

The Third Information Systems International Conference

Validating the Conceptual Model for Predicting Intention to Use as Part of Information System Success Model:

The Case of an Indonesian Government Agency

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Abstract

This study aims at testing the conceptual model for predicting intention to use the information system as part of DeLone-McLean information system success framework. A study literature has revealed that DeLone-McLean Information System success model has difficulty for defining predictor variables for intention to use. This paper offers a solution by finding the proper variables from technology acceptance models which have strong theoretical background for predicting behavioral intention. A conceptual model is proposed based on literature review. An empirical study is conducted to validate the conceptual model. The object for empirical study is a government agency which has offices in several cities/towns in Indonesia. A quantitative data analysis is being done using SmartPLS with the result showing that perceived usefulness is the strongest predictor for intention to use while service quality surprisingly gives a negative coefficient toward intention to use.

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Peer-review under responsibility of organizing committee of Information Systems International Conference (ISICO2015)

Keywords: DeLone-McLean IS success model; intention to use; technology acceptance models; information system in government agency

1. Introduction

The research for defining information system (IS) success has been started few decades ago, but so far this particular research still lacks of an appropriate definition and consensus on what factors affecting information system success [1], [2]. Even though some prominent IS success theories have been introduced, some researchers still expressed the urgency of refining the theories since empirical studies have shown the inconsistency of the results [3], [4], [5]. There are several concerns regarding previous works that are listed by [5] including: poor measurements, lack of theoretical grounding, concern heavily on financial performance, weak survey instruments, inappropriate data collection approaches, and lack of agreement on the dependent variables measurement that result on its incomparability.

The most prominent model for assessing information system success is [6]'s model since it got a lot of attentions (citation, replication, validation, and modification) from the IS research community. However, after getting a lot of criticism from some researchers, especially Seddon [7], DeLone and McLean updated

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their model [8] and included two variables into the model: service quality and intention to use as shown in Fig 1.

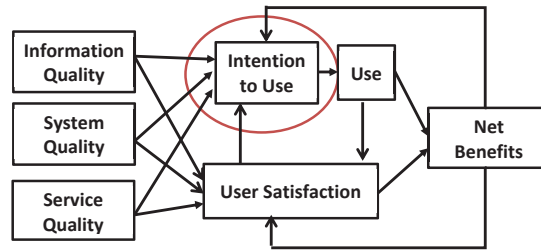


Fig. 1. Intention to use in the updated DeLone-McLean IS model

2. Literature Review

In the updated DeLone and McLean model Fig 1, intention to use is predicted by information quality, system quality, service quality, and user satisfaction. Since behavioral intention to use is drawn theoretically from psychology discipline while information quality and system quality were drawn from technical aspect of [9]’s communication theory, therefore it will raise an internal consistency from theoretical perspective. Based on this argument, the search for finding the surrogate variables for intention to use will be broadened into other disciplines which have strong theoretical background in addressing behavioral intention. This discipline has been known widely as technology acceptance or technology diffusion research. This paper is proposing to make a connection between information system success model and technology acceptance models in the quest of finding the proper variables for intention to use.

2.1. Intention to use the information system in government agency

Intention to use is stemmed from behavioral intention concept introduced by Fishbein and Ajzen [9]. In their theory of reasoned action (TRA), Fishbein and Ajzen asserted that certain behavior can be predicted by the intention for doing the behavior in question. In the theory of information system success, the behavior in question is actual system use (presented by variable “Use” as seen in Fig 1). The intention to use then can be translated as the willingness of user to use the system. Researchers in technology acceptance discipline are the most supporters of the postulate that behavioral intention to use is the antecedent of actual system use. Most studies for validating technology acceptance model (TAM) have proven the aforementioned relationship [10]. In a TAM meta-analysis study, [11] revealed that behavioral intention is a good predictor for actual system use in both subjective and objective measurement. Subjective measurement is taken from self-reporting questionnaire, while objective measurement is conducted by looking at the system log.

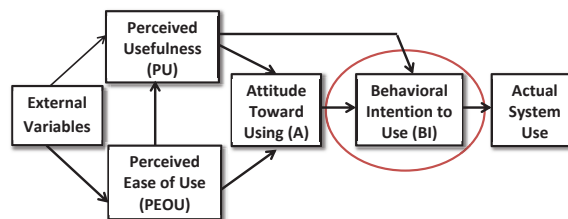


Fig. 2. Behavioral intention to use in TAM

There is a fundamental difference between technology acceptance model and IS success model on predicting intention to use. As mentioned previously, in the IS success model, intention to use is predicted by system quality, information quality, and service quality (as shown in Fig 1). In the TAM (Fig 2), intention to use, or behavioral intention, is predicted by attitude and perceived usefulness.

