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Technology Acceptance Model in Government Context: A Systematic Review on the Implementation of IT Governance in a Government Institution

Lanto Ningrayati Amali[1], Muhammad Rifai Katili[2], Sitti Suhada[3], Lillyan Hadjaratie[4], Hanifah Mardlatillah[5]

[1,2,3,4,5]Department of Informatics Engineering, Universitas Negeri Gorontalo, Indonesia

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ABSTRACT

Recent trends of studies on technology acceptance in local government had recently been popular; the studies focused on identifying the predictors of human behavior in potential acceptance or rejection of technology. This study investigated the use of information technology/information system (henceforth, IT/IS) acceptance in government as a means to improve the quality of public service and strive for transparent governance. A mixed-methods (quantitative and qualitative) study was conducted, and data were collected through questionnaires involving 125 respondents, interviews, and observations. Technology Acceptance Model (TAM) is used as a theoretical framework for behavioral information systems and Smart Partial least square (Smart PLS) analysis was employed in elaborating the complex correlation between the determinants. The result showed that the perceived ease-of-use (PEOU) contributed positively to the perceived usefulness (PU) and attitude towards using technology (ATUT). Moreover, the ATUT significantly contributed to Behavioral Intention of Use (BITU); further, the BITU also contributed to actual technology use (ATU). The PU, however, possessed a negative impact on the ATUT. These results further the information regarding the quality and performance of IT/IS services that can be used as a basis for higher-level decision-making.

Corresponding Author:

Muhammad Rifai Katili,
Department of Informatics Engineering, Faculty of Engineering, Universitas Negeri Gorontalo,
Jl. Prof. Dr. Ing. B. J. Habibie, Gorontalo, Indonesia.
Email: mrifaikatili@ung.ac.id

1. INTRODUCTION

The current modernization of the digital economy and the internet have developed rapidly thanks to the effective use of information communication and technology (ICT). Technological advancement also provides valuable information to the government in providing good public service. As society has grown more aware and proactive, they have considered active producers of knowledge in ways that the society is responsible for themselves in learning knowledge [1]. Advancements in digital technology and the internet have given rise to new methods of learning [2].

The implementation of IT/IS in public/governmental and private sectors is essential to the organization's business process to improve the efficiency of public service and competitiveness [3]. On the other hand, opined that IT/IS implementation in government (in the form of e-government) is crucial to provide information to the community as taxpayers and consumers [4]. They further explain that the effectiveness of implementation is dependent on adoption or acceptance level from the community. The rapid growth of system users will only put pressure on the government to implement an IT/IS. Despite its high potential as a methodological reference, the government must comprehend factors that influence the users' intention in adopting IT/IS [5]. In addition to that, behavior is the most important aspect to be considered in IT/IS implementation, as the users' behavior can determine whether or not an IT/IS implementation is effective [6].

The implementation of IT/IS in government aims to transform governmental activities in central and/or regional government to enhance performance and public service. Its success is highly affected by the quality of IT/IS as well as the information users' behavior towards the IT/IS [7]. Therefore, an analysis of factors influencing IT/IS utilization is of importance as a means to evaluate the acceptance of IT/IS in government. However, information regarding the acceptance of IT/IS within the government and evaluating it further is relatively lacking. This is also expressed by the government of Probolinggo that public organizations need to formulate their policies in developing IT/IS to ensure its optimal implementation [8]. For such a reason, the evaluation and acceptance of IT/IS towards users are required. On top of that, the local government's capability in providing excellent services to society is the key to a region's success. To give such services, an analysis of good acceptance or adoption by the community is necessary [4].

This study's main objectives are to elaborate and analyze the factors and causal relations that influence acceptance and intention of use of IT/are in local government to provide information on optimization of IT/IS use by the government. As a theoretical basis, the study applied Technology Acceptance Model (TAM) based on the Theory of Reasoned Action (TRA) by Ajzen and Fisbein. It elaborates on the reaction and perception of IT/IS users that affect their attitude towards technology acceptance [9]. Moreover, the development and utilization of IT systems refer to the theory of Behavioral Information Systems on TAM models. The TAM is specifically designed as the modeling medium for IT adoption. Davis introduced TAM to predict IT adoption to provide a baseline reference of the influence of external factors on computer users' trust, personalization, and aims [10]. TAM is used as a model because it is a model that can be used to analyze the factors that influence the acceptance of an information system/system with 3 factors: perceived usefulness, perceived ease of use, and intention to use.

