LEARNING MANAGEMENT SYSTEM (LMS) QUALITY METRICS: A CASE STUDY IN MALAYSIAN HIGHER LEARNING INSTITUTION

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Abstract: *Learning management system is an information system specifically designed to manage the interaction between learners and educators. Education institutions throughout the world adopt different kinds of learning management system such as direct installation, open-source initiative, or customized version which are specifically tailored to the needs of the institutions. However, there is a lack of studies focusing on the metric's quality of appraising the learning management system, as well as its impacts on individual satisfaction. Therefore, this study aims to develop the quality metrics in the context of a learning management system, and to investigate the relationship between the quality metrics of a learning management system and individual satisfaction. To address the research objectives, a quantitative study was conducted using an online questionnaire. Respondents were selected based on convenience sampling. The data was then analyzed based on descriptive and inferential analysis.*

Keywords: *learning management system, learners, quality, metrics, satisfaction*

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Introduction

Education has long reckoned as part of humanity greatest basic needs. Education ensures the advancement of society, pooling of knowledge, and encourage the discovery of a new era. Education is no longer confined within the four walls of a classroom; it can be regarded as a continuous process that may happen through on-the-job training or formal education of classroom learning. According to the data retrieved from Portal Data Terbuka (2018) on tertiary education enrolment, 99547 individuals enrolled for diploma, 98605 enrolled for their first degree, 20081 enrolled for Masters degree, and 6855 individuals enrolled for doctorate education in the Malaysian higher educational system. The statistics show that there is increasing number of individuals pursuing their education after the completion of their first degree, which indicates that education has become one of the top priorities for today's generation. This increasing trend can also be attributed to the implementation numbers of education policies by the government such as Malaysia Education Blueprint 2015 2025 (Higher Education) and Ministry of Education ICT Transformation Plan 2019-2023. One of the pillars of these policies is lifelong learning through the adoption of several learning platforms such as a learning management system (LMS) and massive open online course (MOOC).

In Universiti Teknologi MARA (UiTM), LMS and MOOC are provided to students, staffs, and communities through the U-FUTURE learning management system that embeds both internal system (LMS) and external open courses (MOOC). Students will be automatically enrolled into these two sub-systems whenever they register for a subject. The MOOC subsystem which is offered to the local and international communities is quite similar to the concept of Open Learning which can be accessed at https://www.openlearning.com/. The UFUTURE can be used for the purpose of management of educational resources, online attendance, students' assessment, etc. Its use has greatly contributed to the development and learning process of students in UiTM especially during the period of Novel Coronavirus 2019 (COVID-19). However, since the application is currently used by many students, staffs, and external communities, therefore there is a need to investigate the quality of the application, as well as its contributions towards individual's satisfaction (Yunus, 2021; Chávez, Barrera, Montaño, Sánchez, & Faure, 2021).

This study initially investigated the related literature on learning management system, quality metrics assessment, and individual satisfaction in the attempt to develop the conceptual model of the study as well as the methodology of the study. Then, the findings were discussed, and future recommendations were outlined.

Research Model

Figure 1 shows the proposed conceptual framework of the study. There were three independent variables selected for quality metrics, namely service quality, system quality, and information quality. For the dependent variable, user satisfaction towards using a learning management system was conceptualized.

Figure 1: Research Model
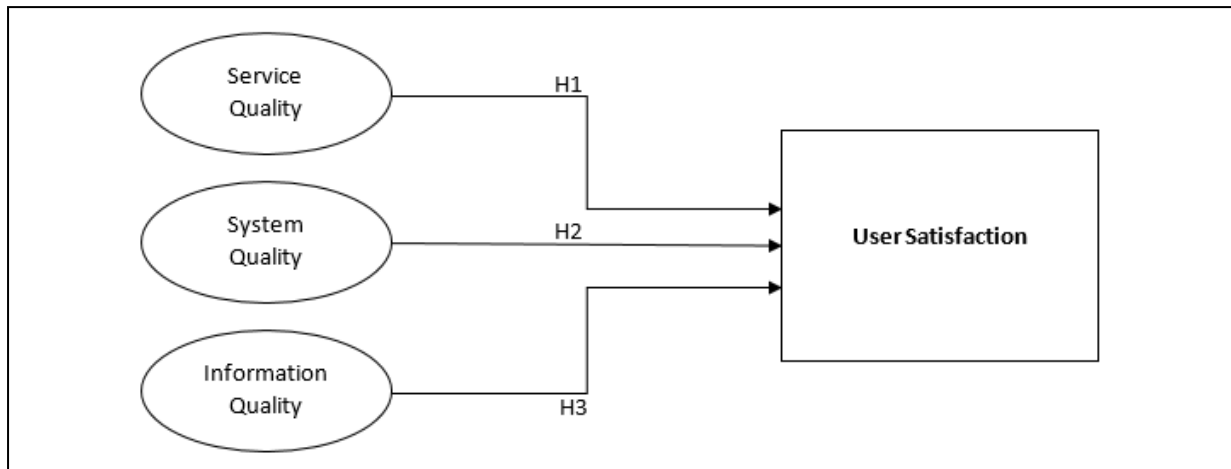
The first variable underlying the quality metrics of a learning management system is service quality. Service quality is operationalized as the extent of the service quality provided by the learning management system (Teo, Srivastava, & Jiang, 2008). The importance of service quality is undeniable (Ahn, Ryu, & Han, 2004; Davis, 1989; DeLone & McLean, 2003; Venkatesh, Morris, Davis, & Davis, 2003). Since a learning management system is considered as a one-way interaction, the quality of the services plays an important role in enhancing user engagement with a learning management system, as well as contributing towards user satisfaction. Lack of interaction between learners and the educators has led to the significance of service quality in a learning management system (Balog, 2011). Therefore, it can be hypothesized that:

