

PREDICTING CONSUMER ADOPTION OF POINT OF SALE (POS) E-PAYMENT SYSTEM IN NIGERIA USING EXTENDED TECHNOLOGY ACCEPTANCE MODEL

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ABSTRACT: *This study is concerned with Predicting Consumer Adoption of Point of Sale (POS) e-Payment System in Nigeria Using Extended Technology Acceptance Model. We extended the TAM by adding two variables: consumer awareness and security of operations to ascertain how they predict the original TAM constructs: PU and PEOU to predict POS adoption. The study was based on a sample of 400 respondents in Awka, Nigeria; of which 234 responded. Questionnaire was the instrument for data collection and was designed with five point likert scale. Four items were used to measure each of the variables. The analysis was done with SEM with the aid of AMOS 23 software. This study has established that PEOU and PU positively and significantly impact POS adoption in Nigeria. It also demonstrated that security impacts PEOU positively and significantly but insignificantly on PU. Consumer awareness (CA) significantly and positively impact PU but impact on PEOU is not significant. The study has implications for research and practice. Further researches should be conducted with further extensions to show the mediation and or moderation impacts of the two variables.*

KEYWORDS: Perceived Usefulness, Perceived Ease of Use, Security, Awareness, SEM, E-Payment.

INTRODUCTION

The Nigerian payments system has undergone remarkable changes over the years in terms of the number of instruments, and breadth of operations these changes have been occasioned by new policies and other revolutions in the environments. In 2006, the Federal government of Nigeria initiated a new payment system strategy 2020, which is part of the overall financial sector strategy (FSS) 2020, the aims of which are to make the Nigeria payments system effective, efficient, technology driven and in line with emerging global trends (FRN, 2006). The CBN also came up with its cashless policy the aim of which is to limit the amount of cash in circulation and to encourage people to key into the new payments system. The advent of Information and Communication Technology (ICT) and its wide application in banking and non-banking institutions in the increasingly globalizing world lead to the development of electronic payment devices and services. One of the e-payment devices that followed the emergence of ICT is the point of sale (POS) terminals. The success of this new payment channel for products and services depends on customer adoption and usage of the service. For us to accept that e-payments like the POS is gaining traction in Nigeria, customer's acceptance, attitude and confidence in the system need to be validated.

Central Bank of Nigeria (CBN)(2015) reports that ATM has 80.2% of the market for e-payments in value terms; and 83.5% in terms of volume while POS accounts for 9.1% of the

market in value terms and 6.5% in terms volume by 2015; Web accounts for 1.5% in volume and 1.8% in value terms; and Mobile accounts 8.5% and 8.9% of the e-payments market in volume and value terms respectively. POS as shown in the CBN report is maintaining consistent and steady growth despite commanding a small share of the market. KPMG 2014 survey of bank customer satisfaction in Nigeria however show that over 80% of those that use ATM use it only for withdrawals. Mantel (2000) maintain that though the checkless society has been predicted for decades, checks remain the most frequently used noncash payment method in the US; just like the cashless policy in Nigeria; there have been debates over why consumers do or do not adopt new payments technology, little is known about the subject.

Studies have been conducted to underpin customer behaviour toward e-payments systems (Safeena, Abdullah & Date 2010; Okeke, 2013 and Gan, Clemes, Limsombunchai & Weng 2006). While Okeke (2013); Okeke & Amobi, 2014; and Gan, et. al. (2006) focused on high technology banking products; Khan (2010) was specifically on ATM. Mantel (2000) conducted a study in the United States (US) on why customers pay bills electronically and employed two models: new product diffusion model and new market development model. These models are as they relate to e-payments generally; and the following variables: security, control, convenience, consumer resources and awareness were tested. Similarly, Osakwe and Okeke (2016) study on facilitating m-Commerce growth through m-Money use was based on these variables: perceived risk, perceived trust, network failure, cost effectiveness, convenience ease of use regulator assurance and bank distance. Osakwe and Okeke study (2016) measured the variables with single item each but this present adopted multiple item measurement for the variables. Some of the studies (like, Adesina & Ayo 2010; Ngugi, Pelowski & Ogembo, 2010) were based on technology acceptance model (TAM). This study aims to extend the TAM model by adding two variables: awareness and security of operations toward predicting customer adoption of the POS e-payment system in Nigeria.