Even though in the original TAM model the predictors for behavioral intention are attitude and perceived usefulness, however, some empirical studies, such as [12], [13], and [14], are also testing the relationship between perceived ease of use and behavioral intention. After reviewing several TAM meta-analysis studies that have been done between 2003 and 2010, it has been revealed that perceived usefulness is the best predictor for behavioral intention (Table 1). The summary of relationships between perceived ease of use (PEOU), attitude (A), perceived usefulness (PU), and behavioral intention (BI) are shown in Table 1. The relationships are translated into one of three categories. “Strong support” means that most studies (more than 50% of the studies) evaluated in the meta-analysis study is significant. Table 1 shows that only the relationship of PU-BI getting strong support almost in all six meta-analysis studies (only one medium support). That means in all six studies, perceived usefulness is proven to be the best predictor for behavioral intention. This conclusion is in line with [15] and [16] that empirical studies have shown that perceived usefulness proven to be the strong predictor for intention to use. The exclusion of perceived ease of use (PEOU) will not affect the internal consistence of the theory since system quality variable from DeLone-McLean model consists of similar measurements namely “easy to use”.

Table 1. The summary from TAM meta-analysis studies (2003-2010)

TAM Meta-Analysis Study	PEOU-BI	PU-BI	A-BI
[17]	Strong support	Strong support	Strong support
[18]	Weak support	Strong support	N/A
[19]	Strong support	Strong Support	Strong Support
[20]	Weak support	Medium support	Medium support
[11]	Strong support	Strong support	N/A
[21]	Medium support	Strong support	Strong support

Based on the discussion from section 1.1 and Fig 1, thus, five predictor variables for intention to use can be concluded, which are information quality, system quality, service quality, user satisfaction, and perceived usefulness. The intermediate result for the proposed model can be seen in Fig 3. Since this study is meant to be validated in the mandatory environment, the quest for finding the predictor variables for intention to use will be broaden into the technology acceptance framework that is designated for mandatory environment.

2.2. Intention to use the information system in government agency

TAM was not developed for any particular condition or environment of information technology usage. In the mission to get a better model for predicting actual use in mandatory setting, Venkatesh, Moris, Davis, and Davis [22] combine eight theories and models to create the Unified Theory of Acceptance and Use of Technology (UTAUT) shown in Fig 4. The eight theories are the theory of reasoned action (TRA), the technology acceptance model (TAM), the motivational model, the theory of planned behavior (TPB), a model combining TAM and TPB, the model of PC utilization, the innovation diffusion theory, and the social cognitive theory (SCT). Four of the theories are psychological-based theories which are the theory of reasoned action (TRA), the theory of planned behavior (TPB), the motivational model, and the social cognitive theory. UTAUT explains the factors affect behavioral intention (interest in using an information system) and use behavior (use of the information system itself). Venkatesh, Moris, Davis, and Davis [22] postulated three factors, namely, performance expectancy of the information system, effort expectancy,

and social influence that affect behavioral intention. The fourth factor, i.e., facilitating conditions, affects the use behavior directly. Other variables, which are gender, age, experience, and voluntary use, play as moderating variables for the relationships among the four factors above with behavioral intention and use behavior.

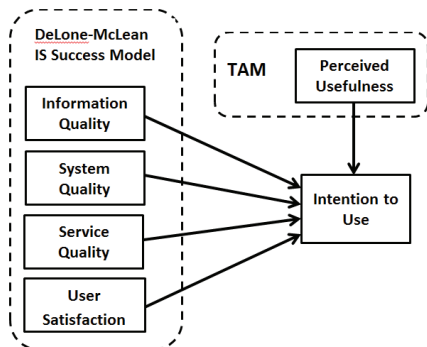


Fig. 3. The intermediate result: The Intention to Use is predicted by five variables

