment of the Measurement Model

The measurement model investigates the relationship between the constructs and their respective indicators. Measurement model analysis will be used to assess convergent and discriminant validity.

Convergent Validity

Fornell and Larcker (1981) suggested three criteria to test the convergent validity: (1) the outer loading of all the indicators should be higher than 0.70; (2) construct reliability (CR) should be higher than 0.70; and (3) average variance extracted (AVE) should be higher than 0.5. Table 1 depicts that all the outer loading of indicators exceeded the recommended 0.7 cut-off point. The values of composite reliability (CR) range in the table is between 0.901–0.941 exceeded the recommended accepted threshold of 0.7. Moreover, the results from Table 1 provided an AVE values range of 0.646 to 0.794 exceeded the cut-off point of 0.5. Thus, the criteria of the convergent validity was met.

Table 1. Results of the measurement model, reliability, and validity

Dimension	Loading	CR	(α)	AVE
<i>Technology Experiences (TE) (Adopted from [24])</i>		0.934	0.904	0.780
1. I feel confident using the e-learning system	0.935			
2. I feel confident downloading necessary materials from the e-learning system	0.930			
3. I feel confident uploading necessary materials to the e-learning system	0.859			
4. I feel confident using online communication tools	0.801			
<i>System Quality (SQ) (Adopted from [14, 18])</i>		0.901	0.863	0.646
1. The system offers flexibility in learning as to time and place	0.784			
2. The course content in the system is available in multimedia form	0.776			
3. The system is reliable	0.849			
4. The system enables interactive communication	0.834			
5. The layout of the e-learning system is user-friendly	0.773			
<i>Information Quality (IQ) (Self-developed based on [8, 16])</i>		0.941	0.921	0.760
1. The information content in the system is very good	0.865			
2. The information from the system is current	0.915			
3. The information provided by the system is complete	0.872			
4. The information provided by the system is important and helpful for my learning	0.903			
5. The information provided by the system appears readable, clear and well formatted	0.799			
<i>Service Quality (SVQ) (Adopted from [16])</i>		0.924	0.890	0.753
1. The system support service is reliable	0.855			
2. The system support service is accessible	0.888			

(continued)

Table 1. (continued)

Dimension	Loading	CR	(α)	AVE
3. The system support service is easy to communicate with	0.924			
4. A specific person (or group) is available for assistance with system difficulties	0.800			
<i>Perceived Ease of Use (PEU) (Adapted and modified from [15])</i>		0.930	0.899	0.768
1. I find the e-learning system easy to use	0.887			
2. I seldom make errors when I use the e-learning system	0.848			
3. E-learning tools are clear and understandable to me	0.916			
4. I find the e-learning system to be flexible to interact with	0.852			
<i>Perceived Usefulness (PU) (Adapted and modified from [15])</i>		0.939	0.912	0.794
1. Using e-learning system enables me to accomplish tasks more quickly	0.894			
2. Using e-learning system improves my performance	0.947			
3. Using e-learning system increases my productivity	0.947			
4. Using e-learning system enhances my learning effectiveness	0.791			
<i>Student Satisfaction (SS) (Self- developed based on [8, 23, 25])</i>		0.941	0.922	0.762
1. I am satisfied with the effectiveness of e-learning system	0.871			
2. I am pleased with my experience of using the e-learning system	0.897			
3. My decision to use the e-learning system was a wise one	0.906			
4. I am satisfied with the quality of interaction between all involved parties	0.834			
5. I am satisfied with my participation in the class	0.855			

Discriminant Validity

Fornell and Larcker (1981) also suggested the use of AVE to test the discriminant validity. The square root of each AVE construct should be greater than its highest correlation with any other construct in the model. [26]. Table 2 depicts the associated

Table 2. Correlations and discriminant validity

	IQ	PEU	PU	SVQ	SS	SQ	TE
Information Quality (IQ)	0.872						
Perceived Ease of Use (PEU)	0.474	0.876					
Perceived Usefulness (PU)	0.578	0.695	0.891				
Service Quality (SVQ)	0.750	0.508	0.472	0.868			
Student Satisfaction (SS)	0.532	0.667	0.784	0.431	0.873		
System Quality (SQ)	0.575	0.622	0.701	0.535	0.739	0.804	
Technology Experiences (TE)	0.238	0.537	0.442	0.260	0.428	0.516	0.883

Square root of AVE shown along diagonal in bold type

measures; it is evident that all the squared AVE values of each construct are relatively higher than the constructs' correlation coefficient with other constructs. Thus, the convergent and discriminant validity were achieved.

Briefly, the reliability, convergent validity, and discriminant validity of the measurement model were sufficient and appropriate for the assessment of the structural model.

4.1.2 Assessment of the Structural Model

The assessment of the structural model (Fig. 2) is the second of the SmartPLS. The structural model and hypotheses will be assessed by examining the path coefficients (β) and their significant levels using PLS path modeling.

The path coefficients (β) are summarized in Table 3 between the independent constructs (technology experiences, system quality, service quality, and information quality), and the dependent constructs (perceived usefulness, perceived ease of use, and student satisfaction in blended learning environment).

