

Analyzing technology acceptance model for collaborative governance in public administration: Empirical evidence of digital governance and perceived ease of use

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ABSTRACT

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This research was conducted with the primary aim to investigate digital governance by examining empirical evidence regarding the application of Technology Acceptance Model (TAM) in public administration. The antecedents of TAM were explored to estimate behavioral intention and actual use in electronic public service in public administration in Indonesia. The research was conducted in Semarang, Central Java, Indonesia by employing simple random sampling techniques to collect a total of 182 respondents. By using Structural Equation Modeling–Partial Least Square (PLS-SEM), the results showed significant effects on perceived usefulness and attitude toward use. The variable of perceived usefulness was also empirically proven to have a significant effect on attitude toward use and behavioral intention. The findings found that attitude toward use had a significant effect on behavioral intention, and then behavioral intention was empirically proven to have an effect on actual use. Mediating analysis from the variables of perceived usefulness, attitude toward use and behavioral intention also found the mediating roles. Theoretically, these findings contribute to the digital governance framework by providing empirical evidence strengthening the relevance and affirming the application of the Technology Acceptance Model (TAM) in the context of public administration. Practically, these findings have managerial implications that the application of TAM in the public administration sector is relevant to be explored with a professional management model and a user-based approach in the development of digital applications and websites.

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1. Introduction

The use of internet technology in providing services to the public through electronic government is something new compared to the use of the internet in the business sector or electronic commerce. Therefore, the use of information technology in the government sector has more challenges than the use of information technology in the private sector. Based on a joint study conducted by McKinsey and Oxford University, it was found that the use of information technology in the government sector requires 6 times more change effort to determine usage costs and is 20 percent more likely to run ahead of schedule than projects using information technology in the private sector (Bloch et al., 2012). Heeks (2008) explained that the challenges faced by electronic government to realize its benefits are in the complexity of the technology used and the varied backgrounds of the community. This complexity will greatly affect the process of society in adopting electronic government services (Helbig et al., 2009; Yildiz, 2007). In addition, Dada (2006) found that there is a systematic mismatch between electronic government services and the community in adopting electronic government services. Meanwhile in Indonesia, the master plan owned by the government only uses a technical approach to telematics and still ignores other considerations such as economic, social, and cultural aspects (Napitupulu, 2017). The inappropriate investments in economic, social and cultural aspects in the master

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plan for e-government indicated that the development of electronic government in Indonesia is still top-down and has not been seen from the community's point of view. The implementation of electronic government in Indonesia began in 2003 based on Presidential Instruction No. 3 of 2003 on National E-Government Development Policies and Strategies. In addition, survey data from the Association of Indonesian Internet Network Providers (APJII) showed that the percentage of internet users who access public services is still low. The APJII survey also explained that of the total people who use the internet in Indonesia who use the internet to access public services an average of 12.23% (APJII, 2017). The use of the internet in public services is classified as information services on accessing public services, administrative information, reporting taxes, and reporting complaints. This condition can indicate that people who use electronic government services are still low. Other data on community behavior showed that to access public services, people prefer to come directly to the service office rather than using the website. The results of the research from the Indonesian Ombudsman showed that 66.70% of the people chose to come directly, 4.80% used intermediary services, 4.80% contacted relatives who worked on the intended service, and 23.60% chose to use website media to access public services (Ombudsman, 2018). The Ombudsman of the Republic of Indonesia also explained in more detail that with regard to access to information services, 46.40% chose to ask the officers directly, 26.90% chose to see information boards, 2.8% asked fellow public service users and 23.90% saw information on the website (Ombudsman, 2018). To analyze technology acceptance in the public sector, the theoretical perspective of Technology Acceptance Model (TAM) is widely used. Although the empirical analysis in the public sector is still limited compared to the private sector, the application of this theory is promising for the public sectors that have directed their services to digital platforms, websites and internet-based applications. In addition, there is a research gap that emerged from previous research. O'cass & Fenech (2003), Chen & Tan (2004) found a significant relationship between ease of use and attitude, while other studies found an insignificant effect between these two variables (Townsend et al., 2001; Chau and Hu, 2001). Furthermore, Wirtz et al. (2018) stated that the perceived ease of use had no significant effect on attitude of use, while a significant effect of the relationship was revealed by Cegarra Navaro (2014), and Mensah (2020). Moreover, little empirical evidence was available in the relationship between the antecedents of TAM to actual use in electronic service in public administration. To fill this gap, this research was conducted to empirically examine digital governance by investigating the effect of perceived ease of use on perceived usefulness and attitude toward use, as well as the effect of perceived usefulness on attitude toward use and behavioral intention in the use of electronic services in public administration. Lastly, the model was built to examine the effect of behavioral intention and actual use. The empirical analysis of mediating effects of perceived usefulness and attitude toward use and behavioral intention was also revealed.