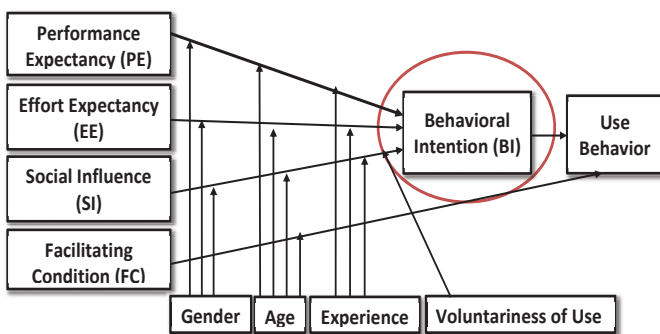


Fig. 4. Behavioral intention in UTAUT

Since UTAUT was introduced almost two decades after TAM, it can be understood that there are limited studies have been done using UTAUT compared to TAM. Up to 2013, there are only two UTAUT meta-analysis studies as seen in Table 2. From three BI predictor variables, only one variable (which is perceived expectancy, PE) that is proven to be the best predictor for behavioral intention since in both meta-analysis studies it got strong and significant support. The relationship EE-BI and SI-BI got strong support only in the first meta-analysis study. That means effort expectancy and social influence is not strong enough for predicting behavioral intention. Therefore both variables will not be included as the predictor variables for behavioral intention. Based on the discussion so far, the predictor variables for behavioral intention can be depicted in Fig. 5.

Table 2. The summary from UTAUT meta-analysis studies

UTAUT Meta-Analysis Study	PE-BI	EE-BI	SI-BI
[23]	Strong support	Strong support	Strong support
[24]	Significant	Not Significant	Not Significant

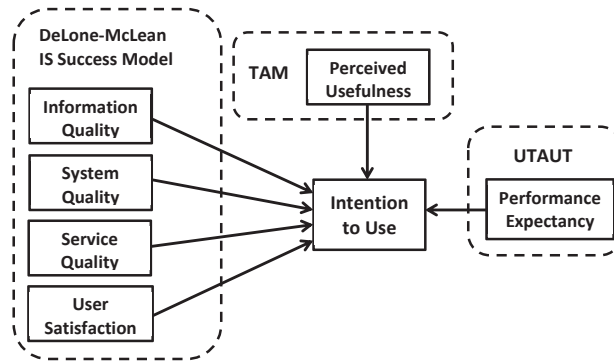


Fig. 5. The conceptual model for predicting intention to use

3. Method

The research method is a quantitative study with purposive sampling method. Purposive sampling method was being used to target the respondents who are a) working at a government agency, b) using the same information system. Since the number of respondents is not sufficient if taken only from one agency office (hence, one city), therefore the study is broaden into several cities in four provinces. The data was collected using questionnaire from several offices of a government agency in ten cities in West Java, Central Java, Bali, and Lombok. The questionnaire was using a five-point Likert scale where the lowest score (1) refers to “strongly disagree” and the highest score (5) refers to “strongly agree”. The respondents for data collection were the operators of an information system that was implemented for managing workforce data. Each office has 5-10 operators, thus in the end of the survey only 90 data were able to be collected and only 88 of them were valid. The analysis was done using SmartPLS due to the small sample size [25]. The result of path analysis is shown on Fig. 6.

4. Model Validation

In establishing model validation for structural model, there are four factors need to be examined. The first is indicator reliability. Hair et al [26] stated that with the sample size around 85, the cutoff loading of 0.6 is deemed to be significant. The result of SmartPLS3 has shown that all indicators have factor loading 0.6 or higher. The second is internal consistency reliability. In SmartPLS, internal consistency reliability can be found in the composite reliability score as shown in Fig. 7. The cutoff score is 0.7 [25]. It can be seen on Fig. 7 that all latent variables have score above 0.7. The third and fourth are convergent and discriminant validity which considered as construct validity. In SmartPLS, convergent validity is expressed by the Average Variance Extracted (AVE) numbers (Fig. 8), while discriminant validity is shown in Fig. 9. The cutoff for AVE is 0.5 [27], therefore the model fulfills the convergent validity requirement. The significance of discriminant validity is fulfilled when the square root of AVE for each latent variable is higher compared to the correlations of that particular variable with other variables [28]. As shown in Fig. 9, the score of discriminant validity for all variables are significant.