The evolution of TAM influences current technology acceptance research trends in various fields, particularly the government sector. Following recent developments, studies on the acceptance of technology in government sectors worldwide have more focused on the acceptance of e-government technology [11-14]. The use of IT/IS in government sectors has, in some cases, been successful in providing many positive values; services get faster and easier, and government activities are more efficient and effective. Nevertheless, unsuccessful IT/IS implementation also often occurs due to the government apparatus's lack of readiness, work culture, and, most importantly, human resources. The utilization of IT/IS by individuals, groups, or organizations is the main variable in information system research. The acceptance or resistance of the IT/IS should be confirmed before the first use [15][16].

The effectiveness of IT/IS implementation in government cycles depends on the adoption level of IT/IS that uses it. The government should use information technology advancement to enhance its capability in processing, managing, and distributing information and service to the public. Thus, improvements in the efficiency of and access to public service are also expected. Public acceptance of the application of IT/IS strongly determines the effectiveness of such implementation in the government. The application can be considered effective and efficient if the local government initially identifies the readiness for better technology utilization [4]. Initial identification is of importance to facilitate the government to educate people regarding the benefits of IT/IS. Besides, it can also overcome current drawbacks and optimize IT/IS implementation in government sectors. TAM in government sectors can produce information on acceptance or resistance behavior towards technology use. The information tells whether or not the developed information technology is successful in its application. Consequently, this model is among the theoretical models used to predict intentions within a person's behavior.

Each government currently develops more constructive work procedures, increases information storage and retrieval, and provides better IT/IS-based public services. On this ground, the trend of IT governance in public organizations, especially in government, is now growing because of the IT/IS-based work procedures, although studies on IT governance are very limited, specifically in public organizations [17]. IT governance supports three core goals: compliance with regulations and laws, operational excellence, and optimum risk management [18]. Poor IT performance is commonly due to failed IT projects, insufficient budget and time management, and no return on investment [19]. Consequently, IT governance is highly required, proven by the well-functioned organizations by building transparency and accountability.

IT governance, therefore, plays a major role in achieving the vision and missions of an organization that adopts IT/IS. Like other management functions in organizations, especially public organizations, IT governance revolves around how to manage IT utilization to result in great output in organizations and help the process of decision-making and problem-solving. IT governance principles should be performed in an integrated manner, as management functions are carried out systematically in a public organization. Effective IT governance indicates that the use of IT in an organization can improve and synergize IT utilization with the organizational vision, missions, goals, and values.

The contribution of this research is to confirm and reaffirm the factors that need to be prepared in the development of IT/IS in local government organizations. In addition, to complement the TAM model, research

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in government organizations is still relatively lacking. This research also encourages the local government to evaluate IT/IS performance to ensure that IT implementation is successful.

2. METHOD

The quantitative research method employed a descriptive correlational approach to identify any correlation between two or more variables. It involved TAM as the research's main model in analyzing factors of IT/IS acceptance [10]. The research TAM model was designed as in Figure 1. Moreover, the data were gathered by questionnaires to the 125 respondents in the school operator, office operator, and the education office staff in Northern Gorontalo Regency, Gorontalo Province as the users of the personnel information system.

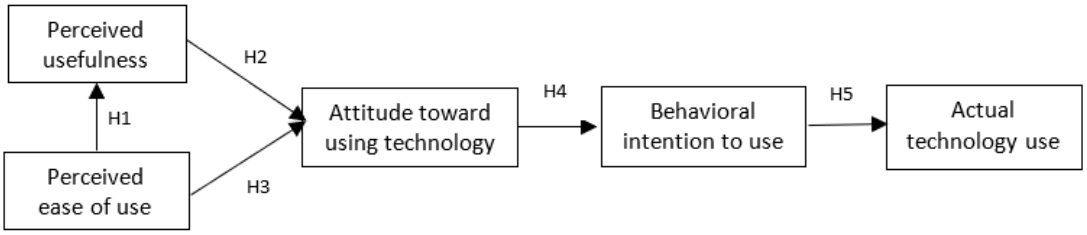

Figure 1. Research TAM Model

As extracted from Figure 1, the study identified expected TAM variables to increase technology acceptance, i.e.