2. Literature Review and Hypotheses

Technology Acceptance Model (TAM) was generally referred to as the adoption of new technology by individuals which was developed by Davis in 1989. The use of TAM in public administration is relevant to assessing the adoption of technological innovations in public service based on information technology. The basic assumption built by Davis (1989) in TAM is that the behavioral constructs of perceived usefulness and perceived ease of use affect the degree of technological adoption. These two determining variables affect business and public sector adoption of new technology. The two variables are perceived ease of use and perceived usefulness in using new technology. Technology Acceptance Model (TAM) is a concept that explains that the main determinants that affect technology acceptance are perceived ease of use and perceived usefulness of new technology (Chatzoglou et al., 2015). Technology Acceptance Model (TAM) was developed on the causal relationship between Theory of Reasoned Action (TRA) in explaining technology acceptance behavior (Venkatesh & Davis, 2000; Chatzoglou et al., 2015).

2.1. *The effect of Perceived Ease of Use on perceived usefulness and attitude*

Perceived ease of use explained user beliefs related to existing technology that using technology does not require hard effort and avoids difficulties (Davis, 1989). Davis (1989) showed that the perception of ease can explain the user's reasons for using the system and can explain if the new system can be accepted by users. In other words, in the context of electronic government, the level of convenience and practicality of electronic government services is more likely to affect people's behavior to use these services. Davis (1989) then reduced the perceived ease of use variable into six indicators, including easy to learn, controllable, clear and understandable, flexible, easy to be skilled and easy to use. The concept developed by Davis (1989) explained that perceived ease of use can be a causal cause of perceived usefulness. This happens because if the electronic government service model is easy to use, it will increase the effectiveness, efficiency and convenience of the community in accessing public services. Perceived ease of use empirically determined a strong influence on system acceptance (Davis, 1989). However, Wirtz et al. (2018) stated that perceived ease of use did not significantly influence the attitude of use. In contrast, previous studies found a significant effect of perceived ease of use on usage attitudes. Cegarra Navaro (2014), and Mensah (2020), Nugroho et al. (2017) stated that perceived ease of use has a significant effect on attitude of use.

H₁: *Perceived ease of use has a significant positive effect on perceived usefulness.*

H₂: *Perceived ease of use has a significant positive effect on attitude toward use.*

2.2. *Perceived Usefulness, Attitude toward Use and Behavioral Intention*

Davis (1989) defined perceived usefulness as the extent to which job performance will be improved by using a technology. It also reflects the beliefs of individuals in the ability of technology to improve their performance (Saadé & Bahli, 2005). According to Davis (1989), the attitude of using the system by individuals is one of them influenced by perceived usefulness.

