

# Bank ATM users' perceptions towards ATM service quality: A structural equation modelling approach

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**Abstract:** This measured ATM users' service quality perceptions and subsequently examined the relationship between service quality and customer satisfaction in the context of conventional banking system in Nigeria using structural equation modelling approach. The study adopts survey research in which questionnaires are randomly administered on customers of five banks randomly selected for the study Access Bank Plc, Fidelity Bank Plc, First Bank of Nigeria Plc, Guarantee Trust Bank Plc and United Bank of Africa Plc. Confirmatory factor analysis (CFA) was used to measure the relationships between the constructs and the indicator variables. The results of CFA retained all the indicator variables. The findings of the study also indicated that there is a strong positive relationship between ATM service quality and customer satisfaction in Nigerian banking sector.

## I. INTRODUCTION

The banking sector is one of the most important service providers for a nation's economy (Suleiman & Usman, 2016). The banking industry like any other industry is always making necessary efforts to provide quality service to ensure their customers derive maximum satisfaction. Customer satisfaction has been observed as a key strategy of every business and a benchmark against which many organizations have set their standards (Burodo, Suleiman and Yusuf, 2021). In a bid to improve efficiency in the Nigerian banking system, Automated Teller Machines (ATMs) were introduced in early 2000. However, prior to the introduction, the Nigerian banking system was characterized by frustrations and poor services occasioned by ineffectiveness and inefficiency in the services delivered ( Burodo, Suleiman and Shaba, 2019). Customers were made to queue for long hours before being served by rude and overworked bank staff who sometimes vent their frustrations on the customers. Wherever there is competition for limited resource queue is likely to occur (Koko, Burodo & Suleiman, 2018). Queues emerge when individuals requesting service, usually called customers, arrive at a service facility and cannot be served on time (Suleiman, Burodo & Ahmed, 2022). Without doubt, the introduction of ATMs has significantly impacted the banking system in many ways. For instance, it has drastically reduced these undesirable experiences and brought banking services closer to the people as it is not uncommon to find ATMs in places where ordinarily banks are not located. It has also provided a lot of reliefs for banks from the pressure of overcrowded banking halls and long queues of customers

waiting to be served at teller points. However, the introduction of the facility to the banking system was not without its challenges. Prime among them at the initial stage was ATM fraud. Fraudsters were having a field day cloning ATM cards to defraud unsuspecting customers of thousands and sometimes millions of Naira. These activities were not without insider information in some cases. Consequently, confidence in the facility declined and people were weary of using the facility.

Structural equation modeling (SEM) is a multivariate statistical method that involves the estimation of parameters for a system of simultaneous equations. SEM is a generalized framework that includes regression analysis, pathway analysis, factor analysis, simultaneous econometric equations, and latent growth curve models (Bollen, 1989). Factor analysis believes that the variables can be grouped by their correlations. It may be assumed that variables within a particular group are highly correlated among themselves, but they have relatively small correlations with variables in a different group. Then it can be said that each group of variables represents a single underlying construct (or factor) that is responsible for the observed correlations (Suleiman et al., 2019). The interest in SEM is often on theoretical constructs, which are represented by the latent factors. The relationships between the theoretical constructs are represented by regression or path coefficients between the factors. The structural equation model implies a structure for the covariances between the observed variables, which provides the alternative name covariance structure modeling. However, the model can be extended to include means of observed variables or factors in the model, which makes covariance structure modeling a less accurate name. Many researchers have tried to use SEM approach to model relationship among variables in banking sector. Some of the principal advantages of the structural equation model (SEM) relative to more traditional data analytic approaches like the linear regression model include the ability to account for measurement error when estimating effects, test the fit of the model to the data, and specify statistical models that more closely align with theory. Despite these advantages, researches in Nigeria tend to give more emphasis on the traditional data analytic approaches over SEM approach (John, (2016), Ogbeide and Akinmayowa (2014), Ijeoma, Akujor and Mbah (2020)).

Carme and Germà (2002) predicted Overall Service Quality of bank customers in county of Girona, Spain using Structural Equation Modelling Approach. They concluded that the two dimensions relating to the behavior of employees have the greatest predictive power on overall quality and satisfaction ratings, which enables managers to use a low-cost reduced version of the questionnaire to monitor quality on a regular basis. It was also found that satisfaction and overall quality were perfectly correlated thus showing that customers do not perceive these concepts as being distinct.

Vucovic, Pivac and kundid (2019) used Structural equation modeling in the acceptance of internet banking in the city of Split, Croatia. This research uses structural equation modeling to explore whether the motivation for the acceptance and use of Internet banking can be explained by the technology acceptance model (TAM) in the city of Split, Croatia. TAM explains the intent of using information systems through the perceived ease of use and the perceived usefulness of a system. It consists of multiple causal relationships, so structural equation modeling is adequate for hypothesis testing. A survey analysis was designed and applied on a sample of 282 working residents of Split. To make the results more credible, the gender and age structure of the sample was harmonized with the population. It is concluded that both elements of TAM positively influence the acceptance of Internet banking in Split. Since there is not much research on the use of Internet banking in Croatia and Southeast Europe, this research contributes to the poor amount of literature in this scientific area for these countries. The research findings can also help banks to understand the factors of Internet banking acceptance and to develop expansion strategies. Future research could include a cross-country comparison of individuals' perception about Internet banking, as well as the dependence relationships of TAM factors.

