Criteria-Based Evaluation of Academic Information System Usage at Brawijaya University Based On Modified Technology Acceptance Model (TAM)

Admaja Dwi Herlambang
Faculty of Computer Science
Brawijaya University
Malang, Indonesia
herlambang@ub.ac.id

Yusi Tyroni Mursityo
Faculty of Computer Science
Brawijaya University
Malang, Indonesia
yusi_tyro@ub.ac.id

Mochamad Chandra Saputra
Faculty of Computer Science
Brawijaya University
Malang, Indonesia
andra@ub.ac.id

Larizza Novianti
Faculty of Computer Science
Brawijaya University
Malang, Indonesia
larizza.novianti@gmail.com

Abstract*—Implementation of academic information system at Brawijaya University (Universitas Brawijaya/ UB), Indonesia, had some problems that related to lecturer's intentions to use it regularly. The name of academic information system at UB is Sistem Informasi Akademik Dosen (SIADO). An evaluation of SIADO implementation success was needed to produce recommendations and improve the usage of SIADO by lecturers at UB. This study measured SIADO implementation success based on Technology Acceptance Model (TAM) that has been modified. The variable that had been measured are Perceived Usefulness, Perceived Ease of Use, Trust, Social Influence, Facilitating Conditions, and Usage Intention Variables. This research used quantitative approach with questionnaire as measurement tool. Data analyzed with descriptive statistic. The research population was 2192 active lecturers at UB, the sample size was 96 that are chosen by purposive sampling technique, and the sample size was calculated with Slovin Formula at 10% error rate. The results showed that the SIADO implementation success categorized as High and the score was 71,96%. Perceived Usefulness (71,00%), Perceived Ease of Use (73,30%), Social Influence (66,20%), Facilitating Conditions (72,30%), and Trust (73,80%) categorized as High and Usage Intention (75,20%) categorized as Very High. Evaluation result recommend that policy maker and stakeholder that are involved in day-to-day operationalization should concern in some aspects to improve the SIADO implementation success, such as security efforts, speed of system's responses, layout of the display, and ease to be accessed anywhere and anytime.

Keywords*— academic information system, perceived usefulness, perceived ease of use, technology acceptance model, trust, usage intention.

I. INTRODUCTION

Information technology is a technology to process data, like getting, compile, store, process, or manipulate the data in various ways to produce quality information, that is relevant, accurate and timely, as well as is a strategic information for decision making which can be used for the purposes of business, government, or private [1]. Brawijaya University (Universitas Brawijaya/ UB) at Malang, Indonesia, is university that implement information technology to assist the lecturer for academic work purpose. One of the information technology has applied by UB is academic information system that called Sistem Informasi Akademik Dosen (SIADO). SIADO is a service portal for the entire UB lecture to provide ease and assist in carrying out activities as well as its role. Each lecturer can access SIADO through the process of login at https://siado.ub.ac.id/.

SIADO has many benefits in helping lecturer at UB for academic work purpose. Lecturers can view and manage the trust of students, teaching schedules, interest in teaching, the results of the questionnaire, see data guidance or examiners of final project, see each student data form identity, study plan, study result, and many more academic profile. Lecturers can also manage the schedule of lectures, material details, presence recap, and grade. SIADO also provides a function to list the recapitulation of presence lecture, and put the grade of each course for each student. SIADO already integrated with academic information system for student which certainly also simplify the process of academic services from student side. SIADO should help UB deliver the academic service between lecturers and students.

Based on the interview result that conducted in preliminary study showed that the intention of lecturers in using SIADO as main service to deliver academic work purpose wasn't good enough. Lecturer motivated in using SIADO because of UB had released regulation that are obligated the lecturer to use it. This top-down approach made SIADO just as a tool that aren't represent the need of lecturer as user and can't represent the success of SIADO implementation in UB. Policy maker and stakeholder that are involved in day-to-day operationalization of SIADO need information that are created from SIADO user as bottom-up strategy policy making. An evaluation process need to be conducted in case of collect information from SIADO user perception. The information that had been collected could be used by policy maker to improve the SIADO implementation success.

