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Learning Management System (LMS) Success: An Investigation Among the University Students

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Abstract: In the recent years, there has been increasing demand in joining of new technologies into educational processes. Learning Management System (LMS) as a web based technology in educational programs, provides support to instructors to reach their pedagogical goals, organize course contents and support students. This study is an attempt to investigate the factors influence the success of LMS. Research model was developed by examining the relationship between students' outcomes (perceived usefulness) and information quality, system quality, and readiness for online learning through system use and user satisfaction. The respondents chosen for this study were undergraduate students from Limkokwing University of Creative Technology in Malaysia. Sample of this study identified based on number of students in each faculty. The quantitative data are gained through questionnaire. The analysis of data indicated that all relations from independent variables to dependent variable are significant, except the relation between readiness for online learning and system use. The most influencing path was information quality on user satisfaction and perceived usefulness and the least influencing path was readiness for online learning, system use and perceived usefulness. The managerial implications and limitations of current study were also discussed.

Keywords: Learning Management System, E-learning, LMS Success, Teaching Technology

I. INTRODUCTION

Schools and universities are investing amounts of money and time in developing education methods alternatives to traditional types of learning systems [1]. E-learning helps to apply information technologies/systems to facilitate student learning, enhance instructor teaching performance and reduce educational costs [2]. There are different softwares, tools and techniques that help to implement e-learning. Examples of e-learning systems are Course Management Systems (CMSs), Learning Content Management Systems (LCMSs) and Learning Management Systems (LMS). LMS is defined as set of networks and tools integrated together to support online learning [3]. LMS allows students to view multimedia lectures, communicate with their teachers and each others in learning communities, download course materials, take online quizzes and submit homework and class work assignments [4]. Many academic institutions have invested heavily in LMS implementation to support online teaching [5]. A number of

studies have investigated the success of information technologies application in education from the learner's perspective, however, none of these studies, provided an examination of all major issues related to LMS success [6]. Therefore, the objective of this study is to investigate the factors that influence the learning management system success among students.

II. THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

In order to find the factors influencing LMS success, the DeLone and McLean information system success model [7] was utilized in this research. This model is one of the most widely refereed IS success model in the literature [8; 9] and can be used to assess LMS success due to its solid theoretical foundation and the numerous successful empirical studies done based on it. This model consists of six variables: (1) system quality, (2) information quality, (3) service quality, (4) use/intention to use, (5) user satisfaction and (6) net benefits. In the following section, the DeLone and McLean IS success model dimensions will be reviewed and adapted to address LMS success.

A. System Quality

System quality is the performance of the system from individual perception. On the other hand, from an e-learning perspective, the system quality is measured in terms of both the various software applications designed for their intended use and needs and the hardware available to the user [10]. In terms of relationship between system quality and system use, some studies found the direct relationship between system quality and system use from different aspects. For instance, system quality has affected both system use and user satisfaction [11]. Thus, system quality has a significantly positive influence on user satisfaction. Learning content has different quality based on each teacher; producer's ability. Therefore, e-learning content is a direct evaluation to user satisfaction [12]. Thus, the following hypotheses are proposed:
H₁: Learning management system quality characteristics positively affect system use.
H₂: Learning management system quality characteristics positively affect user satisfaction.

B. Information Quality

Halawi et al. [10] pointed that “information quality refers to measures of IS output, namely the quality of the information that the system produces primarily in the form of reports”. Based on the study by [13] the quality of the information produced by the online learning system is more important than the hardware and the software components of the system. The essential needs of students are access to support materials and learning concepts [14]. Information quality is represented by content quality in e-learning. Wu and Wang [15] found that information quality have a significantly positive influence on user satisfaction. Therefore, it can be theorized that information quality will be highly correlated with user satisfaction and system use, particularly when the course material is accurate, easy to understand, relevant and timely. Thus, the following hypotheses are proposed:

H₃: Information quality characteristics positively affect system use.

H₄: Information quality characteristics positively affect user satisfaction.

