Applying the Technology Acceptance

by Uce Indahyanti

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Applying the Technology Acceptance Model to Measure the Learning Management System Acceptance by Students of Politeknik Sakti Surabaya

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Graphical abstract
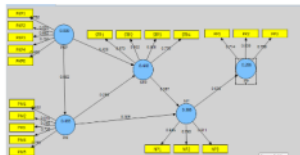
Abstract

The purpose of this study is to measure factors that influence students'acceptance a Learning Management System (LMS) using the Technology Acceptance Model (TAM). LMS is an information system that facilitates e-learning that serves to process, store, disseminate learning materials and provides administrative support and communication related to the teaching and learning process. Support students as users of the LMS content are one of the success factors in the implementation of the LMS. This study uses the Technology Acceptance Model (TAM), which has five factors namely perceived usefullness, perceived ease of use, attitudes towards to use, behavioral intention to use and actual use. A set of questionnaires have been completed by 60 students in Politeknik SAKTI Surabaya. Data were processed using SmartPLS and analyzed using the Structural Equation Modeling–Partial Least Square (SEM-PLS) method. The results showed that the TAM was valid, reliable, and substantially acceptable based on the results of data evaluation, ie the indicator factor loading > 0.5, the t-statistic ≥ 1.96, the cronbach alpha ≥ 0.6, and the value of the goodness of fit = 0.47. The factor that influence students'acceptance of a LMS in Politeknik SAKTI Surabaya are perceived usefullness, perceived ease of use, and attitudes towards to use, affecting the intention to use, and significantly affect the actual use of LMS.

Keywords: Student's acceptance; technology acceptance model; learning management system

1.0 INTRODUCTION

One of the most significant developments in the use of IT in higher education in the last decade is the application of a Learning Management System (LMS) to support learning process [1]. In addition to the college, the LMS is also applied in some secondary schools in Indonesia, according to the survey conducted by researchers from the University of Indonesia [2]. According to [2]McGill *et al.* (2008), LMS is an information system that facilitates e-learning, whereas e-learning is a generic term that refers to learning supported by IT. The term is also used to describe online learning, web-based learning, distribution of learning and learning mediated by IT. LMS also serves to process, store, disseminate learning materials and provide administrative support and communication related to the LP [1](McGill *et al.*, 2008). Govindasamy in [3]Selim (2007) states that there are seven benchmark of quality e-learning, namely institutional support, program development, teaching and learning, course structure, student support, faculty support, and evaluation and assessment. Students in the implementation of e-learning has a vital role, as a user of content. Based on the aforementioned facts, there is a need for a research to determine the factors that may affect student's acceptance of LMS by using TAM[4], especially among students of Politeknik SAKTI Surabaya. This study is expected to provide

knowledge for all lecturers at the Politeknik SAKTI Surabaya, so that they can prepare themselves for the better implementation of the LMS. There are various types of LMS in the market, but in general the application and the methodology are similar with features to create and manage content, communication systems are synchronous (real time) such as chat rooms and asynchronous, such as email and discussion forums[5]. One web-based learning system that is open source is Moodle (http://moodle.org) which will be discussed as an example by the researchers to provide a clearer picture of the learning features on a LMS. Sabine Graf and Beate List (2005)[6] conducted a research on the evaluation and comparison based on open source LMS 8 evaluation categories, i.e. communication tools, learning objects, management of user data, usability, adaptation, technical aspect, administration dan course management. The Moodle application looks best in the completeness of features compared with other LMS applications. The strengths of Moodle are the realization of communication tools, and the creation and administration of learning objects. Additional strengths of Moodle are the comprehensive didactical concepts and also the tracking of data[6]. There are several models in the literature related to individual technology adoption, with TAM being the most researched one[7]. TAM is the first model that included the psychological factors that influence the acceptance of information technology, and the model assumes that the perception

of usefulness and perceived ease of use of technology is influenced by individual attitudes toward the use of technology. Attitudes of individuals thought to affect behavioral intention to use the technology, and ultimately related to actual use [8].