Path Coefficients

	Original Sampl...	Sample Mean (...)	Standard Error ...	T Statistics (O...	P Values
Inf_Qual -> ITU	0.114	0.116	0.098	1.162	0.246
PE -> ITU	-0.009	0.013	0.104	0.089	0.929
PU -> ITU	0.600	0.568	0.135	4.442	0.000
Serv_Qual -> ITU	-0.167	-0.136	0.079	2.107	0.035
Sys_Qual -> ITU	0.273	0.263	0.088	3.090	0.002
User_Sat -> ITU	0.124	0.137	0.097	1.285	0.199

Fig. 6. The result from bootstrapping process

Composite Reliability

	Composite Rel...
ITU	0.894
Inf_Qual	0.901
PE	0.831
PU	0.783
Serv_Qual	0.899
Sys_Qual	0.866
User_Sat	0.934

Fig. 7. Internal consistency reliability

Average Variance Extracted (AVE)

	AVE
ITU	0.737
Inf_Qual	0.646
PE	0.711
PU	0.649
Serv_Qual	0.750
Sys_Qual	0.568
User_Sat	0.876

Fig. 8. Convergent validity

5. Result and Discussion

The result of path analysis shows that the coefficient of determination (R^2) is 0.733. That means the predictor variables explains 73% of the variance in intention to use with perceived usefulness (PU) contributes 60% of it. Wong [25] suggested that only path with coefficient larger than 0.1 is deemed to be significant. Therefore, performance expectancy has to be removed from the model since it has coefficient almost 0. The coefficients for information quality and user satisfaction are above 0.1 but the T-statistic are below 1.96. Therefore both variables are also being removed from the model. Fig 6 shows that there are only three latent variables gave the T-Statistic above 1.96: perceived usefulness, service quality, and system quality (Fig 6). That means only those three variables significantly predict intention to use.

Discriminant Validity

	ITU	Inf_Qual	PE	PU	Serv_Qual	Sys_Qual	User_Sat
ITU	0.859						
Inf_Qual	0.564	0.804					
PE	0.548	0.399	0.843				
PU	0.771	0.437	0.688	0.805			
Serv_Qual	0.188	0.310	0.332	0.382	0.866		
Sys_Qual	0.624	0.715	0.423	0.459	0.311	0.803	
User_Sat	0.582	0.390	0.311	0.528	0.068	0.403	0.936

Fig. 9. The score of discriminant validity for each latent variable

It has to be underlined that the negative coefficient for service quality is quite interesting. It will be counterintuitive if it is concluded that decreasing service quality will increase user's intention to use the information system. A deeper analysis into the case of government agency or public service, it is suspected that the service quality of government agencies generally is not superior [29], [30]. Nevertheless, the employees of government agency have to use the system despite the low service quality during the information system usage. Another explanation for the negative coefficient of service quality could come from the improper questionnaire statements. The questionnaire item for service quality was emphasized on the empathy of the IT personnel toward users. That means the IT personnel are always be there if needed, ready to help, responsive toward users, and friendly. It is widely known that such level quality of service is hardly found in the government agency. The question statements have to be tailored accordingly to tap the proper data. Ambiguous statement could also result in the unfit data.

As shown in the result, perceived usefulness turns out to be the greatest contributor for predicting intention to use. The high path coefficient most likely due to the proper the questions used for tapping the data of perceived usefulness. For example, the statement "Without using this information system, it is impossible for me to get my job done" gives a strong implication that using the information system is a must. Therefore, when a respondent votes a higher scale on the perceived usefulness, it will guarantee that he/she will vote higher on the intention to use. This is in line with the result of [16] where perceived usefulness is proven to be the strong predictor for intention to use in mandatory setting.

System quality is the second variable after perceived usefulness that contributes to the intention to use. It does quite make sense that a good system will increase the willingness of user for using a system. With this result, it is concluded that system quality is the only variable derived from DeLone-McLean model that capable of predicting intention to use. Looking further into the indicator loadings of the survey items for system quality, it showed that the statements regarding the importance of the system toward user's job and system's good response time have the highest loadings which are 0.831 and 0.824 respectively.

6. Conclusions

The analysis of this study has shown that certain common assumptions and practices in information system theories and research might not be applicable in government office's environment. Literature review has given six variables that were supposed to be the predictors for intention to use an information system in organization. After being tested in a government agency, SmartPLS analysis has shown that only three of the latent variables, perceived usefulness, system quality, and service quality, are proven to be significant as the predictors for intention to use. Further study needs to be done to get a deeper understanding on intention to use in mandatory environment, especially in government organizations. The negative coefficient of service quality has given three valuable lessons, a) the undeniable low service quality of the government agency, b) the possibility of improper measurement used in questionnaire, and c) the insufficient sample size. Further research is suggested to use a four-point Likert scale instead of five. Garland [31] found that the mid-point scale tend to distort the result of the survey. He stated that people tend to please the researcher by choosing the middle score (neutral score) rather than negative score. Removing the middle score will reveal the real thought of the respondents.

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