978-1-5386-7407-9/18/$31.00 ©2018 IEEE

Technology Acceptance Model (TAM) is one of theoretical framework that could be used as evaluation parameter in information system success measurement. TAM offers a powerful and simple explanations for the acceptance of the technology and the behavior of its users [2]. There are two main concepts that are trusted in the user acceptance i.e. the perceived usefulness and perceived ease of use [2]. Benefits (perceived usefulness) is defined as a person's level of confidence that a particular use of an information system improves performance in his work. Ease (perceived ease of use) is defined as a person's level of confidence that use of the technology information system will be easy and does not require a hard effort. So in this study, used variables perceived usefulness (PU) and perceived ease of use (PEOU) as the basis for the theory of causal relations result from two factors that build attitude (attitude) in the use of information systems, as well as knowing the importance of trust and influence social (social influence) in the intent of the use of information technology. So this study adopts the model of research from Aljoza & Susanto [3] that developed from research conducted by the Davis [4].

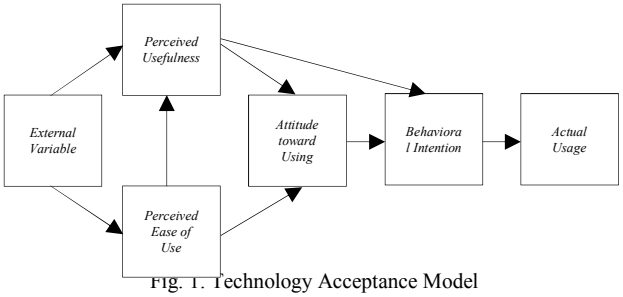

Fig. 1. Technology Acceptance Model

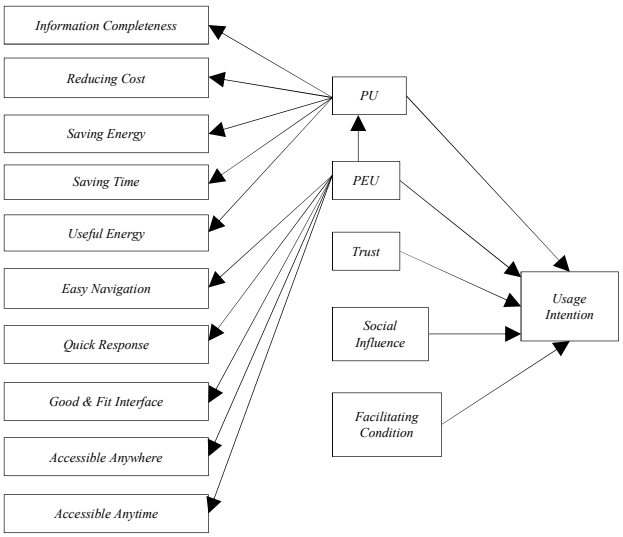

Fig. 2. Measurement Parameters

Figure 1 shows the TAM that developed by Davis. TAM posits that perceived ease of use (PEOU) and perceived usefulness (PU) are important factors that determine the user's attitude toward his or her intention to use and actual usage of IS. According to TAM, usage behavior is a direct function of behavioral intention which in turn a function of attitude toward usage reflect feelings of favorableness or unfavorableness toward using the technology and PU which reflect the belief that using the technology will enhance performance. Attitude is determined jointly by PU and PEOU. Furthermore, a key purpose of TAM is to provide a basis for discovering the impact of external variables on internal beliefs, attitudes, intentions, and usage [4].

II. METHODOLOGY

This research used quantitative approach and used several variables of the model of the Technology Acceptance Model (TAM) that had been modified as measurement parameters or criterias. The main objective of TAM is to provide a basis for tracking the influence of external factors on the user's beliefs, attitudes, and goals [4] [5]. Modified TAM used in this research refers to research conducted by Susanto & Aljoza [3] with the heading "Individual Acceptance of e-Government Services in a Developing Country: Dimensions of Perceived Usefulness and Perceived Ease of Use and the Importance of Trust and Social Influence". Based on the model, the variables used in this study, namely Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Social Influence, Facilitating Conditions, Trust and Usage Intention. The research model used for reference in this research can be seen in Fig. 2.

