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Acceptance Analysis of Learning Management System in Project-based Learning

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Abstract

This research specifically aims to find out which factors significantly influence the acceptance of LMS developed by the learning team of the Graphic and Visual Media Innovation course at the State University of Malang. The course learning uses two management systems, namely LMS and Progress Report Card (PRC). Acceptance analysis is conducted because the LMS used is a product prototype that has just been implemented in the first semester student lectures. The research was conducted using the technology acceptance model framework. The analysis process uses a quantitative approach with hypothesis testing through multiple linear regression tests. There are two variables observed, namely usefulness (X1), ease of use (X2) and tendency to use (Y). From the analysis process that has been carried out, the results show that the two independent variables (X1 & X2) simultaneously have a significant influence on the dependent variable (Y). However, there is a finding that ease of use (X2) does not significantly affect the usage tendency variable (Y). For further studies, it should be conducted with a more massive scope, not only focusing on one narrow context, using more variables and external factors, and focusing on the learner experience.

Keywords: technology acceptance model, learning management system, project-based learning, acceptance analysis

1. Introduction

In the 21st century, technological development is growing very rapidly. Technological innovations and disruptions penetrate all lines of human life, especially in education [1]. Technology has also become one of the integral components in the learning process in the classroom. One of the most used technologies in the learning process today is the Learning Management System (LMS). LMS is a web-based software designed to manage learning content, student interaction, assessment tools, and reports on learning progress and student activity [2]. LMS is one of the most common forms of E-Learning models used to condition unsupervised and distance learning [3].

In the Graphic and Visual Media Innovation course at State University of Malang, the use of LMS is crucial. Project-based learning and gamification activities make the LMS not only as a container for learning content, but also as an information system for learner performance in achieving learning objectives.

In managing learning, the Graphic and Visual Media Innovation course uses two systems side by side, namely the IMGV LMS and Progress Report Card (PRC). Lecturers and students' side by side use the two systems to conduct learning. Both systems are used as a form of redundancy. This redundancy is because LMS IMGV is a new system implemented to replace Progress Report Card (PRC).

The implementation of IMGV LMS side by side with PRC makes a situation where learners tend to use these two technologies. Therefore, the acceptance of IMGV LMS needs to be studied so that it can be used as further evaluation material in the LMS implementation process. One way to find out the tendency, the Technology Acceptance Model (TAM) framework can be used.

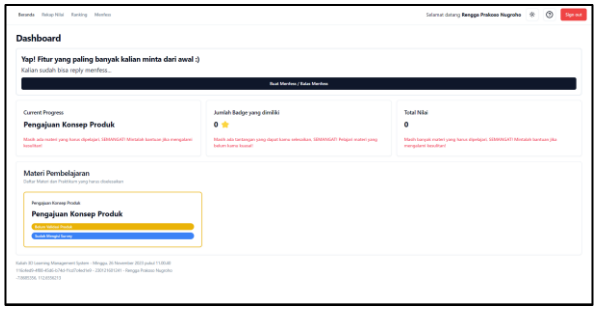

Figure 1 Screenshot of LMS Dashboard

TAM is one of the models used to describe a person's acceptance of the use of an information technology system [4]. TAM was first developed by Davis [5] which consists of five variables. Although TAM originally consisted of five variables, this framework has undergone many changes in the use of variables. Ahmad [6] explains that many factors in TAM can be added and removed according to the needs of the user aspects to be observed. In the basic framework of TAM, there are two main variables in the scope of cognitive responses, namely Usefulness and Ease of Use [5] which are hypothesized to be the fundamental

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determinants of user acceptance [4]. Since the core essence of TAM is to measure the likelihood of use (and not the actual use of the system) [7], the TAM framework with these two variables is an appropriate choice for this study. Pangestu in his research used the TAM framework with two factor variables and one dependent variable to get an overview of how learners' readiness in the process of implementing mobile learning application technology [8].

Although this research is quite simple, there have been many similar studies that have discussed the acceptance of LMS in classroom learning. Research conducted by Rahayu [9] shows the behavior of students who have no interest in using the LMS but still use it because it is mandatory. Comprehensive and supporting environment for integrating technology in learning also presented by Buabeng [10] who describes the condition of prospective learners in the acceptance and integration of LMS in learning, the result is recommending officials and stakeholders to present a supportive and facilitating environment in the implementation of technology. In the research that focused on how teachers perceive the LMS in the blended learning process, positive perceptions were also found by students in providing an interactive and effective learning atmosphere [11]. Outside the learning context, the use of the TAM framework is also applied in the education governance development sector, Aryanto found that TAM can help describe the perceptions of DAPODIK users in helping their performance in education data management [12].