LITERATURE AND THEORETICAL UNDERPINNING

The point of sale (POS) or point of purchase (POP) is the time and place where a retail transaction is completed. It is the point at which a customer makes a payment to the merchant in exchange for goods or after provision of a service. It is a noncash payment for goods and services; as it is also one of the e-payment devices introduced in the quest for cash less economy. In recognizing that electronic banking and payment services are still at the early stages of development in Nigeria, the CBN in 2003 issued guidelines on the operation of electronic banking in Nigeria. (Kotler & Keller, 2016) state that the primary determinant of innovation adoption is the time it takes consumers to learn about a product, to experiment with it, and then ultimately to use it. In Nigeria however cash remains the dominant method of payment for goods and services; with ₦1,456.1B outside the banks compared to ₦1,857.9B currency in circulation (CBN-ARSA, 2015). Thus, it is critical to assess how consumers perceive new payment innovations and whether new innovations are viewed as fundamentally new products, requiring significantly more resources to promote adoption. The introduction of the CBN cashless policy in Nigeria and its adoption by the retail banking public is not without hitches.

In understanding customers' acceptance of innovations, prior works have adapted the TAM model (Davis, 1989) which is strongly connected to the earlier theory of reasoned action (TRA). Briefly, TRA is about the linkages between beliefs, attitudes, and intentional behaviour

(Fishbein & Ajzen, 1975). The TRA beliefs were replaced in the TAM by perceived usefulness (PU) and perceived ease of use (PEOU). According to Davis (1989), the user's attitude towards acceptance of a new system is important for the successful adoption of any information system. To be clear, the quality and effectiveness of a system can only be validated with its level of users' acceptance. It is no wonder that TAM, including its extended version, has been extensively used by scholars in understanding the success factors behind the adoption of mobile financial services (MFS) such as POS (cf. Osakwe & Okeke, 2016; Chauhan, 2015; Dass & Pal, 2011; Tobbin, 2010). In a similar fashion, Morgan and Ravindran (2014) in their work adopted a revised TAM, which the authors referred to as "A Reduced Form Technology Consumer Product Adoption Model" (p. 6) to study important factors impacting the interaction(s) between home Internet and mobile device use in the US context. The model incorporates perceived affordability, perceived risk, and user demographics among others to evaluate US consumers' use of home Internet as well as mobile devices (see Morgan & Ravindran, 2014). Also, from the perspective of the Kenyan consumers, Lule, Omwansa, and Waema (2012) applied the extended TAM model by adding three variables— transaction cost, perceived norm, and perceived self-efficacy – to study mBanking adoption in Kenya. All these studies dwell on other aspects of financial innovations but our study is on POS which has attracted limited attention in this part of the world. TAM has continue to evolve into the unified technology use and acceptance theory (UTUAT) which allows for the incorporation of context/environment specific variables; and has been in mention in recent studies (cf. Oteh, Ibok & Ntoh, 2017). This present study incorporates consumer awareness and security of operations toward predicting POS adoption.

The research model is presented thus:

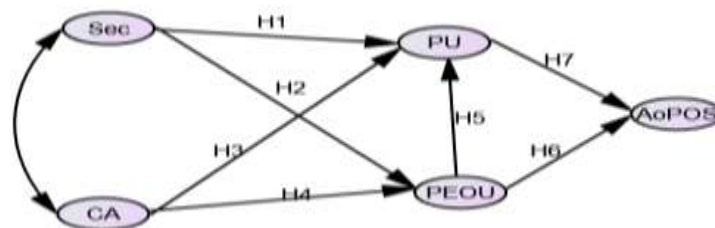


Figure 1: The Proposed Model

Security of Operations: electronic Payments are highly information sensitive activities that rely on ICT to acquire and use, hence security of operations is concerning unauthorised access to information is paramount to the users. This is extremely important as security and safety are what users are primarily concerned with when it comes to using e-payment. Mbogo (2010) states that the use of personal identification numbers and secret codes for transactions increases the security and privacy issues and that the key requirements for electronic financial transactions are confidentiality authentications, data integrity, non-repudiation, anonymity and privacy. Many studies have highlighted the importance of security and privacy concerns in online environments and have seen to be a major barrier in the adoption of information systems that use online environments (Masinge, 2010). Security can be breached through network or data transaction and transmission attacks as well as through unauthorised access to an account by false authentication. It is about the extent to which the user has the assurance that the system can conclude a transaction securely and keep personal information privately. Giovanis, Binioris and Polychronopoulos (2012) maintain that this security issues are important especially for customers who have never used the service before. Mbogo (2010) found that security and