H1: Service quality has a positive and significant relationship with user satisfaction.

The second variable underlying the quality metrics of a learning management system is the system quality. System quality is operationalized as the extent of users' perception of the LMS performance in retrieving and delivering information. According to Baroudi, Olson, and Ives (1986), system quality has a positive and significant predictor of information system engagement. System quality determines whether the user will come again to use the information system. A complicated information system will only lead to disengagement and negatively affects user satisfaction. Nowadays, users prefer a user-friendly information system that focuses on navigability and friendly interface (Saha, Nath, & Salehi-Sangari, 2012). Therefore, it can be hypothesized that:

H2: System quality has a positive and significant relationship with user satisfaction

The third variable underlying the quality metrics of a learning management system is information quality. Information quality is operationalized as the degree of the value of the output produced by the learning management system as perceived by the user. Users are expected to engage with the learning management system if they think the information system provides accurate, timely, and relevant information (Masrek & Gaskin, 2016). The factors of quality, precise, and sufficient information will influence user preferences towards information system usage (Saha, Nath, & Salehi-Sangari, 2012). Therefore, it can be hypothesized that:

H3: Information quality has a positive and significant relationship with user satisfaction

Methodology
This study has two significant objectives; firstly, to develop the quality metrics in the context of learning management system, and secondly, to investigate the relationship between the quality metrics of a learning management system and individual satisfaction. To realise the first objective, a research model was developed based on reviews of previous literature. Next, a quantitative research study was conducted using a structured questionnaire. The items of the instrument were adopted from relevant previous studies in a similar context. The instrument then was sent for an expert reviewing process by 6 experts selected based on several criteria: (1) academic qualification, (2) academic experience, and (3) research interest. Modifications were made to the instrument based on the recommendations by the experts. Then, the instrument was sent for a pilot study. Table 1 shows the result of the pilot study analysis, based on Cronbach's alpha coefficient.

Table 1: Reliability analysis

Construct	Item	Cronbach' alpha
Service Quality (SQ)	4	0.895
Information Quality (IQ)	5	0.937
System Quality (SS)	4	0.848
User Satisfaction (USA)	4	0.955

The Cronbach's alpha coefficient values range from 0.848 to 0.955, indicating strong reliability surpassing the minimum value of 0.7 as suggested by Nunnaly (1994). Therefore, field data collection was conducted for a week in February 2021. The population of the respondents was selected using convenience sampling from one of the public universities in Malaysia. A total of 137 responses were received and analysed for a descriptive and inferential relationship using Statistical Package for Social Sciences (SPSS) version 26. The subsequent section describes the findings of the study.

Findings and Discussion
The findings of the study will be discussed in three subsections, namely demographic characteristics, correlation analysis and regression analysis.

Demographic characteristics
Table 2 shows the demographic characteristics of the respondents. A total of 137 respondents were involved in the final analysis of the research data. The respondents were selected from a faculty in one of the public universities in Malaysia. Based on the frequency analysis, a total of 84.7% or N=116 of the respondents were female students, while another 15.3% or N=21 were male students; indicating that most of the respondents from the sampling were female – the numbers confirm the ratio of more female than male in public universities especially in social sciences courses. In relation to respondent's age, majority of respondents aged from 20 to 30 years old (83.9% or N=115), while another 16.1% or N=22 are below 20 years old.

Table 2: Demographic analysis of respondents

Item	Sub-Items	Frequency	%
Gender	Male	21	15.3
	Female	116	84.7
Age	Below 20	22	16.1
	20 to 30	115	83.9