To help the process of integrating technology in the learning process, research is needed to find out what factors encourage learners in the learning process. By knowing these determining factors, the evaluation and development process can be focused on these determining factors. The impact can be in the form of more targeted development, focusing on the point of learner needs, time efficiency and avoiding considerations that are less relevant to the learning process.

From the background and studies that have been conducted, research is needed that discusses the factors that play a significant role in the use of LMS in project-based learning with a case study in the Graphic and Visual Media Innovation (2D & 3D) course at the State University of Malang. The perception framework used is the Technology Acceptance Model.

2. Research Method

2.1 Research Model

In this study, two independent variables and one dependent variable were used. The variable framework follows the two main variables of TAM, namely Usefulness (UE) as variable X1 and Ease of Use (EU) as variable X2. Meanwhile, the independent variable is the tendency of learners to choose LMS over PRC (Comparison) as variable Y. The following is the framework of the research to be conducted:

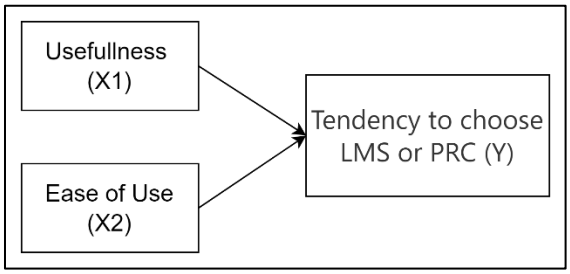

Figure 2 Research Framework

In this study, it is intentional to use a simplified TAM framework, Figure 2 Research Framework. This adjustment was made to provide an initial picture of the learners' experience when a modern technology is applied in their learning process. The TAM framework itself has been developed and modified to suit various contexts and scenarios. Ahmad [6] explains that many factors in TAM can be added and removed according to the needs of the user aspects to be observed.

From the framework that has been made, the following hypotheses are developed,

H1: Perceived usefulness has a positive effect on the tendency of learners to choose an LMS over PRC.

H2: Perceived ease of use has a positive effect on the tendency of learners to choose an LMS.

H3: Perceived usefulness and ease of use simultaneously have a positive effect on the tendency of learners to choose LMS.

2.2 Research Instruments

In the preparation of the research questionnaire refers to the research model to be carried out. The following are the variables and questionnaire indicators used:

Table 1. Variables and number of questionnaire items

Variable	Items
Usefulness (X1)	13 items
Ease of Use (X2)	13 items
Tendency (Y)	10 items

The development of questionnaire statement items uses a framework that has been published by Davis [5] and Ahmad [6]. The statement items were adopted and modified to suit the aspects to be studied, namely Usefulness and Ease of Use. Each statement item contained in the questionnaire is made on a rating scale of 1 - 7 (Strongly Disagree to Strongly Agree).

In the design of the Tendency variable (Y), if the higher the score obtained, then the learners are more likely to

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choose Learning Management System (LMS). If the smaller the score obtained, the more likely students are to choose Progress Report Card (PRC).

2.3 Subjects and Data Collection

The research subjects to be used as respondents are students of the Department of Educational Technology who are taking the Graphic and Visual Media Innovation course in class A. The number of research subjects used as subjects is 31 students.

The LMS implementation was conducted over a period of 8 meetings. In the learning process, the LMS and PRC are used together until the end of the learning. Data collection was conducted on the eighth meeting through a lift distributed to each learner in accordance with the research framework that has been developed.

In addition to quantitative data from the questionnaire results, qualitative data was also used in the form of interviews with several research subjects to get a more in-depth picture of their responses to the LMS and PRC in the learning process. This data will help in the process of drawing conclusions and support the results of quantitative data.

2.4 Data Analysis

Data analysis will use a quantitative approach. The tests carried out consist of two groups, namely the analysis prerequisite test group and the hypothesis test group. The hypothesis test that will be used uses Multiple Linear Regression Test. This test was chosen to adjust to the research model being carried out.