privacy had a significant impact on behavioural intention to use a mobile platform, Giovanis, et. al. (2012) found a significant relationship between security and internet banking adoption in Greece. Osakwe and Okeke (2016) found significant relationship between perceived security and mobile money adoption in Nigeria. The study by Masinge (2010) is in contrast with the literature as it showed that security had no significant effect in the adoption of mobile platform at the Bottom of the Pyramid in South Africa. The diverse results as it relates to security can be explained by the diverse backgrounds. This study is on POS adoption and it is expected that security will impact PU and PEOU which in turn significantly and positively impact POS adoption.

H₁: Security of operations has a positive and significant impact on PU.

H₂: Security of operations has a positive and significant impact on PEOU.

Consumer Awareness (CA): New product diffusion theories point to the important role of consumer awareness in promoting adoption. There is relatively little public data on consumer awareness and perceptions of electronic payment. Clearly, communications efforts in the early stages of an innovation and product life cycle is fundamentally important when compared to communications efforts used for more mature products. Studies have also shown that a consumer's awareness is fundamental for online channel adoption (M'sallem & Mzoughi, 2009). This study aims among others to ascertain the relation between consumer awareness and subsequently adoption of POS in paying for goods and services by customers. Many studies on innovation adoption rarely use awareness but it is included in this study to understand its impact on PU and PEOU which are expected to impact adoption of an innovation like POS in a developing economy. Based on this the following hypotheses are proposed:

H₃: CA has a significant and positive impact on customer PU.

H₄: CA has a significant and positive impact on PEOU.

Perceived Ease of Use (PEOU): This refers to the extent to which a customer believes that an innovation is easy to use and that it requires little or no effort to use (Davis, 1989). PEOU is one of the constructs in the original TAM model. An individual would opt for a product from a range of available options if it requires little or no effort to use (Davis, 1989). Over the years, several studies have clearly demonstrated about the predictive ability of the perceived usefulness of an innovative service as well as its actual adoption rate (for example, see Adesina & Ayo, 2010; Dass & Pal, 2011; Tobbin, 2010). Also in the realm of mobile technology use, a number of studies point out the importance of the PEOU in the adoption story of mobile enabled services (e.g., Adesina & Ayo, 2010; Rusu & Shen, 2011; and Osakwe & Okeke, 2016). Additionally, Rusu and Shen (2011) found a significant positive impact between PEOU and PU. While previous studies agree that PEOU influence adoption of an innovation like POS little is known on its effect on PU that will lead to adoption of POS. Based on this, the following hypotheses are proposed:

H₅: PEOU has a significant positive effect on adoption of PU.

H₆: PEOU has a significant positive effect on adoption of POS.

Perceived Usefulness (PU): Perceived usefulness relates to whether a customer sees a particular system as relevant to the performance of his day to day activities. It is seen as the most prominent belief in TAM and explains that a user's perception about latent benefits of

using a technology based product elicits positive feelings towards it (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). Some of the latent benefits for a user (as reported in the literature) are the reduction of time and effort to complete a task, better control during interaction with the system, and greater expediency (see Davis et al., 1989). Equally, empirical evidence shows that PU is a strong predictor of consumer adoption of an innovation (cf. Adesina & Ayo, 2010; Dass & Pal, 2011; Tobbin, 2010; Osakwe & Okeke, 2016). If customers perceive POS as useful, it will eventually lead adoption of the POS payment system. Based on this the following hypotheses are proposed:

H₇: PU has a significant and positive effect on POS adoption.