The development of questionnaire begins with determining the variables that will be measured. The variables are Trust, Perceived Usefulness, Perceived Ease of Use, Social Influence, Facilitating Conditions, and Usage Intention. Perceived usefulness is defined as the extent to which a person believes that the use of a particular information system will improve his performance [4]. Perceived ease of use is how much computer technology perceived relatively easy to understand and use [6]. Social influence as an individual's level of perception of interests believed by others to influence him to use the new system [2]. Facilitating conditions defined as the level one believes that organizational and technical infrastructure is available to support the use of the system [2]. Usage intention of technology in someone seen from the desire to use a technology, the desire to use a technology frequently, and the desire to motivate other users to use a technology [7].

Every variable had indicators that construct the measurement domain and every statement in the questionnaire developed from every indicator. The questionnaire in this research was contained 46 statements with five interval scales and was pilot tested. The population in this study is an active lecturer of Univeritas Brawijaya who has used Sistem Informasi Akademik Dosen (SIADO) with a total of 2192 lecturers. The sample in this study uses the disproportionate stratified random sampling method because the data is taken from the population with a certain of considerations or criteria. To determine the number of samples in this study, the Slovin formula was used because the sample size was determined from the known population. Through the calculation of the Slovin equations with a concession rate of 10% from the total population that is 2192 people, the results of the sample are 96 lecturers from all faculties in Universitas

Brawijaya Malang. The allocation of disproportionate stratified random sampling for the purpose of analysis between strata, is more appropriate to use balanced allocation or equal allocation to determine the sample size of each stratum[8]. So that after finding the minimum number of samples, the distribution of each faculty's respondents was divided by dividing the minimum number of samples with the number of faculties in Brawijaya University, namely 96 divided by 16 faculties, which means 6 respondents for each faculty. Data collection was done by distributing questionnaires directly to the respondents. The next stage after the data collection process is the stage of descriptive statistical analysis. The calculation of descriptive statistics in this study was assisted by using the help of SPSS software.

TABLE 1. CATEGORIZATION FOR PERCENTAGE VALUE

Value	Category
$75.01 < x \leq 100$	Very High
$58.34 < x \leq 75.01$	High
$41.66 < x \leq 58.34$	Middle
$24.99 < x \leq 41.66$	Low
$0 < x \leq 24.99$	Very Low

Data had been collected was analyzed with descriptive statistic. Statistical analysis performed revealed in two sizes, namely data centralization and data distribution. Data centralization represented by average (mean) and percentage value. Data distribution represented by standard deviation value. After the calculation of descriptive statistics, the next step is categorizing the percentage value. Categorization is made with the norm curve [9]. The X axis on the norm is divided into 6 areas of each area having a distance of one standard deviation. The norm curve is divided into two parts where the middle part is the average value. The value of each category is found from the ideal minimum percentage value. Ideal maximum percentage, reach, ideal percentage average, and standard deviation. The average value changed to the number before it is categorized. Categorization for percentage value showed in Table 1.

III. RESULT

Perceived usefulness variable had five indicators, namely information completeness, reducing cost, saving energy, saving time, and useful information. This variable categorized as High with percentage value at 71,00%. The result of descriptive statistical analysis for Perceived usefulness variable showed in Table 2. Perceived ease of use variable had five indicators, namely easy navigation, quick response, good and fit interface, accessible anywhere, and accessible anytime. This variable categorized as High with percentage value at 73,30%. The result of descriptive statistical analysis for perceived ease of use variable showed in Table 3. Social influence variable had three indicators, namely subjective norm, social factors, and image. This variable categorized as High with percentage value at 66,20%. The result of descriptive statistical analysis for social influence variable showed in Table 4. Facilitating conditions variable had three indicators, namely perceived behavioral control, facilitating conditions, and compatibility. This variable categorized as High with percentage value at 72,30%. The result of descriptive statistical analysis for facilitating conditions variable showed in Table 5. Trust variable had one indicator, namely trust of system. This variable categorized as High with percentage value at 73,60%. The result of descriptive statistical analysis for trust variable showed in Table 6. Usage intention variable had three indicators, namely desire using the system, the desire to use the system frequently, and the desire to motivate other users to use the system. This variable categorized as High with percentage value at 73,20%. The result of descriptive statistical analysis for usage intention variable showed in Table 7. Descriptive analysis of all variables showed at Table 8.