C. Readiness for Online Learning

The concept of readiness for online learning was proposed by [16]. They defined readiness for online learning in terms of three aspects: (1) students’ preferences for the form of delivery as opposed to face-to-face classroom instruction; (2) students’ confidence in using electronic communication for learning and, in particular, competence and confidence in the use of Internet and computer-mediated communication; and (3) ability to engage in autonomous learning. Other studies found that there is relationship between readiness for online learning and student satisfaction, this relationship match with previous results which are (1) a learner’s self-regulatory learning strategy is a very important variable related to e-learner’s satisfaction and (2) a learner’s computer self-efficacy is also a very critical component too [12]. Thus, the following hypotheses are proposed:

H₅: Readiness for online leaning characteristics positively affects system use.

H₆: Readiness for online leaning characteristics positively affects user satisfaction.

D. System Use

System use is an important measure of information system success [17; 11; 18]. This construct is defined as “the extent and nature of use of an IS” [18]. Results of the study by [19] suggest that students who continuously access a Website will perform better in an online class than those who do not.

E. User Satisfaction

The measurement of users’ satisfaction with information system is still main concern to researches. Based on previous study, user satisfaction measures are categorized in terms of three perspectives such as:

- (a) user attitudes towards IS;
- (b) user satisfaction in terms of information quality; and
- (c) user satisfaction in terms of perceived IS effectiveness [20].

In the online learning system context, user satisfaction can be described as the extent to which learners believe the online learning system meets their online learning needs. In this study, user satisfaction is a measure of the successful interaction between the online learning system and its users. Research results by [22] and [22] provided evidence that heavily used systems are positively related to user satisfaction. Thus, the following hypothesis is proposed:

H₇: System use characteristics positively affect user satisfaction.

F. Perceived Usefulness

Perceived usefulness is defined as “the degree to which a person believes that using a particular system would enhance his or her job performance” [23]. Usefulness has also been used by different researchers as predictors of satisfaction within online context such as [24]. It is the valuation of the benefits of LMS to the students. Thus, the following hypotheses are proposed:

H₈: System use characteristics positively affect perceived usefulness.

H₉: User satisfaction characteristics positively affect perceived usefulness.

Based on the above discussion, the research model of this study can be proposed as Figure 1.

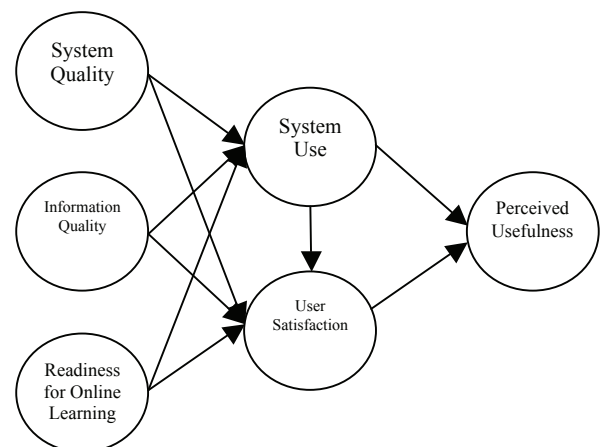


FIGURE 1. RESEARCH MODEL

III. METHOD

A. LMS in Limkokwing University of Creative Technology (LUCT)

LMS in LUCT, Malaysia, has been developed in house in July 2009. It works as a basic learning management system with a main function as delivery content and materials from instructor to students. Some other functions are also active such as track the performance, financial status for the students. In addition, students can benefit from some features that provide by the system such as e-library and further learning. The use of this system is not mandatory by instructors.

B. Population and Sample

This study focused on university students particularly in LUCT. The population of interest in this study was all undergraduate students who were in semester three or above in LUCT that using LMS in their educational progress. This university has six faculties with about 8000 students. Therefore, based on the [25] sample size formula, the required sample for testing the research model would be 368. In selecting the sample, the stratified random sampling method was utilized based on the students' number of each faculty and its portion in total students' number.