From the selected hypothesis test, the group of prerequisite tests that must be met before proceeding to the hypothesis test are normality test, linearity test, multicollinearity test and heteroscedasticity test. As a guideline in testing, the selected significance level is 5% (0.05).

To ensure the results of the data obtained in the questionnaire that has been distributed to respondents, validity and reliability tests are carried out before conducting prerequisite tests.

To optimize and reduce errors in the calculation process, data processing software is used, namely IBM SPSS version 28. With the use of this software, conclusions can be made quickly and simply by paying attention to the significance value issued by the data processing software, so the use of T and F values is not necessary.

3. Results and Discussion

After the questionnaire distribution process was carried out, 30 students filled out the questionnaire. After this, the validity and reliability of the questionnaire were tested, and the results showed that all items in the questionnaire were valid and reliable. Next is to test the prerequisite group of hypothesis testing.

3.1 Data Analysis Results

Statistics

		Usefullnes	Ease of Use	Comparative
N	Valid	30	30	30
	Missing	0	0	0
Mean		76,53	71,50	45,53
Median		75,00	72,50	45,00
Std. Deviation		8,974	10,040	4,688
Variance		80,533	100,810	21,982
Range		28	30	19
Minimum		62	56	36
Maximum		90	86	55

Figure 3 Descriptive Statistic

From the results of descriptive statistical processing Figure 3 Descriptive Statistic, the comparative value (variable Y), the mean and median scores are close. So that there are two axes that support one of the learning media, it can be interpreted that there are learners who are more inclined to choose LMS or PRC.

In normality testing, data is declared normally distributed if the significance value is above 0.05. The following are the results of testing the normality of the data with Kolmogorov-Smirnov:

Table 2. Test of Normality

Variable	df	Significance
Useful (X1)	30	0,066
Ease Use (X2)	30	0,200
Tendency. (Y)	30	0,200

From the results of the tests carried out in table 2, the three significance values on the variables are above the predetermined significance level, so it is stated that the data is normally distributed.

Next is the linearity test. The basis for making linearity test decisions is when the significance value of the linearity deviation is above the significance level (0.05), it is stated that there is a significant linear relationship between variables X and Y. The following are the results of the linearity test that has been carried out,

Table 3. Test of Linearity

Variable	f	Sig. Deviation
X1 to Y	2,273	0,075
X2 to Y	0,476	0,917

From the test results in table 3 that have been carried out, both variables have a significant value above 0.05. From these results, it can be decided that the two variables have a linear relationship to the Y variable.

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Next is the multicollinearity test. The basis for taking the multicollinearity test is when the tolerance value is above 0.10, it is stated that there is no multicollinearity in the regression model. The following are the results of the multicollinearity test,

Table 4. Test of Multicollinearity

Variable	tolerance	VIF
Useful (X1)	0,102	9,794
Ease Use (X2)	0,102	9,794

From the test results on table 4, both variables have a tolerance value of more than 0.10 so it can be stated that there is no multicollinearity in the regression model.

The last prerequisite test is the heteroscedasticity test. The basis for this test decision is when the significance value is above the 0.05 level, then there are no symptoms of heteroscedasticity. The following are the results of the heteroscedasticity test,

Table 5. Test of heteroscedasticity

Variable	t	Sig.
Constant	-1,531	0,137
Useful (X1)	0,911	0,371
Ease Use (X2)	-0,166	0,870

From the test results in table 5, the overall significance value is above the 0.05 level so it can be stated that there are no symptoms of heteroscedasticity in the two X variables.

Because all tests in the prerequisite analysis group have been carried out and the data has met all the prerequisite tests. Next is hypothesis testing. Hypothesis testing uses multiple linear regression tests. The following are the results of hypothesis testing:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,920[a]	,846	,834	1,909

a. Predictors: (Constant), Ease of Use, Usefullnes

Figure 4 Regression Model Output

In the regression test model summary in Figure 4 Regression Model Output, the R Square value is 0.846. These results indicate that the usefulness variable (X10) and the Ease-of-Use variable (X2) simultaneously affect the Propensity variable (Y) by 84%. While the remaining 16% is influenced by other variables not examined in this study.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	539,050	2	269,525	73,942	<,001[b]
	Residual	98,417	27	3,645		
	Total	637,467	29			

a. Dependent Variable: Comparative
b. Predictors: (Constant), Ease of Use, Usefullnes