.

TABLE 2. ANALYSIS OF PERCEIVED USEFULNESS VARIABLE

Indicator	Average		Std. Deviation
	Score	*Percentage (%)*	
Information completeness	3,53	70,60	0,66
Reducing cost	3,78	75,70	0,77
Saving energy	3,56	71,20	0,74
Saving time	3,45	69,00	0,71
Useful information	3,45	69,00	0,69
Total Average		71,00	
Category		High	

TABLE 3. ANALYSIS OF PERCEIVED EASE OF USE VARIABLE

Indicator	Average		Std. Deviation
	Score	*Percentage (%)*	
Easy navigation	3,59	71,80	0,76
Quick response	3,60	72,00	0,66
Good & fit interface	3,57	71,40	0,75
Accessible anywhere	3,80	76,00	0,73
Acessible anytime	3,78	75,60	0,73
Total Average		73,30	
Category		High	

TABLE 4. ANALYSIS OF SOCIAL INFLUENCE VARIABLE

Indicator	Average		Std. Deviation
	Score	*Percentage (%)*	
Easy navigation	3,23	64,6	0,95
Quick response	3,86	77,2	1,03
Good & fit interface	2,84	56,8	1,01
Total Average		66,20	
Category		High	

TABLE 5. ANALYSIS OF FACILITATING CONDITION VARIABLE

Indicator	Average		Std. Deviation
	Score	*Percentage (%)*	
Perceived behavioral control	3,61	72,60	0,76
Facilitating conditions	3,78	75,60	0,74
Compatibility	3,52	70,40	0,74
Total Average		72,30	
Category		High	

TABLE 6. ANALYSIS OF TRUST VARIABLE

Indicator	Average		Std. Deviation
	Score	*Percentage (%)*	
Trust of system	3,68	73,60	0,637
Total Average		73,60	
Category		High	

TABLE 7. ANALYSIS OF USAGE INTENTION VARIABLE

Indicator	Average		Std. Deviation
	Score	*Percentage (%)*	
The desire to use the system	3,81	76,2	0,637
The desire to use the system frequently	3,84	76,8	0,637
Desire motivates other users to use the system	3,63	72,6	0,755
Total Average		75,20	
Category		High	

TABLE 8. ANALYSIS OF ALL VARIABLE

Variable	Percentage (%)	Category
Perceived Usefulness	71,00%	High
Perceived Ease Of Use	73,30%	High
Social Influence	66,20%	High
Facilitating Conditions	72,30%	High
Trust	73,80%	High
Usage Intention	75,20%	Very High
Average Total	71,96%	High

Based on Table 8 it can be seen that the overall percentage is included in the high category with a percentage of 71,96%. There are five variables included in the high category, namely perceived usefulness, perceived ease of use, social influence, facilitating conditions, and trust. There are two variables which have percentage value below the total average, namely perceived usefulness (71,00%) and social influence (66,20%). So, perceived usefulness and social influence need to be improved in the near future for better SIADO implementation success. The data that showed comparison between variables are visualized in Fig. 3.