C. Measures

The questionnaire used for this study was developed on the items that constructed in previous studies. Table 1 shows the items adoption breakdown. The Likert scale was selected to examine how strong students agree or disagree with the statements on a five-point scale from "strongly disagree" to "strongly agree".

TABLE 1. MEASURES

Variable	Sources
System quality	[26], [27]
Information quality	[1], [2]
Readiness for online learning	[28], [29], [27]
System use	[29], [30], [27]
User satisfaction	[13], [27]
Perceived usefulness	[23], [31]

D. Data Collection

From the 520 questionnaires that were distributed, the researchers managed to get a return of 465 useable questionnaires after eliminating some uncompleted cases. The data collection method was drop-and-collect-survey method. This method involves the researcher personally delivering the survey instrument and later collecting questionnaire either directly from the target respondent or indirectly via a gatekeeper.

E. Reliability and Validity Test

Validity is an indication of an instrument's ability to measure what it claims to and reliability is the repeatability and consistency of a survey instrument. In order to ensure the validity, the questionnaires were checked by a three expert in the field of learning and information systems. Their comments and suggestions were taken into account and the questionnaire was revised. Then a pilot study was conducted with 30 respondents. The reliability test was conducted on the data from the pilot study. The Cronbach's alpha scores for all the constructs are shown on Table 2. All the results were found to have exceeded the threshold value of 0.7. It indicates high reliability of the survey instruments [32]. Based on the

feedback, there were no significant changes to the items enlisted on the questionnaire.

TABLE 2. RELIABILITY STATISTICS

Variables	Cronbach's Alpha
1- System Quality (SQ)	.750
2- Information Quality (IQ)	.791
3- Readiness for Online Learning (ROL)	.700
4- System Use (SU)	.756
5- User Satisfaction (US)	.749
6- Perceived Usefulness (PU)	.838

IV. FINDINGS

A. Respondents' Characteristics

From the 520 distributed questionnaires, 465 undergraduate students returned the questionnaires. The final sample after removing the defective cases and checking the outliers' tests was 446 cases. This yields a response rate of 86%. The majority of the respondents were in the mean age group of 18-25 years old with the percentage of 83.2. About 58.7% of the students were male. Regarding the semester level, 88.4% of the students were in semester 3rd, 4th and 5th. It shows that respondents were fully engaged in their education progress and usage of LMS. Table 3 shows more detail information regarding the demographic data of respondents.

TABLE 3. STUDENTS' DESCRIPTIVE STATISTICS

	Frequency	Percentage
Gender		
Male	262	58.7
Female	184	41.3
Age		
18-25	371	83.2
26-29	65	14.6
30 and above	10	2.2
Semester level		
3 rd	159	35.7
4 th	133	29.8
5 th	102	22.9
6 th	26	5.8
7 th	11	2.5
8 th	15	3.4

B. The Significant of the Model Hypotheses

Tests of the hypotheses in the desired model were made based on three measures, the Coefficient of Determination (r^2), the significance of Correlation Coefficients (r) and the Multiple Regression (Beta).

C. Correlation Analysis

Table 4 provides the results of the correlation analysis among variables. The correlation coefficient summarizes the relationship between two variables based on standard deviation. The measures showed that all relations are significant with p-value less than 0.001. Readiness for online

learning shows weak correlations values while all other correlations values show moderate and strong values.

TABLE 4. CORRELATIONS MATRIX

	SQ	IQ	ROL	SU	US	PU
SQ	1					
IQ	0.618**	1				
ROL	0.283**	0.262**	1			
SU	0.422**	0.476**	0.217**	1		
US	0.570**	0.632**	0.298**	0.508**	1	
PU	0.515**	0.600**	0.272**	0.548**	.681**	1

*p<0.05, **p<0.01

D. Testing of Hypotheses

The research model has nine hypotheses. This model was tested as four sub-models:

- 1) Sub-model 1: System Quality, Information Quality and Readiness for Online Learning as predictors of System Use;
- 2) Sub-model 2: System Quality, Information Quality and Readiness for Online Learning as predictors of User Satisfaction;
- 3) Sub-model 3: System Use as a predictor of User Satisfaction;
- 4) Sub-model 4: System Use and User Satisfaction as predictors of Perceived Usefulness.