METHODOLOGY

Data used in this study were collected with structured questionnaire and each of the five variables used in the study was measured with four items on a five point Likert scale- of: strongly agree, agree, undecided, disagree, and strongly disagree and this is in line with researches in marketing and consumer behaviour. The study was conducted in Awka, the capital of Anambra State; and which is predominantly a civil service state. It was based on a sample of 400 respondents that make use of POS. The sampling procedure adopted for this study is quota sampling method and this sampling method was chosen to allow for the selection of respondents from the different gender, educational background and age in the sample. Before giving a copy of the questionnaire to a respondent, a feeler question is asked whether the person uses POS and if the answer is No we discontinue with that respondent. Guttman split-half reliability coefficient was employed to test internal consistency of the instrument while structural equations modelling SEM was used to analyse the data. In SEM analysis, a number indices are used to assess model validity and some of these are: Chi square (χ^2), goodness of fit index (GFI), normed fit index (NFI), root mean residual, and the root mean square error approximation (RMSEA). The analysis was conducted with IBM SPSS-AMOS 23 software.

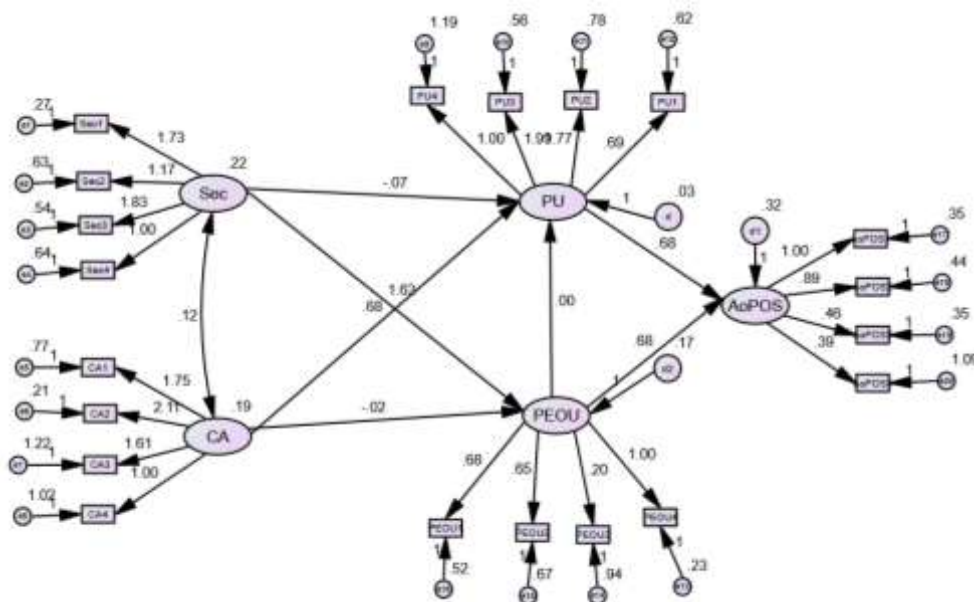
RESULTS/FINDINGS

Of the 400 copies of questionnaire distributed to respondents who use POS, 234 copies were returned and certified usable. This represents a response rate of 58.5 percent and is considered acceptable for a study of this nature. The demographic variables used in the study are: gender, income, occupation and education; and the responses shown in Table 1 confirmed that the respondents are in a position to give valid information for the study.

Table 1: Demographic Characteristics of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Gender:	Male	152	65.0	65.0	65.0
	Female	82	35.0	35.0	100.0
	Total	234	100.0	100.0	
Income:	Below N50,000	54	23.1	23.1	23.1
	N50,000 - N150,000	91	38.9	38.9	62.0
	Above N150,000	89	38.0	38.0	100.0
	Total	234	100.0	100.0	
Occupation:	Civil/Public servant	166	70.9	70.9	70.9
	Private Firm's employee	56	23.9	23.9	94.9
	Self-employed	12	5.1	5.1	100.0
	Total	234	100.0	100.0	
Education:	O'Level	93	39.7	39.7	39.7
	HND/BSc	111	47.4	47.4	87.2
	Postgraduate	30	12.8	12.8	100.0
	Total	234	100.0	100.0	

We analyse internal reliability/consistency of the items using the Guttman Split-Half reliability and the coefficient show a value of .821 which is above the .6 threshold. Further analysis with the inter-item coefficient indicate that no item merit exclusion and all these indicate that the data merit further analysis. The next stage is model validation before hypotheses testing.



