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Examining the proposed instrument model in learning management system use: a pilot study

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ABSTRACT

Online and distance learning technology with the learning management system (LMS) is an example of the application of online learning models at universities, which is the impact of technological developments. However, advances in LMS technology still need to be implemented in universities, the problem of university readiness being the main factor. Another area for improvement is the level of computer self-efficacy (CSE) among LMS users. Therefore, before the actual research was carried out, instrument testing was carried out regarding the factors influencing LMS users at the university. After testing the limited instrument on 63 university students, the results showed that of the six constructs with 21 indicator items, it was proven that only one indicator item was invalid. However, the reliability test has met the criteria. The conclusion of the initial test results of the instrument was declared valid and reliable, so it was suitable for actual testing.

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1. INTRODUCTION

Internet technology has significantly impacted education, especially in digital-based learning [1]. Online learning at universities is increasingly developing and greatly influences lecturers' and students' learning processes [2]. Advances in technology-based learning are also increasingly being applied in developing countries, especially in Southeast Asia [3].

Technological progress is influenced by many factors, from internal users to environmental factors [4], [5]. Learning technology uses a learning management system (LMS), which is a learning media trend in developing countries [6], [7]. The users of this LMS are mostly university lecturers and students [8], [9]. In evaluating its implementation, it will be seen that user satisfaction is an indicator of the success of technology implementation [10]. Therefore, using a model theory approach as a basis for measuring success is very necessary.

In previous studies, it is known that there has been much research on LMS acceptance using the technology acceptance model (TAM), unified technology acceptance and use of technology (UTAUT), and Delone McLean model theoretical approaches [11]. Technology acceptance theories include the TAM and UTAUT [12], [13]. In theory, the TAM and UTAUT models are used to measure the behavioral attitudes of

technology users by utilizing internal and external factors [14]. The weakness of the two TAM and UTAUT models is that they are limited to user behavior, so they cannot explain the evaluation of the application of the technology used.

In previous studies, the Delone McLean model was proposed because it was considered better than the TAM model and UTAUT model [15], [16], because it was more complex with six system quality (SQ) factors, information quality (IQ), and service quality (SeQ), student satisfaction (SS), LMS system used (LU) with the addition of computer self-efficacy (CSE) [17], [18]. Therefore, the advantages of the Delone McLean model can be considered the best. Developing countries such as Indonesia, Malaysia, and Thailand have adopted many technologies, such as LMS for education [19], [20]. This study investigated the effects of the Delone McLean model on students who use LMS at universities. Therefore, we used the Delone McLean model theoretical approach, where we tried a pilot study measuring instrument variables and indicators. Table 1 shows the measurement construct, and Figure 1 shows the proposed research model.

Table 1 explains the constructs in the Delone Mclean model. There are 6 constructs: IQ with 4 items; SQ with 4 items; SeQ with 4 items; CSE with 3 items; SS with 3 items and LMS usage (LU) with 3 items. CSE is a new construct added as a proposed model in further research.

Figure 1 explains the relationship between each construct in the Delone Mclean mode. The importance of the proposed model is to see the opportunities for novelty that will be achieved in further research after this pilot study has been carried out [21], [22]. Therefore, this proposed model is very suitable if the results of this pilot study are significant after meeting the standard criteria for instrument validity and reliability.

Table 1. Measurement constructs

Construct	Item	Statement
IQ	IQ1	I can obtain accurate information from LMS.
	IQ2	The LMS can provide me with the necessary information to complete my duties.
	IQ3	LMS can provide updated task-related information.
	IQ4	The LMS can provide me with up-to-date task information.
SQ	SQ1	The LMS features an intuitive user interface.
	SQ2	The LMS provides time and location flexibility.
	SQ3	The LMS contains effective communication language.
	SQ4	LMS is readily accessible whenever I need to use it.
SeQ	SeQ1	Training on the LMS's operation is sufficient.
	SeQ2	Multiple channels are available to communicate with the technicians.
	SeQ3	The provided training can enhance my ability to utilize LMS.
	SeQ4	In general, the university provides sufficient support for LU.
CSE	CSE1	I am comfortable using a web browser.
	CSE2	I am confident in completing tests online.
	CSE3	I am comfortable uploading/downloading files.
SS	SS1	The LMS applications have met my expectations.
	SS2	The LMS application is of good quality.
	SS3	The LMS application meets my requirements.
LU	LU1	Utilizing LMS is a wise decision.
	LU2	Working with the LMS is enjoyable.
	LU3	I enjoy working with LMS.