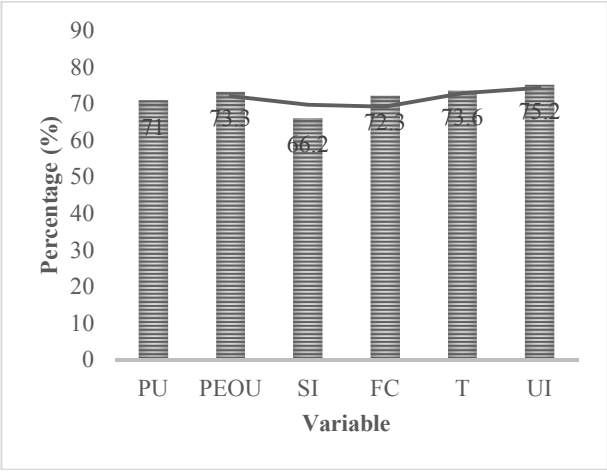

Fig. 3. Analysis Results Each Variable

IV. DISCUSSION

All indicators on perceived usefulness variables, namely information completeness, reducing cost, saving energy, saving time, and useful information are categorized as High. The category level indicates that user perceptions of the benefits of using SIADO should be maintained or enhanced by making improvements in order to achieve very high categories. UB needs to make efforts in order to increase the user's confidence about the benefits of using SIADO. From the results of the analysis found four indicators that have a percentage below the total average, namely information completeness, saving energy, saving time, and useful information. Saving time and useful information indicator has the lowest percentage among all indicators, so both of this indicators are highly recommended for improvement. Recommendations are given to improve are paying more attention and increasing the response speed of the system in response to user command, so the lecturer does not require long waiting time when using SIADO. The recommendation is in line with the research about information system effectiveness in finance field [10]. The research result said that many companies have found that increasing the responsiveness of contemporary management accounting information systems enables them to realize significant cost savings through the elimination of a large number of internal monthly reports [10].

User perceptions of the ease of SIADO should be maintained and enhanced by improving all indicators to achieve very high categories. So there is a need for special attention given to people who lack experience and not really understand the use of the system to further enhance the user's confidence in the ease gained from the use of the system. From the analysis results found three indicators that have a percentage value below the average percentage of the total, namely easy navigation, quick response, and good & fit interface. So, these indicators are highly recommended for improvement. Referring to indicators of perceived ease of use variables in the research of Susanto & Aljoza [3], the user's belief in the ease of using SIADO can be enhanced through ease of navigation on SIADO, the speed of response provided by SIADO, in the form of a layout that is easy to understand and in accordance with the needs, and ease to be accessed at any place and at any time.

Overall social influence variable has the lowest percentage value among the other variables. The result is in line with the conclusions in previous research by Susanto and Aljoza [3]. In order to implement the information system, social influence variables need to get special attention by the organization [3]. From the analysis results also known that there are two indicators that have a percentage value below the total average percentage are subjective norm and image. User perceptions of the ease of SIADO should be maintained and enhanced by improving all indicators to achieve very high categories. Social influence variables have the lowest percentage value level among other variables, so need to get special attention by UB. Facilitating conditions categorized as High. This category indicates that the condition of facilities provided by the UB in supporting the implementation of SIADO should be maintained and further improved by making improvements in order to achieve very high category. trust of system indicator in trust variable categorized as High. The category level indicates that the level of trust of lecturers towards SIADO (trust of system) should be maintained and enhanced by improvements to further build trust of users. Overall usage intention variables have the highest percentage value of other variables that is equal to 75,50%. So, the user's

intention in using SIADO should be maintained and enhanced again.

Recommendations could be given to improve the SIADO implementation success based on existing condition of perceived usefulness, perceived ease of use, social influence, facilitating conditions, trust, and usage intention variables are (1) get more attention and improve the ease of navigation on SIADO, (2) increase the speed of response provided by SIADO, (3) enhance the layout of the view that is easy to understand and in accordance with the needs, and (4) make SIADO more ease to be accessed at any place and at any time. UB also needs to ensure the security of personal data owned by lecturers, so that it will not be misused by the parties who are not responsible. It can also be supported through the provision of more training for new and old users and the availability of a user guide that contains step-by-step instructions for reference when problems or difficulties arise in the use of the system. Other technical recommendations, such as improving the appearance of SIADO to be better, easier to understand, and according to the needs of its users, as well as pay attention to the ease of navigation of SIADO to help lecturers who have less experience and find difficulties in using the system can easily learn and understand how to use it. In addition, the developer also needs to pay attention to the related speed of the response system in providing responses.