Figure 5 F Simultaneous Test Output

The results of the model summary table are also supported by the simultaneous F test results displayed in Figure 5 F Simultaneous Test Output. The ANOVA table shows the significance value below the predetermined significance level. (0.001 <0.05) so it is stated that variables X1 and X2 simultaneously affect variable Y. From the results of the F test, it is stated that H3 failed to be rejected.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Correlations Zero-order	Correlations Partial	Correlations Part
1	(Constant)	10,513	3,225		3,260	,003			
	Usefullnes	,312	,124	,597	2,525	,018	,913	,437	,191
	Ease of Use	,156	,111	,333	1,409	,170	,900	,262	,107

a. Dependent Variable: Comparative

Figure 6 Regression Coefficient Output

Next is hypothesis testing H1 and H2 through the Partial t test. The test results can be seen in Figure 6 Regression Coefficient Output on the significance section. Based on the significance value of the Usefulness variable (X1), the significance value is below the predetermined significance level (0.018 <0.05) so that it can be concluded that there is an influence of variable X1 on variable Y. This result results in the decision that H1 fails to be rejected.

Next is to test H2 in the same way, namely the Partial t test. Based on the significance value of the ease-of-use variable in the Regression Coefficient table, the value is obtained above the specified significance level. (0.170> 0.05) so it can be concluded that there is no significant effect of variable X2 on variable Y. This result results in the decision that H2 is rejected. This result results in the decision that H2 is rejected.

In testing the Coefficient of Determination from the results in Figure 4, Variable X1 contributes 50% influence while Variable X2 is 20% to variable Y. The other 30% percentage is other factors not examined in this study. This significant comparison also supports the decision to reject H2 and accept H1.

3.2 Discussion of Analysis Results

This research specifically aims to find out which factors significantly influence the acceptance of LMS by learners in project-based learning process. By knowing the determinants of LMS acceptance, learning transformation can be carried out continuously by prioritizing aspects that are important for learners. By focusing on revamping and improving factors that have a significant impact on learners' needs, the learning process will be optimal and efficient.

From the test results that have been carried out, there are interesting findings in the test results in hypothesis H2. The Ease-of-use variable in TAM is a variable that specifically highlights the ease of use of a technology in completing work [3], [6]. In the context of this

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research, the IMGV LMS is a new system and has never been implemented before. This illustrates that the IMGV LMS still needs improvement in terms of ease of user access. Findings like this are rare, especially in research that discusses technology that has been widely used by many individuals. Like the research conducted by Aklani [13], the Ease-of-Use variable has a positive influence on the Intention to Use variable, which means that users consider that the technology is easy to understand and easy to use. Ease is a complex factor to explore, especially in digital learning environments. There are sub-factors that can influence the assessment of the ease of a technology product, especially in the learning process. Despite being a modern technology, convenience is not something that can be underestimated. Although in this study ease of use did not have a significant effect, ease of use is one of the main aspects in a learning process.[14].

Meanwhile, in the Usefulness variable (X1), there is a major influence on the LMS propensity variable (Y). This shows that the usefulness of the LMS plays a role in the learner's tendency to use the LMS rather than the PRC. In the research field conditions, the features available in the LMS are specifically designed in project-based learning. Various adjustments were made to the LMS features that could support the learning process in the research subjects. In its development, the LMS was made to optimize the usefulness in supporting the learning process. The existence of features that are specifically presented in accordance with the learning context plays a significant role in the usefulness of the LMS for learners. These results have also been widely found, one of which is in the educational environment. Pangestu [8] in his research discussing mobile learning technology obtained the same results, namely the aspect of usefulness has a significant influence on the learning readiness of learners in using technology.