1. Perceived usefulness (PU), consists of 5 indicators: work more quickly (PU1), job performance (PU2), effectiveness (PU3), makes the job easier (PU4), and usefulness (PU5) [20] [21].
2. Perceived ease of use (PEOU), consists of 5 indicators: easy to learn (PEOU1), controllable (PEOU2), clear and understandable (PEOU3), flexibility (PEOU4), and easy to use (PEOU5) [20][21].
3. Attitude toward using technology (ATUT), consisting of 1 indicator: users' attitude towards IT/IS implementation (ATUT1) [20][21].
4. Behavioral intention to use (BITU), with 2 indicators: carrying out the task (BITU1) and planned utilization in the future (BITU2) [22][23]
5. Actual technology use (ATU), with 3 indicators: actual use (ATU1), actual frequency (ATU2), and users' satisfaction (ATU3) [22][23].

Therefore, the study generated hypotheses as follows:
H1: PEOU influences PU in IT/IS implementation.
H2: PU influences ATUT in IT/IS implementation.
H3: PEOU influences ATUT in IT/IS implementation.
H4: ATUT influences BITU in IT/IS implementation.
H5: BITU influences ATU in IT/IS implementation.

The study employed SmartPLS ver. 3.0 software to analyze the data. SmartPLS has its benefits; the data do not need to have a multivariate normal distribution (indicators with categorical, ordinal, interval, and rational scales can be used in similar models), and the samples' sizes do not have to be significant. There were two required analyses (the outer model and the inner model), the outer model consists of validity and reliability tests, while the inner model consists of the coefficient of determination and hypothesis testing.

The outer model tests, comprised of:

1. Convergent validity > 0.5, which is a loading factor value in latent variables with its indicators.
2. Discriminant validity is the value of the cross-loading factor that is useful to investigate whether the construct has a sufficient discriminant. An indicator is considered valid if it has the highest cross-loading to the intended construct compared with cross-loading to other constructs.
3. Average Variance Extracted (AVE) >0.5.
4. Composite Reliability >0.7 which means that it has high reliability or is considered reliable.
5. Alpha's Cronbach >0.7 for all constructs so they can be considered reliable.
   This value in validity and reliability tests is following the suggestion by Vincenzo [24]

The tests on the inner model are consist of:

1. Path coefficient (β) measurement that has a threshold value above 0.1. It shows that the path influences the model.

2. Coefficient of determination (R^2). It is used to value whether the influence of independent latent variables on latent dependent variables is substantial. The criteria of the R^2 threshold in the classifications are as follows (Table 1) [25].
3. T-test with the bootstrapping method with the significance level of 5% or 0.05 to test the research hypothesis. If the value of the T-test >1.96, the hypothesis is acceptable.
4. Effect size. It is used to show whether endogenous latent variables have a significant impact on exogenous latent variables. The calculation is:

   R^2 include is R^2 that involves exogenous variables, whereas R^2 exclude is counted without involving exogenous variables. The interpretation of the threshold 0.02 is for little influence, 0.15 for medium influence, and 0.35 for significant influence.
5. Predictive relevance (Q2). It uses the blindfolding method to prove that certain variables used in a model have a predictive relevance with other variables in the said model with a threshold value above zero.
6. Relative impact (q2). It uses the blindfolding method to measure the relative impact of the relation between the predictive of a particular variable with other variables with a threshold of 0,02 for insignificant influence, 0,15 for medium influence, and 0,35 for significant influence.

Table 1. The Criteria of R-squared (R^2) Classification

Criteria	Description
R^2 >= 0,67	Substantial
R^2 >= 0,33	Moderate
R^2 >= 0,19	Weak
R^2 >= 0,7	Strong

The qualitative data were obtained through interviews, observation, and documentation [26-28] to validate the technology acceptance model in a governmental context. On the other hand, qualitative analysis is used to acquire model validity which is hypothesized. In this research, the interview method used to collect the data was the semi-structured method. The interviewees 6 respondents were the head of the office, the head of planning, the head of IT support, the education office staff, and school operators, as the personnel information system users. Also, an observation was conducted to gain a more distinct activity concerning the technology acceptance model. As for the documentation, it was used to review the data source from the existing documents and can be used to widen the acquired data.

3. RESULTS AND DISCUSSION

Based on the analysis of data using the SmartPLS 3.0 and IBM SPSS version 19 tools, findings are discussed in the following subsections.