Multiple linear regression analysis was applied to test these models.

a. Test of Sub-Model 1

The model summary measures show that this sub-model is significant with $r=0.502$. The Adjusted R Square=0.247 tells that this sub-model accounts for 27.4% of variance in the spelling scores. These values can be counted as moderate. This sub-model covers the test of the hypotheses H1, H3 and H5. As it can be seen in Table 5 the p-values of system quality and information quality are 0.00 that show a significant relationship between these two variables and system use and H1 and H3 are accepted. However, the p-value of the relationship between readiness for online learning and system use is 0.087 that is above 0.05. Based on this result there is no significance relationship between these two variables and H5 is rejected.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.072	.201		5.343	.000
System Quality	.208	.056	.201	3.724	.000
Information Quality	.329	.054	.323	6.038	.000
Readiness for Online Learning	.082	.048	.075	1.717	.087

b. Test of Sub-Model 2

The model summary measures show that this sub-model is significant with $r=0.679$. The Adjusted R Square=0.456 tells that this sub-model accounts for 45.7% of variance in the spelling scores. These values can be counted as a strong level. This sub-model covers the test of the hypotheses H2, H4 and H6. As it can be seen in Table 6 the p-values of system quality, information quality and readiness for online learning are 0.00 that show a significant relationship between these three variables and system use. Therefore, H2, H4 and H6 are accepted.

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.456	.170		2.685	.008
System Quality	.279	.047	.269	5.884	.000
Information Quality	.444	.046	.437	9.627	.000
Readiness for Online Learning	.116	.040	.108	2.888	.004

a. Test of Sub-Model 3

This sub-model is a linear relationship (H7) between two variable one predictor (System Use) and one criterion variable (User Satisfaction). System use show a moderate correlation $r= 0.508$ with User Satisfaction. This was significantly explained by having a p-value of 0.00. Table 7 summarizes this sub-model measures. The Adjusted R Square between the two variables is 0.258.

TABLE 7. CORRELATIONS AND COEFFICIENTS FOR SYSTEM USE

Model	Correlations		Standardized Coefficients		
	Pearson Correlation	Sig. (2-tailed)	Beta	t	Sig.
System Use	.508	.000	.508	12.221	.000

b. Test of Sub-Model 4

The model summary measures show that this sub-model is significant with $r=0.721$. The Adjusted R Square=0.517 tells that this sub-model accounts for 51.7% of variance in the spelling scores. These values can be counted as a strong level. This sub-model covers the test of the hypotheses H8 and H9. As it can be seen in Table 8 the p-values of system use and user satisfaction are 0.00 that show a significant relationship between these two variables and perceived usefulness. Therefore, H8, and H9 are accepted.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.501	.130		3.860	.000
System Use	.279	.040	.272	7.006	.000
User Satisfaction	.557	.040	.543	13.984	.000

Based on the above results, all nine hypotheses in the research model were tested and the results were summarized in Table 9.

TABLE 9. HYPOTHESES TESTING RESULTS

Hypothesis	Status
H ₁ : Learning management system quality characteristics positively affect system use.	Supported
H ₂ : Learning management system quality characteristics positively affect user satisfaction.	Supported
H ₃ : Information quality characteristics positively affect system use.	Supported
H ₄ : Information quality characteristics positively affect user satisfaction.	Supported
H ₅ : Readiness for online learning characteristics positively affects system use.	Not supported
H ₆ : Readiness for online learning characteristics positively affects user satisfaction.	Supported
H ₇ : System use characteristics positively affect user satisfaction.	Supported
H ₈ : System use characteristics positively affect perceived usefulness.	Supported
H ₉ : User satisfaction characteristics positively affect perceived usefulness.	Supported