$\chi^2=885.536$, $df=162$, $p=0.000$; $GFI=0.744$; $IFI=0.648$; $NFI=0.602$; $RMR=.095$; $RMSEA=.138$

Figure 2: The Research SEM Model

Model Validation

The correlation between the two variables added, Sec and CA is 0.59 which is below the 0.7 threshold which shows absence of collinearity. Similarity their covariance (Estimate=0.121, CR=4.009, ρ =.000). Many indices are available for validating a SEM model and these are the absolute fit indices, incremental fit indices among others. The widely reported are the ones above as shown in figure 2. The first is the χ^2 with a value of 885.526, degree of freedom is 162 with ρ =.000. Dividing the χ^2 by the DF gives 5.466. The next is the RMR=0.095, which is above the 0.05 threshold and RMSEA=0.138 which is equally slightly above the 0.03 to 0.08 threshold. Absolute fit indices as the ones above measure how well the specified model reproduces/fits the observed data; but Hair, et. al. (2010) reports that “more recent researches point to the fact that drawing absolute ‘cut-off’/fit are inadvisable”(p.649); adding that these fit indices are affected by the sample size. Some other indices used in validating SEM models are the GFI, IFI and NFI which from our analysis have values of 0.744, 0.648 and 0.602 respectively. These indices take values from 0 to 1 and it has been recommended that the closer they are to 1 the better. Some authors recommend cut-offs of 0.9 to 0.95 but Hair, et. al. (2010) maintain that such absolute cut-offs are not necessary. Based on the values, our model is not a bad fit hence we proceed to interpret the regression coefficients and validate the hypotheses.

Table 2: Regression Weights: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
PEOU <--- Sec	1.633	.244	6.682	***	S
PEOU <--- CA	-.022	.153	-.143	.886	NS
PU <--- Sec	-.067	.178	-.375	.707	NS
PU <--- CA	.682	.216	3.152	.002	S
PU <--- PEOU	-.003	.088	-.036	.971	NS
AoPOS <--- PU	.682	.270	2.525	.012	S
AoPOS <--- PEOU	.683	.082	8.314	***	S

NB: S=Supported; NS=Not Supported

Hypotheses and Results:

Based on the information on Table 4 we validate the hypotheses earlier proposed for the study. The part Sec to PU (β =-0.067, CR=-0.375; and ρ =.707); hence H1 is not validated. Sec to PEOU (β =1.633, CR=6.682; and ρ =0.000), hence H2 is fully supported and validated. CA to PU (β =0.682, CR=3.152; and ρ =0.002) thus H3 is fully supported and validated. CA to PEOU (β =-0.022, CR=-0.143, and ρ =0.886), hence H4 is not supported. PEOU to PU (β =-0.003, CR=-0.036; and ρ =0.971); hence H5 is not supported. PEOU to AoPOS (β =.683, CR=8.314; and ρ =.000); hence H6 is fully supported and validated. Finally, PU to AoPOS (β =.682, CR=2.525, ρ =.012) thus H7 is fully supported and validated.

DISCUSSION

This study is concerned with Predicting Consumer Adoption of Point of Sale (POS) e-Payment System in Nigeria Using Extended Technology Acceptance Model. The original TAM model has two variables: PU and PEOU as determinants of adoption of an information technology

innovation. In this study we extended the TAM by adding two variables: consumer awareness and security of operations which we consider vital for the adoption of an innovation like the POS in a developing economy like Nigeria. These two variables were included to ascertain how they predict the original TAM constructs: PU and PEOU to predict POS adoption. POS is one of the e-payments platforms brought about by advances in ICT but CBN-ARSA reports show that in Nigeria POS is among the least in both market share and volume terms hence this study sets out to examine how TAM with extensions predict adoption of the system. The questionnaire was the major instrument for data collection and the study was based on a sample of 400 respondents out of which. Guttman split-half coefficient was used to test the reliability of the constructs while the analysis was with SEM with the aid of AMOS 23 software. The correlation between the two variables added, Sec and CA is 0.59 which is below the 0.7 threshold which shows absence of collinearity. Similarity their covariance (Estimate=0.121, CR=4.009, $\rho=0.000$).