V. CONCLUSIONS AND SUGGESTIONS

Perceived usefulness variables categorized as High with a percentage at 71,60%. The category indicates that user perceptions of the benefits of using SIADO should be maintained or enhanced by making improvements in order to achieve very high categories. Perceived ease of use variable categorized as High with percentage value equal to 73,20%. The percentage value indicates that user perceptions of the ease of SIADO should be maintained and enhanced by improving all indicators to achieve very high categories. Social influence variables categorized as High with percentage value equal to 66,20% but have the lowest percentage value level among other variables. Social Influence variables need to get special attention by UB. Facilitating conditions categorized as High with percentage value equal to 72,30%. The category indicates that the condition of facilities provided by the UB in supporting the implementation of SIADO should be maintained and further improved by making improvements in order to achieve very high category. Trust variable with Trust categorized as High with percentage value equal to 73,60%. The category level indicates that the level of trust of lecturers towards SIADO (trust of system) should be maintained and enhanced by improvements to further build trust of users. Overall Usage Intention variables have the highest percentage value of other variables that is equal to 75,50%. So the user's intention in using SIADO should be maintained and enhanced again.

Recommendations are given to maintain and improve the intention of UB lecturers in using SIADO based on perceived usefulness, perceived ease of use, social influence, facilitating conditions, trust and usage intention variables such as more attention and improve the ease of navigation on SIADO, the speed of response provided by SIADO, the support of the layout of the view that is easy to understand and in accordance with the needs, and ease to be accessed at any place and at any time. UB also needs to ensure the security of personal data owned by lecturers, so that it will not be misused by the parties who are not responsible. It can also be supported through the provision of more training for new and old users and the availability of a user guide that contains step-by-step instructions for reference when problems or difficulties arise in the use of the system. Suggestion given for further research is from result of analysis and recommendation based on intention of user which have been given in this research, hence furthermore can do deeper evaluation to system to do overall improvement start from display, system security, and feature which need to be added to SIADO.

REFERENCES

[1] Judy Sheard, Simon, Matthew Butler, Katrine Falkner, Michael Morgan, & Amali Weerasinghe. "Strategies for Maintaining Academic Integrity in First-Year Computing Courses". *Proceedings of the 2017 ACM Conference on Innovation and Technology in Computer Science Education (ITiCSE '17)*, Bologna, Italy, July 03 - 05, 2017, pp. 244-249.

[2] V. Venkatesh, M. G. Morris, G. B. Davis, & F. D. Davis. "User Acceptance of Information Technology: Toward a Unified View". *J. Chem. Inf. Model.*, vol. 53, no. 9, pp. 1689–1699, 2003.

[3] T. D. Susanto and M. Aljoza. "Individual Acceptance of e-Government Services in a Developing Country: Dimensions of Perceived Usefulness and Perceived Ease of Use and the Importance of Trust and Social Influence". *Procedia Comput. Sci.*, vol. 72, pp. 622–629, 2015.

[4] F. D. Davis. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of lnformation Technology". *MIS Q.*, vol. 13, no. 3, pp. 319–340, 1989.

[5] Junitha Fadhillah Sigar. "The Influence Of Perceived Usefulness, Perceived Ease Of Use And Perceived Enjoyment to Intention to Use Electronic Money in Manado". *Jurnal EMBA*, vol.4, no. 2, pp. 498–507, 2016.

[6] Nurcan Alkis, Duygu Findik Coskuncay, and Sevgi Ozkan Yildrim. "A Systematic Review of Technology Acceptance Model in e-Learning Context". *Proceedings of the XV International Conference on Human Computer Interaction (Interacción '14),* Puerto de la Cruz, Tenerife, Spain — September 10 - 12, 2014, Article No.55.

[7] J.-L. Hsiao, H.-C. Chang, and R.-F. Chen. "A Study of Factors Affecting Acceptance of Hospital Information Systems". *J. Nurs. Res.*, vol. 19, no. 2, pp. 150–160, 2011.

[8] Johnnie Daniel. *Sampling Essentials: Practical Guidelines for Making Sampling Choices*. USA:Sage, 2012.

[9] Jack R. Fraenkel and Norman E. Wallen. *How to Design and Evaluate Research in Education*. New York: McGraw-Hill, 2009.

[10] Lay Smrity Guria, Rishikesh Patankar, and Dinesh Tyagi. "ICT-Based Financial and Investor Literacy through Common Service Centres". *Proceedings of the 10th International Conference on Theory and Practice of Electronic Governance ()*, New Delhi AA, India, March 07 - 09, 2017, pp. 532-533.