V. DISCUSSIONS

All the hypothesized relations were significant, except the relation between readiness for online learning and system use. The analysis of the independent variables influences in the model show that information quality was the most influencing variable with a significance level of Beta=0.437 on user satisfaction and also on system use (Beta= 0.323). System quality was coming next with a significance level of Beta= 0.269 on user satisfaction and also on system use (Beta=0.201). The least influencing independent variable was readiness for online learning with a significance level of Beta= 0.108 on user satisfaction and also on system use (Beta= 0.075). The analysis of the variables with multiple roles in the model shows that user satisfaction was highly influenced from independent variables and as a logical result it influence perceived usefulness with a significance level of Beta= 0.543. System use was coming next with a significance level of Beta= 0.272 on perceived usefulness. The analysis also shows that system use influenced user satisfaction with a significance level of Beta= 0.508. Finally, it is clear that the most influencing path was information quality → user satisfaction → perceived usefulness and the least influencing path was readiness for online learning → system use → perceived usefulness.

VI. CONCLUSIONS AND IMPLICATIONS

The major objective of the research is to investigate the factors influencing the learning management system success among

students. From this study, several major conclusions can be drawn. First, technology characteristics which are system quality and information quality were the major factors affecting the success of the learning management system. Information quality had a better impact compared with system quality. Second, personality characteristic which is readiness for online learning had a very weak impact in the learning management system. Therefore, readiness for online learning is not a success factor. Third, system use had a high impact in the user satisfaction which means that motivating the students to use the system increase the students' satisfaction which lead to the success of the system. Fourth, user satisfaction and system use directly impact the students' outcome. Both the two variables worked as the engine for LMS success. Five, information quality through system use had the second most influencing impact in the LMS success. System quality through user satisfaction and system use had a good influence in the learning management system success. The results of this research support part of the theory postulated by [27] that the roles of system quality, information quality, and readiness for online learning are very important and essential predictors of perceived usefulness. Moreover, the results support the model originally developed to assess information system success of LMS introduced by [1]. Similarly, this study also confirms the positive relationship between system use and user satisfaction. Unquestionably, this research reveals that, the more system use, the higher the value would be on the perceived usefulness. The general characteristics highlighted in this study were found to be the weak impact of readiness for online learning. In other words, high value toward perceived usefulness goes beyond this consideration. Therefore, there are still wide possibilities for future research to investigate the effects of other attributes. Information quality had the highest impact in the learning management system success. It is important to enhance this factor by motivating lecturers to prepare better material for students to understand, to upload appropriate and relevant contents that fit best to the students' expectations. Also, system quality had a good impact in the learning management system success. It is recommended to develop the system to be more user-friendly, to add tools and services for interaction and to make the system attractable with modern look and rich features. Motivating the students to use the system is important by forcing them to frequently use the system and making the system part of the continuous learning process. This could be achieved by adding new features and by motivating lecturers to be more active in the system. Increasing system use will enhance the students' satisfaction which will increase the LMS success. In general LMS success can be enhanced by increasing the quality of the content and the features of the system. Students must be motivated by lecturers to use the system by making all off-class activities via the LMS system.

VII. LIMITATION AND RECOMMENDATIONS FOR FUTURE RESEARCH

One of the limitations of this study is that the data collected from only one university, thus; it may not have been

representative of other universities students in Malaysia. It will be better to replicate this study in other universities inside Malaysia and also in other countries around the world to support the proposed model. Another limitation for this research is related to the using of LMS in LUCT that is not mandatory. While most of the lectures in undergraduate studies use the system, but some of them are not active in the system. This limitation for sure bias the students' satisfaction of the system. Another limitation is related to the services offered by the system; while the system has many features like chat and forum but most of the lectures use the LMS as a basic content management system. This limitation may affect system use which drives the success of the system. Future research is needed to investigate other factors that may affect the LMS success. Investigating the impact of the instructor characteristics in the system success is necessary. The investigation of the LMS success from the prospective of instructors is another research stream regarding LMS successful application in education that should be taken into account.

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