Moreover, usage attitude showed the level of individual evaluation of the use intention that has an impact on the targeted behavior (Ajzen & Fishbein, 1975). Individuals will accept the use of new technology if they think that the technology provides benefits. Perception of usefulness is a consideration for users to accept or not accept the electronic government service model. Previous research (Writz et al, 2011; Cegarra-Navarro, 2014; Mensah, 2020) argue that perceived usefulness is a determining factor of attitudes to use technology. Indicators that can measure this variable are improving performance, increasing productivity, being effective, making work easier, and useful Davis (1989). Furthermore, Davis (1989) stated that perceived usefulness also had a direct effect on behavioral intention in using information systems without going through attitude of use (Davis et al, 1989; Venkatesh & Davis, 2000). In other words, perceived usefulness of new technology will be more likely to encourage a person's behavioral intention to use the new technology. That means that people who feel the benefits of the electronic government service model will have a tendency to use the electronic government service model repeatedly. Previous studies (Huang & Liaw, 2005; Cegarra-Navarro, 2014; Mensah, 2020) found that perceived usefulness has a significant effect on behavioral intention in adopting technology systems.

H₃: *Perceived usefulness has a significant positive effect on attitude toward use.*

H₄: *Perceived usefulness has a significant positive effect on behavioral intention to use.*

2.3. Attitude Toward Use and behavioral intention to use

Attitude toward use refers to the manifestation of a person in the acceptance or rejection of using the technology system in a job (Davis, 1989). Usage attitude showed the level of an individual's evaluation of his intention in using technology that has an impact on the desired behavior (Ajzen & Fishbein, 1975). Davis (1985) explained that attitude is determining aspects of individual behavior. Furthermore, individual attitudes consist of elements of cognitive, affective, and behavioral components. In the end, a person's acceptance or rejection of a new technology can be seen after someone uses the technology. The flow of individuals in adopting new technology is the perception that affects the attitude of use and the attitude of use then affects the intention in behavior (Davis, 1989). Behavioral intention reflects a decision that has been made by a person and as shaped by a process of mental deliberation, conflict and commitment that spans a certain period of time (Davis, 1985). In other words, usage behavior intention is the tendency of individuals as users of the electronic government service model to use the electronic government service model repeatedly (Noor, 2022; Fathya et al., 2022). The usage behavior intention can be influenced by the individual's usage attitude towards the new technology or information system to support their jobs. This means that the individual's attitude to accept the use of the electronic government service model is more likely to affect the public's decision to use the electronic government service model repeatedly. Behavioral intention to use is defined as an individual subjectivity possibility in which a person will perform a certain behavior (Ajzen & Fishbein, 1975). Behavioral intention reflects a decision that has been made by a person and as shaped by a process of mental deliberation, conflict and commitment that spans a certain period of time (Davis, 1989). Simply put, Usage Behavior Intention is an individual's tendency to use new technology. Shaw et al. (2018), Sadaf et al. (2012) argue that the level of use of a person's technology can be predicted from the attention to the technology and considers that the use of technology is worthy. Previous studies (Mensah, 2020; Cegarra Navarro et al, 2014) highlighted that usage attitudes have a significant effect on individual intention in using new technology.

H₅: *There is a significant effect of attitude toward on behavioral intention to use.*

2.4. Behavioral Intention to use and Actual Use

In the theoretical perspective of Technology Acceptance Model (TAM), actual use is defined as a real condition of using the system. This means that actual system usage measures how often and duration a person uses information and communication technology to support their jobs. Davis (1989) designed the concept of actual use in the form of measuring the frequency and duration of a person's time in using an information system. Actual use can be influenced by individual behavioral intention in new technology (Turner et al., 2010). Writz et al. (2014) stated that actual use in this case is defined as the final condition whether a system is used. These conditions can be influenced by a person's decision to use the system in a certain way. This means that people actually use the electronic government service model repeatedly because the community has the tendency and decision to use the electronic government service model repeatedly (Writz et al, 2014).