2.0 EXPERIMENTAL

2.1 Methods

The research model (Figure 1) was adopted from TAM, which has five factors namely perceived usefullness, perceived ease of use, attitudes towards to use, behavioral intention to use and actual use. A set of questionnaires have been completed by 60 students in Politeknik SAKTI Surabaya. The questionnaire research is adopted from a similar research by Venkatesh[8]. Data were processed using a SmartPLS and analyzed using the Structural Equation Modeling-Partial Least Square (SEM-PLS) method.

2.2 Data Processing

The survey results were tabulated using MS Excel and saved in a format that is recognizable by SmartPLS, ie. csv (comma separated

value). The data is then imported into the design of the models that have been made previously on SmartPLS. The design of the model included the measurement model and the structural model. Measurement model is the relationship between the latent variable with the indicators, and the structural model is the relationship between the variables shown in the model. The model is then calculated and the results can be seen in Figure 2. Furthermore, the researchers checked if all the indicators in the model has a factor loading values > 0.5, as indicators with low factor loading should be removed from the model because it is not valid [9,10]. Based on the calculated results, there are two indicators that have a factor loading value < 0.5, ie PKP5 (-0.460) and PM3 (0.246). These indicators were excluded from the model, and the model was recalculated. Then the researchers performed bootstrapping (resampling technique research data) to models that have been recalculated, to obtain path coefficient value, average value, standard deviation value, and the value of the t-statistic. Report the results of calculations and bootstrap displayed in html format by SmartPLS.
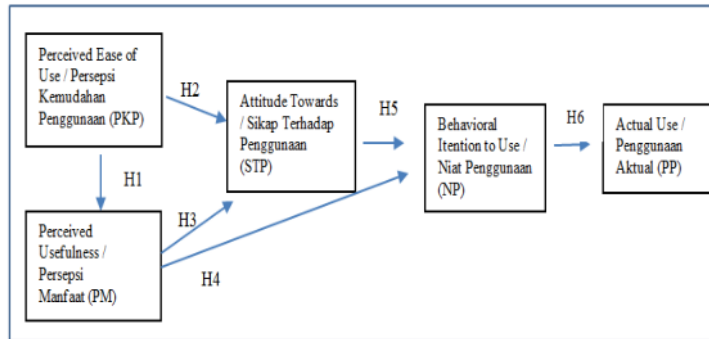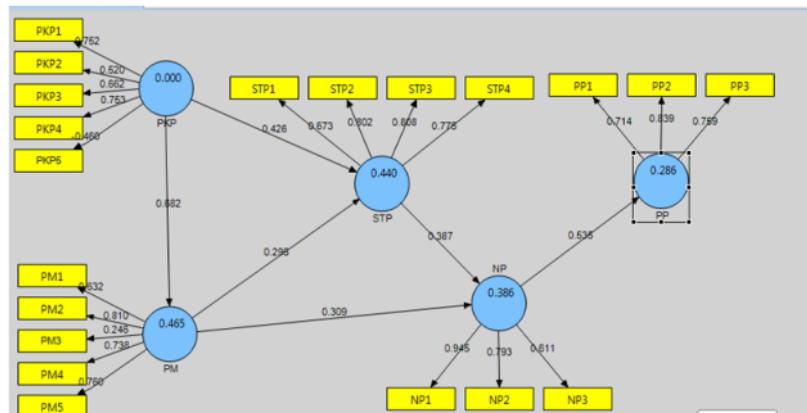

Figure 1 Research model

Figure 2 The results of the calculation of the model, factor loading values appearing in the figure

2.3 Testing of the Data

The researchers then performed testing of the measurement model, the structural model, and the model results are combined to obtain an acceptable research substantially.