Correlation

The next step is to analyze the correlation coefficient of the research model. Correlation analysis was performed using the SPSS version 26 involving the four main variables: service quality, information quality, system quality, and user satisfaction. Figure 2 shows the result of Pearson's correlation coefficient. The Pearson's correlation coefficient determines whether there is statistical evidence of a linear relationship between two variables. Based on the research model proposed by the study, three results were produced by the test. Firstly, there was a positive correlation between service quality and user satisfaction ($r=0.847$, $n=137$, $p=0.00$). Secondly, there was a positive correlation between information quality and user satisfaction ($r=0.691$, $n=137$, $p=0.00$). Thirdly, there was a positive correlation between system quality and user satisfaction ($r=0.837$, $n=137$, $p=0.00$).
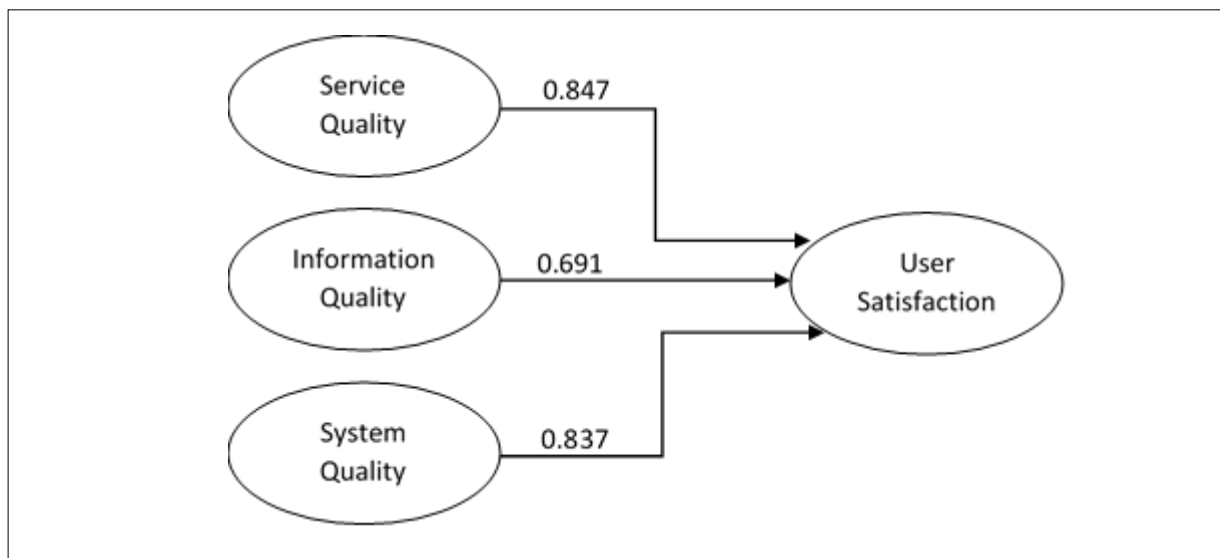

Figure 2: Pearson's Correlation coefficient

Regression

Next, a multiple regression was conducted to determine the predictive power of the independent variables on the dependent variable. The three dependent variables for this study were service quality, information quality, and system quality and they were tested against the dependent variable conceptualized as user satisfaction in using a learning management system. Based on the final model assessment, the adjusted R square of 0.775 shows that the research model was capable to explain 77% of the variance. Table 3 shows the final result of the multiple regression.

Table 3: The result of multiple regression

Hypothesis	Coefficients	t-value	P-value	Supported
H1: Service Quality → User Satisfaction	0.421	5.223	< 0.05	Yes
H2: Information Quality → User Satisfaction	0.150	2.635	< 0.05	Yes
H3: User Satisfaction (USA) → User Satisfaction	0.382	4.894	< 0.05	Yes

Discussion

The findings of the study indicate that the quality metrics (service quality, information quality, and system quality) conceptualized for the purpose of the study were found to have positive and significant relationship with user satisfaction in the context of the use of learning management system. The results show that fulfilling these three criteria can influence users to use the information system. The results of our study also indicate that the most important predictor of user satisfaction is the service quality. Service quality enables easier access to multiple works as well as reduces work load through systematic and continuous service. Moreover, the personalisation feature also helps to further encourage the use of the learning management system.

In relation to information quality, having a standardised platform to distribute information and content helps the learner to strategize their study and enables a more standard workflow than utilising non-learning management systems such as Telegram, WhatsApp, etc. Moreover, utilising multiple channels for the purpose of teaching may increase disengagement, as well as low satisfaction among students due to confusion over the instruction, assignment, as well as duplication of resources and content.

System quality by far should be put as one of the priorities in promoting the use of a learning management system. A thorough assessment of system development, testing, and maintenance must be conducted to ensure the success of the information system implementation. Incomplete system testing usually leads to poor information system adoption, low user satisfaction, and a decrease in the productivity of users.

Conclusion

This study was conducted with two purposes: firstly, to develop the quality metrics in the context of learning management system and secondly, to investigate the relationship between the quality metrics of a learning management system and individual satisfaction. To realise the first objective, relevant literature was reviewed, and a conceptual framework was developed for further evaluation and confirmation. For the second purpose, a quantitative study was conducted in order to confirm the conceptual research framework.

This study is, however, not without limitation. Firstly, quality metrics were conceptualised based on minimal numbers of predictors. Future study may consider expanding the study by integrating more variables, especially on the individual levels. Secondly, the inferential analysis was conducted using SPSS. We suggest future study to use other statistical software such as Partial Least Square Structural Equation Modelling (PLS-SEM), or SmartPLS. Thirdly, the assessment of the variables was performed on first-order analysis. It is suggested for future studies to use higher-order conceptualisation to gain more insight into the issue.

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