3.1. The measurement model analysis (outer model)

Based on the convergent validity test in Table 2, an indicator is deemed valid if it generates a loading factor >0.5 towards the construct. The validity test from 125 samples results that the loading factor is 0.8, or above 0.5 (with the PU1 indicator generating the smallest value of 0.701); therefore, the indicators were considered to pass the convergent validity.

Table 2. Loading Factor Test

	Actual Technology Use (ATU)	Attitude Toward Using Technology (ATUT)	Behavioral Intention to Use (BITU)	Perceived Ease of Use (PEOU)	Perceived Usefulness (PU)	Significance level	Result
ATU1	0,882						Valid
ATU2	0,855						Valid
ATU3	0,887						Valid
ATUT1		1,000					Valid
BITU1			0,921				Valid
BITU2			0,924				Valid
PEOU1				0,842			Valid
PEOU2				0,857			Valid
PEOU3				0,882		>0,5	Valid
PEOU4				0,899			Valid
PEOU5				0,862			Valid
PU1					0,701		Valid
PU2					0,833		Valid
PU3					0,859		Valid
PU4					0,826		Valid
PU5					0,818		Valid

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Discriminant validity tests through Fornell-Lacker's cross-loading were conducted by looking at the square root of AVE [29], which has to be higher than the correlation between variables with other variables as shown in Table 3. Table 3 explains that the square root of AVE is higher than the correlation between constructs and other constructs. At the same time, the AVE tests describe the variant quantities or the manifest variable diversity (indicator) that can be contained by latent variables (constructs).

Table 3. Discriminant Validity Tests Based on Fornell-Lacker's Cross-Loading

	Actual Technology Use (ATU)	Attitude Toward Using Technology (ATUT)	Behavioral Intention to Use (BITU)	Perceived Ease of Use (PEOU)	Perceived Usefulness (PU)
Actual Technology Use (ATU)	0,875				
Attitude Toward Using Technology (ATUT)	0,511	1			
Behavioral Intention to Use (BITU)	0,758	0,633	0,922		
Perceived Ease of Use (PEOU)	0,719	0,532	0,737	0,869	
Perceived Usefulness (PU)	0,744	0,48	0,684	0,783	0,809

Table 4 shows that the value of AVE is above 0.5 for all constructs found in the research model. The lowest value of AVE is 0.655 in the PU (Perceived Usefulness) construct. Therefore, all constructs are declared valid.

Table 4. Validity Test Based on AVE Value

	Average Variance Extracted (AVE)	Significance level	Result
Actual Technology Use (ATU)	0,765		Valid
Attitude Toward Using Technology (ATUT)	1,000		Valid
Behavioral Intention to Use (BITU)	0,851	>0,5	Valid
Perceived Ease of Use (PEOU)	0,754		Valid
Perceived Usefulness (PU)	0,655		Valid

The composite reliability (CR) results showed that all variables have a value of CR>0.7. Thus, they are considered reliable, as shown in Table 5.

Table 5. Composite Reliability Test

	Composite Reliability	Result
Actual Technology Use (ATU)	0,907	Reliable
Attitude Toward Using Technology (ATUT)	1,000	Reliable
Behavioral Intention to Use (BITU)	0,919	Reliable
Perceived Ease of Use (PEOU)	0,939	Reliable
Perceived Usefulness (PU)	0,904	Reliable

Further, based on the Cronbach's Alpha reliability test, a construct is deemed reliable if it generates Cronbach's Alpha value of >0.70. As Table 6 illustrates, the Cronbach's Alpha value of all constructs was above 0.7, with the BITU construct possessing the lowest value of 0.825; therefore, all constructs were deemed reliable. A multicollinearity test was employed to identify whether or not any correlation is found between independent variables in a regression model [30]. A good regression model features no correlation between independent variables with Variance Inflation Factor (VIF) value <=10.00; thus, no multicollinearity occurs.

Table 6. Cronbach's Alpha reliability Test

	Cronbach's Alpha	Result
Actual Technology Use (ATU)	0,847	Reliable
Attitude Toward Using Technology (ATUT)	1,000	Reliable
Behavioral Intention to Use (BITU)	0,825	Reliable
Perceived Ease of Use (PEOU)	0,919	Reliable
Perceived Usefulness (PU)	0,868	Reliable

Based on Table 7, all variables were free from multicollinearity due to each variable's VIF value of <10.00. In conclusion, all model measurements (outer model) have statistically good characteristics. Therefore, it can be said that they fulfilled the requirements to go on to the structural model tests (the inner model).