H₆: *There is a significant relationship between behavioral intention to use and actual use.*

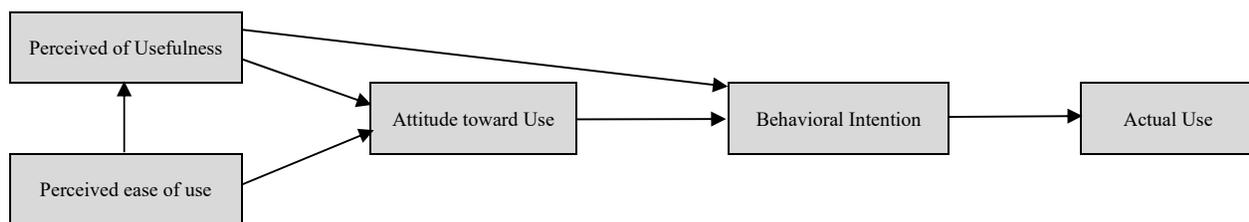


Fig. 1. Theoretical Model

3. Research Method

This study was conducted to estimate the empirical effects of perceived ease of use on the attitude toward use, and its effect on behavior and actual use intentions on electronic services in public administration. The variable estimated in this study is perceived ease of use as an exogenous variable, and actual use as an endogenous variable. This study employed three

mediating variables, namely perceived usefulness, attitude toward use, and behavioral intention in regard to complex relationships between user perceptions and their actual use of an electronic service or technology adoption. The sampling used in this research is the simple random technique by collecting data from 250 respondents through a direct questionnaire distribution. The research was conducted in Semarang, Central Java, Indonesia. Of this amount, a total of 195 respondents returned the questionnaire, so that the response rate of 78 percent was obtained. The next stage found 13 incomplete questionnaires. The final result found a number of 182 questionnaires that could be further processed. Perceived ease of use in this study was adopted from Davis (1989) and was operationally defined as the extent to which users believe that the use of electronic services in public administration can facilitate their efforts. The item was modified from Venkatesh & Davis (1996) with seven items used to measure this variable in public administration context such as ease of operation, convenience, actual information and system capability. The variable of perceived usefulness is defined as the extent to which electronic service users in the public sector believe that using information technology services can provide benefits to them (Davis, 1989). The variable was measured by using six items modified from Bhattacharjee (2001) and Yi and Jiang (2007) such as system quality and information quality. Furthermore, the variable of attitude toward use or evaluative effect is defined as a positive or negative feeling felt by users from their behavior using electronic services in public administration. The variable was measured by using seven items adopted from Ha and Stoel (2009). Moreover, the variable of behavioral intention is defined as the proportion shown by users of electronic public services that reflect the actions that are likely to be taken in the future. The seven items used to estimate the variable were adopted from Värzaru et al. (2021). Lastly, the variable of actual use in this study is defined as the amount of time and frequency used by public service users to interact with electronic services. The variable was measured by using six indicators adopted from Anandarajan et al. (2000) with the items such as time, frequency, activities and type of web pages. All items for each construct developed in this study were measured by using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The model was measured by Structural Equation Modelling (SEM) approach. The technique for testing the hypotheses was conducted by using Structural Equation Modeling – Partial Least Square (PLS-SEM).

4. Research Results

The first analysis was conducted to examine the convergent validity through loading factor value and showed that each indicator has loading factor value > 0.6 . The other results obtained were the Average Variance Extracted (AVE) in perceived ease of 0.815, perceived usefulness of 0.789, attitudes toward use of 0.836, behavioral intention of 0.822, and actual use of 0.636.