Many indices are available for validating a SEM model and these are the absolute fit indices, incremental fit indices among others. The widely reported are the ones above as shown in figure 2. The first is the χ^2 with a value of 885.526, degree of freedom is 162 with $\rho=0.000$. Dividing the χ^2 by the DF gives 5.466. The next is the RMR=0.095, which is above the 0.05 threshold and RMSEA=0.138 which is equally slightly above the 0.03 to 0.08 threshold. Absolute fit indices as the ones above measure how well the specified model reproduces/fits the observed data; but Hair, et. al. (2010) state that “more recent researches point to the fact that drawing absolute ‘cut-off’/fit are inadvisable”(p.649); adding that these fit indices are affected by the sample size. Some other indices used in validating SEM models are the GFI, IFI and NFI which from our analysis have values of 0.744, 0.648 and 0.602 respectively. These indices take values from 0 to 1 and it has been recommended that the closer they are to 1 the better. Some authors recommend cut-offs of 0.9 to 0.95 but Hair, et. al. (2010) maintain that such absolute cut-offs are not necessary. Based on the values, our model is not a bad fit hence we proceed to interpret the regression coefficients and validate the hypotheses. Based on the information on Table 4 we validate the hypotheses earlier proposed for the study. The part Sec to PU ($\beta=-0.067$, CR=-0.375; and $\rho=0.707$); hence H1 is not validated. Sec to PEOU ($\beta=1.633$, CR=6.682; and $\rho=0.000$), hence H2 is fully supported and validated. Issues of security of operations or perceived security remain profound in e-payment researches (eg. Oteh, et. al., 2017; Osakwe & Okeke 2016; Adesina & Ayo 2010; and Rusu & Shen, 2011) and continue show significant impact on e-payments adoption. Oteh, et. al. (2017) was not based on inference their finding still confirm as a factor; and our finding here agrees with theirs in part that security impacts PEOU. CA to PU ($\beta=0.682$, CR=3.152; and $\rho=0.002$) thus H3 is fully supported and validated. This finding partly agrees with Masinge (2010). CA to PEOU ($\beta=-0.022$, CR=-0.143, and $\rho=0.886$), hence H4 is not supported. PEOU to PU ($\beta=-0.003$, CR=-0.036; and $\rho=0.971$); hence H5 is not supported. This finding disagrees with Rusu and Shen (2011). PEOU to AoPOS ($\beta=0.683$, CR=8.314; and $\rho=0.000$); hence H7 is fully supported and validated. This finding agrees with Osakwe and Okeke (2016); Adesina and Ayo (2010); Dass and Pal, (2011); and Rusu and Shen, (2012). PU to AoPOS ($\beta=0.682$, CR=2.525, $\rho=0.012$) thus H6 is fully supported and validated. This finding agrees with Osakwe and Okeke (2016); Adesina and Ayo (2010); and Rusu and Shen, (2012).

Implications to research and practice

This study has added to the existing literature on e-payments adoption particularly POS in a developing economy. It established like many other studies that PU and PEOU impact

significantly and positively on POS adoption. Most importantly the study is an extension of TAM hence two variables: Sec and CA were added to show their impact on the original TAM constructs: PU and PEOU to impact adoption of an e-payment platform like POS. The study shows that Security impacts PEOU significantly and positively to impact POS adoption but does not impact PU. Similarly, CA impacts positively and significantly on PU and negatively on PEOU. These have implications for research. The implication for practice is that as POS is still very much at the fringe in Nigeria the operators and regulator need to engage the customers more by creating serious on the use of POS for payments instead of cash more so as transactions in the Nigerian are still highly dependent on cash payments. The awareness creation need to be complimented with enhanced security of operations.

CONCLUSION

The e-payment market in Nigeria has five segments and our study has shown that ATM continues to dominate the market both in volume and value terms. While POS controls an insignificant portion of the market, it however continues to demonstrate steady growth. This study has established that PEOU and PU positively and significantly impact POS adoption in Nigeria. It also demonstrated that security of operations impact PEOU positively and significantly but its impact on PU is not significant. The study also show that consumer awareness (CA) significantly and positively impact PU but impact on PEOU is not significant.

Future Research

This study has established a fit for the extended TAM model by adding two variables: consumer awareness and security of operations. The study tested neither the mediation nor moderation of the variables on the original TAM dimensions of PU and PEOU. Further researches should be conducted to show the mediation and or moderation impacts of the two variables. Additional variables should also be added to further extend the TAM model and evaluate the total effects on POS adoption in a developing economy like Nigeria. Generally further studies are required on main streaming other e-payment platforms more so as ATM still account for over 80 per cent of the market in value and volume terms.

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