Table 7. Multicollinearity Test Based on VIF Value

	Actual Technology Use (ATU)	Attitude Toward Using Technology (ATUT)	Behavioral Intention to Use (BITU)	Perceived Ease of Use (PEOU)	Perceived Usefulness (PU)
Actual Technology Use (ATU)					
Attitude Toward Using Technology (ATUT)			1,000		
Behavioral Intention to Use (BITU)	1,000				
Perceived Ease of Use (PEOU)		2,582			1,000
Perceived Usefulness (PU)		2,582			

3.2. The structural model (inner model)

Path coefficient (β) tests showed the same results as depicted in Table 8. Of the five paths in the model, there was one path, the PU□ATUT, that showed insignificant influence. The Coefficient of Determination tests, as in Table 8, indicate the extent of influence of independent latent variables on latent dependent variables. The T-test conducted in Table 8 exhibits four out of five accepted hypotheses, and one rejected hypothesis.

Table 8. Result of the Structural Model Analysis

	Hypotheses	B	*T*-test	f^2			q^2			Analyses					
No	Path			R^2-in	R^2-ex	$\sum f^2$	Q^2-in	Q^2-ex	$\sum q^2$	B	*T-test*	R^2	f^2	Q^2	q^2
1	ATUT□BITU	0,633	5,879	0,401	0	0,669449	0,323	0	0,477105	S	A	M	b	PR	b
2	BITU□ATU	0,758	11,735	0,575	0	1,352941	0,407	0	0,686341	S	A	M	b	PR	b
3	PEOU□ATUT	0,404	2,868	0,293	0,233	0,084866	0,2	0,148	0,065	S	A	L	s	PR	s
4	PEOU□PU	0,783	11,374	0,613	0	1,583979	0,337	0	0,508296	S	A	M	b	PR	b
5	PU□ATUT	0,064	0,958	0,293	0,287	0,008487	0,2	0,217	-0,02125	I	R	L	s	PR	s

S=significant; I=insignificant; A=accepted; R=rejected; M=moderate; L=low; b=big; s=small; PR=predictive relevance

Table 8 shows the Effect Size test on five paths. There are three paths with a significant influence PEOU□PU, ATUT□BITU, BITU□ATU, and two paths with an insignificant influence PU□ATUT and PEOU□ATUT. Predictive Relevance tests in Table 8 show that Q2 of all variables have predictive relevance. As for Relative Impact (q2), Table 8 also shows the results of five paths. Three paths have a significant influence on PEOU□PU, ATUT□BITU, BITU□ATU, while the other two paths have an insignificant influence on PU□ATUT and PEOU□ATUT.

The study implemented multiple regression analysis to perform a hypothesis test. Based on the theory, the path of causal correlation between constructs as well as the indicators (consisting of 5 constructs and 16 indicators) was displayed in Figure 2.

The PEOU variable has a significant effect on the PU variable (P-value<0.05); hence, it can be concluded that hypothesis 1 (H1) is accepted. The higher one's belief that IT/IS can improve performance, the higher the possibility of utilizing IT/IS in performing daily duties. The result of this study was following Davis (1989) that individual performance will increase as long as someone believes that the use of the technology can improve one's performance [10]. Furthermore, this was also in line with Isaac et al. and Bhatiasevi and Yoopetch, that PEOU has a positive and significant effect on PU [31-32]. Given this result, the effort to enhance users' interest in using IT/IS is recommended to focus on factors of ease of use or further dissemination of IT/IS to the users.