Table 1
Outer Loading

Items	Perceived Ease of Use	Perceived Usefulness	Attitude Toward Use	Behavioral Intention	Actual Use
PEOU1	0.904				
PEOU2	0.900				
PEOU3	0.917				
PEOU4	0.905				
PEOU5	0.903				
PEOU6	0.907				
PEOU7	0.884				
PU1		0.877			
PU2		0.877			
PU3		0.898			
PU4		0.893			
PU5		0.888			
PU6		0.894			
ATU1			0.882		
ATU2			0.907		
ATU3			0.907		
ATU4			0.913		
ATU5			0.916		
ATU6			0.907		
ATU7			0.967		
BI1				0.912	
BI2				0.925	
BI3				0.925	
BI4				0.884	
BI5				0.895	
BI6				0.840	
BI7				0.962	
AU1					0.736
AU2					0.800
AU3					0.747
AU4					0.770
AU5					0.878
AU6					0.845

Further testing of convergent validity found the Average Variance Extracted (AVE) value > 0.5 for all constructs (Table 2). Furthermore, the discriminant validity test also shows the correlation value received of > 0.6 for all relationships between

constructs. This shows that both items or constructs tested in this study are valid, so that they can be continued in further testing.

Table 2
Convergent Validity (AVE) and Discriminant Validity

Constructs	Actual Use	Attitude Toward Use	Behavioral Intention	Perceived Ease of Use	Perceived Usefulness	AVE
Actual Use	0.797	-	-	-	-	0.815
Attitude Toward Use	0.762	0.914	-	-	-	0.789
Behavioral Intention	0.842	0.704	0.907	-	-	0.836
Perceived Ease of Use	0.763	0.668	0.733	0.903	-	0.822
Perceived Usefulness	0.754	0.632	0.669	0.664	0.888	0.636

Reliability testing through Composite Reliability (C.R) and Cronbach's Alpha found Cronbach's Alpha > 0.7 and the value of Composite Reliability (C.R) > 0.9 for all constructs built in this study. This shows that all constructs in this study are reliable (Table 3).

Table 3
Composite Reliability (C.R) dan Cronbach's Alpha

Constructs	Cronbach's Alpha	Composite Reliability
Perceived Ease of Use	0.962	0.969
Perceived Usefulness	0.946	0.957
Attitude Toward Use	0.967	0.973
Behavioral Intention	0.964	0.970
Actual Use	0.886	0.913

Table 4
Model Fit

Indices	Saturated Model	Estimated Model
SRMR	0.091	0.091
d-ULGS	0.787	0.787
d_G1	0.510	0.510
d-G2	0.391	0.391
Chi-square	221.392	221.392
NFI	0.678	0.678

Testing the fit model of the theoretical model built in this study found all indicators are fit. This is indicated by the Saturated Model and Estimated Model values for all indices of SRMR (0.091), d-ULGS (0.787), d_G1 (0.510), d_G2 (0.391), Chi-Square (221,392), and NFI (0.678). This means that the model built in this study is fit (Table 4). The next step is hypothesis testing (Table 5). The acceptance for the particular hypothesis was indicated by the path coefficient and the significance value (*p*-value) <0.05. The test results confirm the significant effect of perceived ease of use on Perceived Usefulness, which is indicated by the path coefficient value of Original Sample (O) of 0.874 and a significance value of 0.000 (*p* = <0.05). Thus, the first hypothesis is accepted. This shows that the high comfortability and convenience offered by electronic public services increases user perceptions about the benefits of electronic services in public administration. This is in accordance with previous research pointing out the significant effect of perceived ease of use on perceived usefulness (Moslehpour et al., 2018). This is consistent with Moses et al. (2013), Weng et al. (2018), and Hansen et al. (2018) highlighting the positive effect of perceived ease of use on attitude toward use.

Table 5
Path Coefficient

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T-Statistics (O/STDEV)	<i>p</i>	Confirmation
PEU → PU	0.874	0.865	0.038	21.545	0.000	Accepted
PEU → AU	0.887	0.887	0.027	30.723	0.000	Accepted
PU → AU	0.813	0.817	0.067	11.940	0.000	Accepted
PU → BI	0.809	0.806	0.051	15.004	0.000	Accepted
AU → BI	0.819	0.816	0.047	16.200	0.000	Accepted
BI → AU	0.787	0.768	0.062	12.632	0.000	Accepted