These two phenomena present intriguing insights, particularly as students persist in utilizing IMGV LMS despite potential usability challenges. Numerous factors contribute to students' preferences between LMS and PRC, making the exploration of this behavior both intricate and valuable. Among these factors, the economic dimension plays a significant role. The adoption of IMGV LMS does not entail additional expenses for students, unlike PRC, which necessitates printing costs to adhere to specific templates and formats. Furthermore, beyond economic considerations, the distinctive features offered by IMGV LMS and PRC amplify this disparity. While PRC primarily serves as a practical control sheet for documenting student performance in learning activities, IMGV LMS offers a diverse array of functionalities aimed at enriching the learning experience. These range from facilitating peer performance evaluations and fostering collaborative learning environments to providing personalized learning materials and features tailored to individual project requirements. These nuanced differences not only influence students' selection between LMS and PRC but also reflect the evolving landscape of educational technology and its impact on pedagogical practices. These findings underscore the importance of considering multifaceted factors in understanding students' technology adoption behaviors within educational contexts. The insights gleaned from these investigations align with the research of Mohamed Riyath [15], who similarly underscored the pivotal influence of perceived usefulness and ease of use on students' perceptions and utilization of LMS within the learning environment.

In this study, it can indeed be seen in Figure 3 Descriptive Statistics that not all students choose to use the LMS, from interviews that have been conducted to several research subjects, there are several responses, namely:

1. Project work can still be done without the need for an LMS.
2. LMS is only used to report performance or logbooks,
3. Not so interested in features such as leaderboards, or materials.
4. Uncomfortable interface for viewing on smartphones.

But not a few students also feel the benefits of using the LMS. Mostly, positive feedback is contextualized in social relationships and helps in regulating the learning process, some of the responses are:

1. Can help keep track of task deadlines.
2. Can oversee the process of their colleagues without the need to ask directly.
3. The material content on the LMS is in accordance with the obstacles that often occur in project work.
4. No fear of loss and practical, no risk of being damaged due to carelessness

To mitigate potential hurdles and setbacks in the integration of Learning Management System (LMS) technology, a comprehensive examination of the learning process scenario becomes imperative. One effective approach involves conducting a feasibility study of the proposed scenario. Such feasibility assessments can take various forms, ranging from utilizing the Technology Acceptance Model (TAM) as demonstrated in this research, to qualitative inquiries akin to those undertaken by Sabila [16]. It is crucial to meticulously scrutinize the key features that underpin the learning process, ensuring their alignment with the intended scenario. These pivotal features wield significant influence over the efficacy of an LMS for both learners and educators alike. Furthermore, establishing a quality assurance team and a dedicated

task force exclusively tasked with LMS development is strongly advised, particularly for large-scale LMS deployments. Such measures not only bolster the reliability and functionality of the LMS but also signify a commitment to enhancing the overall educational experience.

Various types of LMS have been developed in various forms, from website-based LMS to Intelligent Tutoring System integrated with artificial intelligence (AI).[17]. Qolbi's [18] research illustrates the positive response of learners in utilizing LMS technology based on mobile seamless learning. Qolbi's research has results that are in line with the research, namely the usefulness of the system encourages learners to continue using the LMS as a tool to support their learning process. In line with Qolbi, Gregory also found that the adoption of new technology is also in line with the needs of the learners and the scenarios that will be carried out by the learners [19]. These studies both prove that development that prioritizes learner needs, and appropriate assessment techniques can be used as a basis for implementing technology massively and continuously.

From the discussion that has been explained, the implementation of Learning Management System (LMS) is a promising positive innovation. The flexibility of online learning platforms allows learners to present a variety of dynamic learning experiences. Although there are many challenges that need to be faced in implementing an LMS technology, such as infrastructure, the ability of learners and learners to regulations from each institution, presenting innovations that prioritize the needs of the learning process has promising potential to be accepted from all circles.

4. Conclusions

From the results and studies, it is concluded that:

1. The perceived usefulness and convenience of IMGV LMS simultaneously influences students' tendency to choose between using LMS and PRC.
2. LMS usability plays a dominant role in the choice between LMS and PRC.
3. Convenience factor does not play a significant role in learners' tendency to choose between LMS and PRC.
4. Although the LMS is not entirely easy to use, the usefulness of the LMS plays a significant role in maintaining students to use the IMGV LMS.

So, it can be concluded that the factor that has a significant role in the acceptance of this LMS is its usefulness in helping learners in the learning process.

4.1 Recommendations

The research suggestions that should be considered in future research are:

1. Using a larger sample size, using a more comprehensive Technology Acceptance Framework
2. Broader learning context, not only in project-based learning.
3. Conducted on a massive scale.
4. Pays attention to external variables such as internet access.
5. Focusing on learner aspects such as efficacy, motivation, initial competencies using ICT, even external motivation.

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