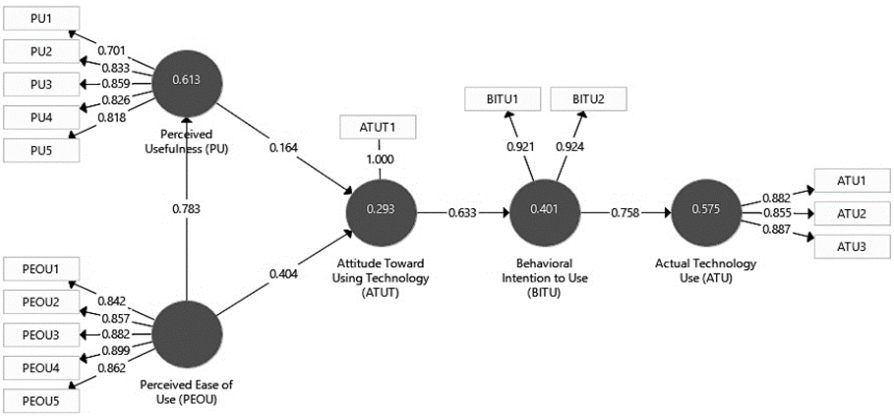

Figure 2. Technology Acceptance Model in Government

There is no influence of PU on ATUT (P-value of 0.295 or >0.05); therefore, hypothesis 2 (H2) was rejected. The results show that the more manageable the usage, that is, users feel that IT/IS has easy and understandable feature accesses and language the higher the utilization of IT/IS. If users can easily apply the IT/IS without exhorting much effort, they feel content with its implementation. The second hypothesis deduces that the user has a negative and insignificant influence on the behaviors towards system utilization. Since IT/IS is obligatory to use, despite the users' perception of whether a system is useful, the operator is required to utilize this system. In such an environment, users in the Education Office and Schools in Gorontalo Utara Regency have no choice but to use the IT/IS provided by the government. In this case, users attempt to seek as much benefit as possible from the system implementation. It was following studies conducted by Daneji et al., and Kanchanatanee et al. explaining that the PU variable does not influence ATUT [33-34]. The present study's result, however, denied findings by Juniwati, Alraimi et al., and Wu and Chen signifying that the PU variable had a positive effect on the ATUT variable [35-37]. This signifies that an IT/IS usefulness does not affect the users' attitude.

The PEOU variable significantly influences the ATUT variable (P=0.002 or <0.05); therefore, hypothesis 3 (H3) is accepted. In other words, an IT/IS' ease of use has a positive and significant effect on the user's attitude. The higher one's belief about its ease of use, the higher the person's interest and satisfaction will increase in utilizing the particular IT/IS. The study's result was in line with Weng et al., and Andoh, implying that PEOU has a positive and significant effect on ATUT [38-39]. Other studies conducted by Kanchanatanee et al., and Chang et al. also obtained the same results [34][40]. Given the result, efforts on increasing ease of use are recommended to emphasize its factors e.g language use that is understandable by the users.

The ATUT variable influences the BITU variable (P=0.000); therefore, hypothesis (H4) was accepted. This shows that users' attitude has a positive and significant effect on one's intention to use IT/IS. This is to say that if someone feels happy and easy to operate a system, the person's frequency and interest in using the system will increase, this will also increase the duration of use of the IT/IS. The result was consistent with research conducted by Kanchanatanee et al., Weng et al., and Suki and Suki that the ATUT variable has a positive and significant effect on BITU [34][38][41].

The BITU variable significantly influences ATU (P <0.05); therefore, hypothesis (H5) was accepted. This signifies that the user's intention has a positive and significant effect on the actual use of technology. In other words, the higher the user's to continue using IT/IS, the perception of the usefulness of IT/IS is more likely to increase, therefore, it also increases the frequency of use. This study's result was in line with Hoong et al., Tikno, and Haris et al. stating that BITU has a significant effect on ATU [42-44]. Therefore, one is recommended to take into account the intention factor to increase the users' interest and frequency of use.

4. CONCLUSION

In implementing IT/IS, the government is recommended to take into account the individual factors of the IT/IS users in determining the extent of success of the implementation of IT/IS. These factors include perceived usefulness, perceived ease of use, attitudes, perceived preferences, job relevance, results obtained, behavioral interest, and behavior. The results of the study underlined that ease of use (PEOU) has a positive effect on perceived usefulness (PU) and attitude (ATUT). Furthermore, attitude (ATUT) has a significant influence on behavioral intention (BITU) as well as behavioral intention (BITU) also affects the actual technology user (ATU). However, it was found that the usefulness (PU) hurt attitude (ATUT).

The study has indeed failed to support all of the presented hypotheses; despite that, the findings generated are expected to be of significance for the improvement of IT/IS in the future. Due to the research duration limit, the writer could not test other factors regarding IT/IS usage improvement. The writer wishes for similar follow-up research that adds independent variables in this research to further explain user acceptance by using the TAM model.

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