Table 3. Path coefficients and hypotheses testing

Hypothesis and path		Path coefficients	t-value	p-value	Significance level
H1a	Technology Experiences → Perceived Ease of Use	0.304	4.127	0.000	***
H1b	Technology Experiences → Perceived Usefulness	0.134	2.048	0.041	**
H1c	Technology Experiences → Student Satisfaction	0.079	1.276	0.202	NS
H2a	System Quality → Perceived Ease of Use	0.316	4.112	0.000	***
H2b	System Quality → Perceived Usefulness	0.483	5.698	0.000	***
H2c	System Quality → Student Satisfaction	0.616	9.059	0.000	***
H3a	Information Quality → Perceived Ease of Use	0.057	0.535	0.593	NS
H3b	Information Quality → Perceived Usefulness	0.307	3.986	0.000	***
H3c	Information Quality → Student Satisfaction	0.224	3.051	0.002	***
H4a	Service Quality → Perceived Ease of Use	0.216	2.139	0.033	**
H4b	Service Quality → Perceived Usefulness	-0.051	0.679	0.497	NS
H4c	Service Quality → Student Satisfaction	-0.087	1.062	0.289	NS

Note: NS = not significant. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$

The coefficient of determination (R^2 value) is a measure of the model's predictive power and is calculated as the squared correlation between a specific endogenous

construct’s actual and predicted values [27]. Figure 2 shows R^2 values of the dependent constructs: perceived usefulness, perceived ease of use, and student satisfaction. The model explains 49.7% of variance in the student’s perceived ease of use of LMS in blended learning, 55.1% of variance in their perceived usefulness of LMS, and 57.1% of variance in satisfaction with LMS. The R^2 values of three dependent constructs (perceived usefulness, perceived ease of use, and student satisfaction) are 0.551, 0.497, and 0.571 respectively, are considered as substantial [27]. Figure 2 shows the standardized path coefficients with their significance levels and coefficient of determination.

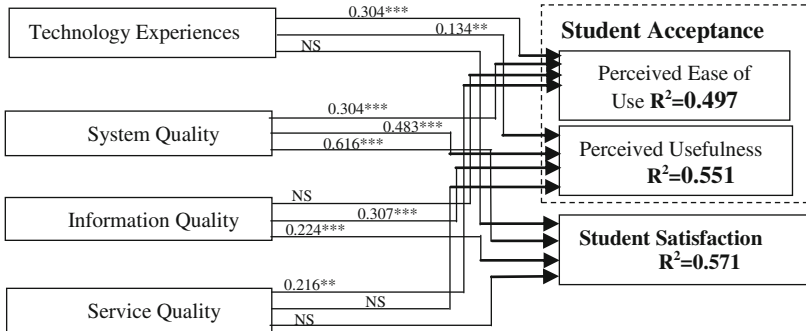


Fig. 2. Results for the structural model

5 Discussion and Conclusion

This study adapts the IS success model [11, 12], and the re-specified IS success models developed by various scholars [18] to investigate the important factors for satisfaction and acceptance of LMS usage in a blended learning environment. SEM was used in this study to test the proposed model which attempts to identify the critical factors affecting students’ acceptance and satisfaction of LMS.

The findings indicated that past experience with technologies has a positive impact on the perceived usefulness and perceived ease of use of new technologies, and it is consistent with [14]. In contrast, this study indicated that the technology experiences did not influence students’ satisfaction. This is maybe due to the fact that some students have experience in using internet, but they do not have e-learning experience. Thus, a number of students may struggle with acquiring the crucial technical skills to function well in a blended learning environment. This finding is supported by [17].

In regards to the system quality, the findings identified that system quality was a significant positive effect with perceived usefulness, perceived ease of use and student satisfaction, derived when using the e-learning system.. It is easy to believe that users are accepted the LMS when system quality meets their expectations. The finding showed that a well-designed and user-friendly interface is considered as one of the most important factors in determining the perceived ease of use and perceived usefulness of students when using the LMS. Good system characteristics such as interactivity, user interface, and guaranteed response time are critical factors in improving

acceptance and satisfaction of e-learning systems. Students usually perceive that e-learning systems are useful and ease of use, and they are satisfied with using a system that provides user-friendly operations. This is in line with many IS-related studies [8, 10, 14, 18, 20].

The finding indicated that information quality has significant affect with perceived usefulness and student satisfaction. This finding displays that if students perceive the e-learning system as reliable, accurate, readable, updated, and well formatted course contents, they will find the LMS courses more useful for their learning and they will be satisfied. These results support previous research [8, 16, 18, 20]. However, the results proved that information quality did not significantly influence the students' perceived ease of use, which is inconsistent with [18]. This may be due that when students perceive online course quality as appropriate, flexible, and regularly updated; consequently it will become easy for them to use the e-learning system.

Furthermore, the results indicated that the service quality has a positive significant influence on the students' perceived ease of use. Students are extremely accepted by the services and assistants' attitudes provided by the administrative and faculty staff. In general, students in online learning courses often face technical problems which negatively affect their perspectives on ease of use [28]. In contrast, service quality has no significant association with student satisfaction and perceived usefulness. This finding could be due to the fact that most students had moderate experience in using computers and e-learning system. Thus, service quality was not an important factor influence on their satisfaction and perceived usefulness.

This study offers insights for universities to foster LMS applications and improve student acceptance and satisfaction. A perception of non-acceptance and unsatisfactory will obstruct students' motivation to continue their blended learning education. The crucial factors identified from this study cannot be ignored in implementing a successful LMS environment.

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