In order to test the validity and reliability of the measurement model (**outer model**), the data should be tested against some of the following statistical parameters. (**1**)

Indicator validity: the value of a factor loading> 0.5 and the value t_statistic ≥ 1.96, as show in Figure 3; (**2**) **reliability of the data**: the value of composite reliability (**CR**) **or** the value of Cronbach's alpha (**CA**), if the value is greater 0.7, the indicator is known as consistency in measuring a latent variable [9]. However, a minimum value of 0.6 for the Cronbach's alpha is considered good[11], as show in Table 1.
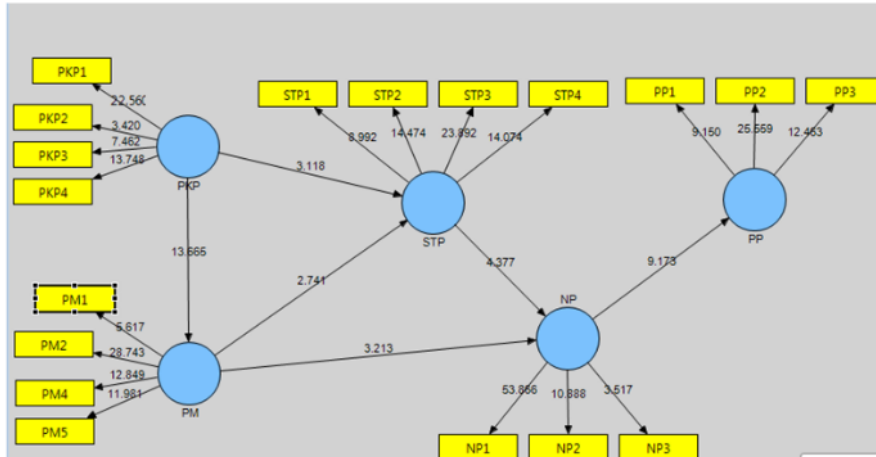

Figure 3 The results of the bootstrap of the model, t_statistic values appearing in the figure

Table 1 The calculation results from report generated by SmartPLS

Variable	Composite Reliability (CR)	Cronbach,s Alpha (CA)	AVE	Square Root of AVE	R *Square*	Communality
NP	0.832738	0,75576	0,631089	0,794411	0,386955	0,631088
PKP	0.786444	0,642252	0,485953	0,697103	*	0,485953
PM	0.82499	0,729852	0,54321	0,737028	0,427435	0,543210
PP	0.815217	0,661731	0,596315	0,772214	0,286554	0,596315
STP	0.849484	0,765543	0,586694	0,765960	0,427298	0,586694
				Average R square	0.382061	
				Average Communalities		0.568652

*PKP is an exogenous variable (independent), so it does not have the value R^2

(**3**) Value of **Average Variance Extracted** (AVE), which is a value that indicates the amount of variance that is capable of indicators contained by latent variables. AVE value > 0.5 indicates good convergent validity adequacy for latent variables. (**4**) Value of **cross loading factor**, that each indicator should correlate higher with latent variables compared with other latent variables. (**5**) Comparing the root AVE values with the value of the correlation between the latent variables. In order to test the validity and reliability of the structural model (**inner model**), the data should be tested against some of the following statistical parameters. (**1**) The **coefficient of relationship between the variables** is seen from the path coefficient values (positively or negatively correlated) and the value of the t-statistic. (**2**) **Coefficient of determination** (R^2 value) which describes how much the exogenous variables (independent) in the model can explain the endogenous variable (dependent). R^2 values close to 1, with a limit value criterion is divided into three classifications,

i.e. 0.67 = substantial, moderate = 0.33, and 0.19 = weak. Testing the combined model is seen from value of the goodness of fit (GoF). According to [11]Vinzi *et al*. (2010), the GoF value is a single measure that is used to validate the performance of joint between the measurement model and the structural model, which calculated using equation (1):

$$GoF = \sqrt{\overline{com} \times \overline{R^2}} \qquad (1)$$

GoF value lies between 0 and 1 with the interpretation of 0.1 (small), 0.25 (moderate), and 0.36 (substantial). The greater the value of the GoF implies the model is better in describing the sample of the study. The average value of communalities and the average value of R square is calculated in the equation, and generate value GoF = 0.466111.