PEU= Perceived Ease of Use; PU= Perceived Usefulness; AU= Attitude Toward Use; BI= Behavioral Intention; AU= Actual Use

The second hypothesis states a significant influence in the relationship between perceived ease of use and attitude toward use. Statistic testing indicates the path coefficient received, with the Original Sample (O) of 0.887, Sample Mean (M) of 0.887, Standard Deviation (STDEV) of 0.027, T-Statistics (O/STDEV) of 30,723, and *p*-value of 0.000 (<0.05). Thus, the second hypothesis is accepted, which means that the increase in convenience perceived by users of electronic public services is more likely to influence the user's perception positively in using information technology channels in public administration. This is consistent with previous research (Hansen et al., 2018; Grover et al., 2019). Li and Shang (2020) also demonstrated that perceived ease of use in public administration will be more likely to influence user attitude toward use of electronic government. Statistical testing for the third hypothesis which states the effect of perceived usefulness on the attitude toward use found significant results. This is indicated by the original sample value (O) of 0.813, sample mean (M) of 0.817, standard deviation (STDEV) of 0.067, T-Statistics (O/STDEV) of 11,940, and *p*-value of 0.000 (<0.05). Therefore, the third hypothesis is accepted, which confirms that the existence of the benefits felt by users in using electronic services in public administration positively affects the positive evaluation of users in using technology in obtaining public services. This is consistent with previous research (Moses et al., 2013; Weng et al., 2018; Hansen et al., 2018). Furthermore, statistical output also shows that perceived usefulness has a significant effect on behavioral intention. This is proven empirically with the original sample value (O) of 0.809, sample mean (M) of 0.806, standard deviation (STDEV) of 0.051, T-Statistics (O/STDEV) of 15,004, and *p*-

value of 0.000 (<0.05). This confirms that the fourth hypothesis which states the significant effect of perceived usefulness on behavioral intention is declared accepted. This is in line with Mensah (2020) and Huang & Liaw (2005) stating that the user's perception of the benefits of technology will positively influence their evaluation of electronic technology and services used in public administration. The fifth hypothesis testing is to prove empirically the relationship between attitude toward use and behavioral intention. Statistic testing found a significant effect of attitude toward use and behavioral intention, which was confirmed from the coefficient path value with the original sample value (O) 0.819 and *p*-value of 0,000 (> 0.05). Thus, the fifth hypothesis is accepted. This shows that an increase in the positive evaluation of users in using electronic services is more likely to increase the possibility of users of electronic public services to use the technology in the future. In addition, statistical analysis also found a significant effect of behavior of intention on the actual use indicated by the original sample value (O) of 0.787, sample mean (M) of 0.768, standard deviation (STDEV) of 0.062, T-statistics (O/STDEV) of 12,632, and *p*-value of 0.000 (<0.05). Therefore, the sixth hypothesis which states the significant influence of behavior of intention in the actual use is declared empirically proven. This shows that an increase in the possibility of using electronic services by users is more likely to increase user frequency in using electronic services in the public sector. This is consistent with Hansen et al. (2018) and Nugroho et al. (2017).

Table 6
Indirect Effects

Path	T-stat.	P-value	Confirmation
PEU → AU → BI → AU	4.716	0.000	Accepted
AU → BI → AU	7.658	0.000	Accepted
PU → AU → BI → AU	4.925	0.000	Accepted
PEU → PU → AU → BI → AU	4.475	0.000	Accepted
PU → BI → AU	6.723	0.000	Accepted
PU → BI → AU	5.315	0.000	Accepted
PEU → PU → AU	5.253	0.000	Accepted
PUE → AU → BI	4.903	0.000	Accepted
PU → AU → BI	5.173	0.000	Accepted
PEU → PU → AU → BI	4.746	0.000	Accepted
PEU → PU → BI	5.595	0.000	Accepted

PEU= Perceived Ease of Use; PU= Perceived Usefulness; AU= Attitude Toward Use; BI= Behavioral Intention; AU= Actual Use

Indirect analysis shows complex output from the relationship between constructs (Table 6). Statistics results show that all variable mediation of perceived usefulness (PU), Attitude Toward Use (AU), and Behavioral Intention (BI) empirically are proven to be able to bridge the relationship between perceived ease of use and actual use in the context of electronic public service of public administration, with *p*-value of 0.000 (<0.05) for each relationship built in the model (Fig. 2).