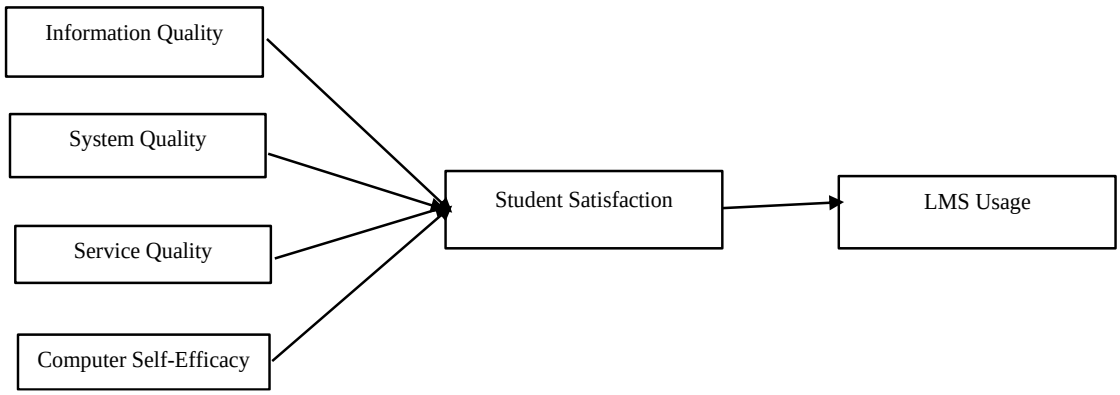


Figure 1. Research proposed model

2. METHOD

We conducted a pilot study to evaluate the design and construct validity of the instrument to ensure adequate validity and reliability of the data. This research obtained data from primary sources, so a quantitative survey was carried out. We seek to obtain feedback from respondents filling out the questionnaire. Additionally, we use Google Forms to distribute surveys. Then, after getting answers from respondents, the data was analyzed using the SmartPLS application.

This survey was conducted on 63 students at a university. The components in the survey instrument consist of 21 items for the six factors proposed in the model. The six initial factors and items, respectively, are information quality (4 items), system quality (4 items), service quality (4 items), CSE (3 items), SS (3 items), and LU (3 items). This study uses Cronbach's Alpha and outer loading values to evaluate the internal consistency and reliability of the items for each suggested factor [23], [24].

3. RESULTS AND DISCUSSION

In the first stage, a pilot survey was conducted, with approximately 63 students (undergraduates) from the general population answering the survey questionnaire. At the end of this survey, the number of respondents remained at 63, ensuring that there were repeat answers from respondents. The time allocated to complete the survey is between 5 to 10 minutes, and the purpose of the survey is to determine the validity of the answers to each question. Preliminary analysis results from the pilot study are presented in Table 1.