Table 2 The values of cross loading factor

	NP	PKP	PM	PP	STP
NP1	0.945982	0.434211	0.582423	0.603854	0.689157
NP2	0.791446	0.140332	0.329676	0.314641	0.218043
NP3	0.609916	0.020756	0.173469	0.078183	0.132593
PKP1	0.365883	0.836427	0.616191	0.538294	0.538631
PKP2	0.185016	0.528453	0.417149	0.344551	0.223481
PKP3	0.267012	0.653209	0.292629	0.370737	0.400266
PKP4	0.136923	0.73366	0.440404	0.409098	0.43747
PM1	0.281316	0.231141	0.622944	0.2643	0.256442
PM2	0.392146	0.671002	0.815145	0.519843	0.659608
PM4	0.490797	0.383675	0.737713	0.424525	0.368193
PM5	0.413075	0.507575	0.759012	0.372757	0.349181
PP1	0.341216	0.516453	0.422812	0.713997	0.319471
PP2	0.454853	0.385515	0.393368	0.838753	0.532363
PP3	0.432329	0.526277	0.483236	0.758714	0.615559
STP1	0.487781	0.422683	0.415699	0.540651	0.665925
STP2	0.359029	0.294781	0.403219	0.372166	0.806826
STP3	0.519673	0.591586	0.610329	0.5501	0.815899
STP4	0.313793	0.432796	0.304282	0.471983	0.765938

■3.0 RESULT AND DISCUSSION

The next step is the analysis of the results. From the results of preliminary calculations, it was found that some indicators are not valid (refer Table 2). The indicator is PKP5 have value factor loading = -0.460, which contains the statement "working on the system is so complicated, it is difficult to understand what is going on", and PM3 which has value of factor loading = 0.246, which includes the statement "if I use the system, I will increase my chances of getting a raise". Indicators as mentioned above indicate that the statements are not valid to measure the variables. Methods of analysis of the measurement model is summarized in the Table 3.

Table 3 Methods of analysis of measurement model

The Values	Explanation
Loading Factor	All indicators have been valid in measuring the latent variable (all have value greater 0.5)
T-statistic	All indicators were significantly correlated to the latent variables (t-statistic values $\geq$ 1.96)
CR & CA	This study uses the value of CA to measure the reliability of research data. All indicators are consistent / reliable in measuring the latent variable (CA values $\geq$ 0.6)
AVE	All variables contain a good indicator variants (AVE value greater 0.5)
Coss Loading Factor	All indicators have good discriminant validity (square root of AVE values higher than the correlation between the variables)
Square root of AVE R^2 (R square)	All indicators were significantly correlated to the latent variables (t-statistic values $\geq$ 1.96)

Validity and reliability of the structural model based on coefficient of relationship between the variables and the coefficient of determination. Table 4 shows the relationship between the variables based on the research hypothesis. Path coefficient shows the relationship between the variables be it correlated positively or negatively, while the value of the t-statistic indicates that a relationship is significant or not. The hypotheses are accepted if the relationships between the variables are correlated positively and significantly. If a significant negative correlation means that the relationship is the opposite strengthen.

Table 4 The results of the research hypothesis

Research Hypothesis	Relationship Between the variables	Path Coefficients	T_statistics	Conclusion
H1	PKP →PM	0.653785	13.762474	Significant
H2	PKP →STP	0.357699	3.614978	Significant
H3	PM → STP	0.361154	3.214014	Significant
H4	PM→NP	0.306489	3.334491	Significant
H5	STP→NP	0.388841	4.388959	Significant
H6	NP→PP	0.535307	9.309115	Significant

◼4.0 CONCLUSION

This study concluded that: (a) the research model adopted from TAM has substantially acceptable; (b) perceived ease of use of LMS very significant influence on the perceived usefulness and significant effect on the attitude toward using LMS; (c) perceived usefulness significant effect on attitudes toward using LMS, also on behavioral intention to use; (d) attitudes toward using LMS significant behavioral intention; and (e) the behavioral intention to use of LMS significant effect on actual use of the LMS. This study still require development, especially in the development of the research model by adding an external variable or variable features of the LMS, in order to obtain a more comprehensive research model. As revealed by [12] Imtiaz *et al*. (2014), that important fact is that most of these studies used TAM as a base model and extended with other construction. Very few studies using the TAM without expanding it.

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