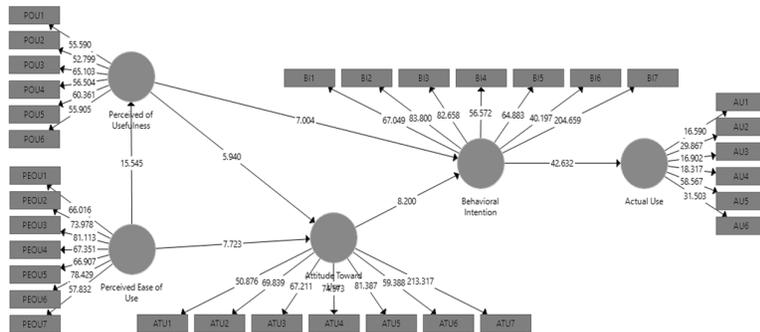


Fig. 2. Full Model

The latest analysis shows the moderate values of R^2 and Q^2 in predicting the magnitude of the variability of the effect of exogenous variables (Table 7). In general, this finding theoretically confirmed the Technology Acceptance Model (TAM) in the context of public administration. The findings are consistent with the previous research highlighting the importance of personal values and user experience in using technology in public sector administration (Belanche et al., 2012; Langa & Conradie, 2003; Abu et al., 2014; Cegarra et al., 2014).

Table 7
 R^2 and Q^2

Constructs	R^2	Q^2
Perceived Ease of Use	0.441	0.214
Attitude Toward Use	0.510	0.301
Behavioral Intention	0.579	0.380
Actual Use	0.710	0.409

5. Conclusion

The findings conclude that perceived ease of use has a significant effect on perceived usefulness and attitude toward use in the use of electronic services in public administration. Likewise, empirical evidence finds a significant effect of perceived

usefulness on attitude toward use and behavioral intention. Furthermore, the findings found that attitude toward use had a significant effect on behavioral intention, and then behavioral intention was empirically proven to have an effect on actual use. Tests of mediating effects from the variables of perceived usefulness, attitude toward use and behavioral intention also found the mediating role of the three in strengthening the empirical relationship between perceived ease of use and actual use in public administration. Theoretically, these findings contribute to empirical evidence in strengthening the relevance and affirming the application of the Technology Acceptance Model (TAM) which is rarely researched in the context of public administration. The findings also highlighted the importance of the antecedents of technology acceptance in examining digital governance framework. Practically, these findings have managerial implications that the application of TAM in the public administration sector is relevant to be explored with a professional management model and a user-based approach in the development of digital applications and websites. The development of digital technology today has encouraged the public sector to re-evaluate its rigid and administrative relationships to become more digitally friendly. Some limitations in this study need to be stated as a direction for future research. In terms of the model, this study focuses on a complex relationship between TAM antecedents and actual use, which is indicated by the absence of a direct relationship. The relationships among the various variables are arranged horizontally, which results in a lack of empirical evidence available for some of the construct relationships. Although these findings are promising in providing empirical evidence, and the model built has been based on widely accepted theoretical conceptions, future research can further explore the relationships between constructs directly by utilizing alternative theoretical foundations such as extended TAM, Theory of Planned Behavior (TPB) and Theory of Reasoned Action (TRA) as an inherent part of behavioral analysis in the use of technology in the public sector. Other limitations are related to sample size and generalizability. Future research is expected to broaden the sample base in public sector services to gain deeper insight into the application and acceptance of technology and improve generalizability.

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