According to Hair *et al.* [25] states that we found the internal consistency reliability value must be above 0.7 at the initial stage of research and above 0.8 or 0.9 at a more advanced stage and will be considered satisfactory as long as the value follows the instructions given. Thus, the threshold proposed by AlHamad [26] was used in this study. As shown in Table 2, indicators with an outer loading value of less than 0.6 were assumed to be unreliable and were removed to maintain the dependence of the variables they support. Next, item reduction was carried out, followed by Cronbach Alpha re-analysis. The system (PLS algorithm) is re-run to identify the most reliable items that measure the results of the LMS that the respondent has used [27], [28]. Table 2 displays the reliability of the re-run values for the Cronbach Alpha (α) values and factor loadings for each factor. This pilot analysis was completed after removing one indicator item with an outer loading value below 0.60. Testing on Cronbach Alpha aims to illustrate convergent validity. If a constructed value is >0.7, then it meets the criteria, and if the Cronbach Alpha value is below 0.7, it is concluded that it does not meet the criteria [29]. The composite reliability (CR) test measures the CR of a reflective model [30]. According to the researchers, the CR value is higher than the value of the Cronbach Alpha test results. The CR value varies from zero to 1. For exploratory research, the minimum CR value is 0.60 [31], [32] or more than 0.70 in confirmatory research [33]. A CR value >0.90 indicates a small (minor) error variance value. Average variance extracted (AVE) can be used to see convergent and divergent validity [34]. The AVE test results will reflect each latent factor in the reflective model. The reflective model is considered good if the AVE value exceeds 0.50 [35]. The AVE value must be higher than the cross-loading correlation value. If the AVE value is below 0.50, it is considered to have a high error.

Table 2. Instrument validity and reliability test

Construct	Item	Outer loading	Cronbach Alpha	CR	AVE
IQ	IQ1	0.778	0.884	0.920	0.743
	IQ2	0.865			
	IQ3	0.891			
	IQ4	0.907			
SQ	SQ1	0.863	0.815	0.874	0.635
	SQ2	0.780			
	SQ3	0.825			
	SQ4	0.712			
SeQ	SeQ1	0.863	0.830	0.885	0.660
	SeQ2	0.780			
	SeQ3	0.825			
	SeQ4				
CSE	CSE1	0.938	0.855	0.932	0.873
	CSE2	0.931			
SS	SS1	0.911	0.874	0.922	0.799
	SS2	0.898			
	SS3	0.872			
LU	LU1	0.721	0.799	0.884	0.719
	LU2	0.879			
	LU3	0.930			

Table 2 discusses the research results in the outer loading section of the 21 indicator items. It is known that only one item was deleted, namely CSE3, because the value was brought to a minimum standard of 0.6 [36], only 20 indicator items met the criteria (above the minimum standard). The outer loading results show that the smallest value is 0.721 (LU1), while the largest is 0.938 (CSE1). With these results, it was concluded that the 20 outer-loading indicator items had successfully met the criteria. The results of outer loading in this study are based on previous research by Gerhart *et al.* [37] and Foroughi *et al.* [38], which stated that if the outer loading value is sufficient or more than the minimum limit, then the result of the item can be used. On the other hand, if it is less than the minimum limit, the item must be eliminated [39]. The results of Cronbach Alpha show that it has met the criteria (>0.7) [40], where the smallest value obtained for the LU construct is 0.799, while the most significant value obtained for the IQ construct is 0.884. For other constructs, the value is between 0.799-0.884. In the CR value, it was found that all constructs met the criteria (>0.6). The smallest CR value is 0.884 (LU), and the most significant value is 0.932 (CSE), so the values for other constructs are between 0.884-0.932. In the AVE results, the smallest value obtained was 0.635 (SQ), and the most significant value was 0.873 (CSE), while the other construct values were between 0.635 and 0.873. The conclusion is that the values of all constructs meet the minimum standard criteria of 0.5 [41], [42]. The results of this pilot study are based on the study by Ashrafi *et al.* [43] and Musyaffi *et al.* [44]. Namely, the criteria are above 0.5, so a Cronbach Alpha value that meets the criteria is obtained. Therefore, this instrument can be continued in large-scale research.

4. CONCLUSION

The latest observations show that the 20 indicator items are valid and reliable based on tests of outer loading, Cronbach Apla, CR, and AVE. The results of testing this instrument met the criteria so that it was appropriate and related to the research objective, namely, testing the instrument's suitability to be used in testing the use of LMS at universities. Even though this testing is still in a pilot study, the results will influence the instrument's continued use for actual research later. Therefore, the tests that have been carried out in this initial study are very good for the development of the Delone Mclean model.

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