Giao (2018) studied the relationship between quality of ATM service and customer satisfaction. The research uses the combination of qualitative and quantitative methodology with the Cronbach's alpha reliability analysis, Exploratory Factor Analysis (EFA) method; Confirmation Factor Analysis (CFA) and Structural Equation Modeling (SEM) through SPSS and AMOS 20.0 data analysis software. The survey was conducted with 800 questionnaires with the convenient sampling method. The number of remaining sample for analysis was 779 responses of individual customers using ATM card services of Bank for Foreign Trade of Vietnam (Vietcombank) Vinh Long. The results show that the satisfaction of customers using ATM cards of Vietcombank Vinh Long is influenced by 4 factors with the order of importance as follows: (1) Price; (2) Network; (3) Reliability; (4) Empathy. Thereby, the author suggests some managerial implications to Vietcombank Vinh Long management to enhance the ATM service quality, then improve customer satisfaction. This research still has some limitations: (1) The study does not investigate other influencing factors, (2) The

convenient sampling method has not been generalized well and (3) The research is only conducted for Vietcombank

Amin and Isa (2008) examined the relationship between service quality perception and customers' satisfaction in Malaysian Islamic banking using the SEM approach. They used SERVQUAL measurement scales consisting of six dimensional structures: tangibles, reliability, responsiveness, assurance, and empathy, and plus the compliance dimensions to measure Malaysian Islamic banking service quality. Respondents are the customers (Muslim and non-Muslim) who visit the bank counters. They must have an account with one of the full-fledged Islamic banking and dual-banking systems. The results showed that the proportion of Malaysian Muslims' awareness of the Islamic banking products and services were high compared to non-Muslim customers. The majority of the Islamic banking customers were satisfied with the overall service quality provided by their banks. The findings suggest that the standard model of Islamic banking service quality dimensions should consist of the six dimensions and good determinants of satisfaction. The relationship between service quality and customer satisfaction was significant.

John (2016) investigated the influence of ATM service quality on customer satisfaction in the banking sector of Nigeria. The study adopts survey research in which questionnaires are accidentally administered on customers of four banks randomly selected for the study (First Bank of Nigeria Plc., United Bank for Africa Plc., Guarantee Trust Bank Plc. and Skye Bank Plc. at the ATMs terminals of the Banks during transactions. Multiple Regression Analysis, Descriptive Statistics of the Mean, Standard Deviation, Tables and Charts are the main tools of data analysis. Findings reveal that the higher the ATM service quality, the higher the level of satisfaction it provides. The study then concludes that ATM service quality determines customer satisfaction. Some recommendations are offered on the way forward.

Ogbeide and Akinmayowa (2014) investigated dimensions of ATM service quality and its effect on customer satisfaction. Questionnaire was developed and used to collect information from the study sample. The structured questionnaire was administered to three hundred and fifty (350) respondents of which three hundred and three (303) were found usable, giving 87% response rate. Data collected were analyzed using SPSS 20.5. Regression results indicate that convenience, efficient operation, security and privacy, reliability and responsiveness are significant dimensions of ATM service quality and that ATM service quality has a significant positive relationship with customer satisfaction. Findings from this study are relevant in improving ATM service quality by banks' management to stimulate broad-based customers' satisfaction. It is therefore recommended that banks need to constantly up-date and differentiate their ATM service quality dimensions to ensure continuous satisfaction and retention of customers.

## II. METHODOLOGY

### 2.1 Data

This research adopts survey method in order to allow the respondents to express their opinions regarding their satisfaction with Automated Teller Machine Services in Nigerian banking system. Five deposit money banks randomly selected for the study are Access Bank Plc, Fidelity Bank Plc, First Bank of Nigeria Plc, Guarantee Trust Bank Plc and United Bank of Africa Plc. Primary data used in this study were obtained via questionnaire administration. The population of customers who patronize ATM service in Katsina metropolis could be ascertained (relatively large). According to Krijcie and Morgan (1970) table, for a relatively large population the minimum sample size should be at least 384. In this research, a sample size of 150 respondents were randomly selected each from five banks at their ATM terminals in Katsina Metropolis during the course of transactions in order to meet up with minimum sample size as suggested by Krijcie and Morgan (1970). Thus, 750 questionnaires were administered but 736 copies (98%) were validly returned by the respondents.

### 2.2 The Study Model

This work adopted the model of Amin and Isa (2008) who stated that the that the ATM service Quality (SERVQUAL) measured in six dimensional structures of tangibles, reliability, responsiveness, assurance, and empathy, and compliance dimensions influence Customer satisfaction ( see figure 1). The implication of this is that the higher the quality of a product or service provided, the higher will be the level of satisfaction it renders. The model identifies Tangibles, Reliability, Responsiveness, Assurance, Empathy and Compliance as the main dimensions of service quality. Structural equation modeling approach was used to test the hypothesis which asserts no significant relationship between SERVQUAL and customer satisfaction.

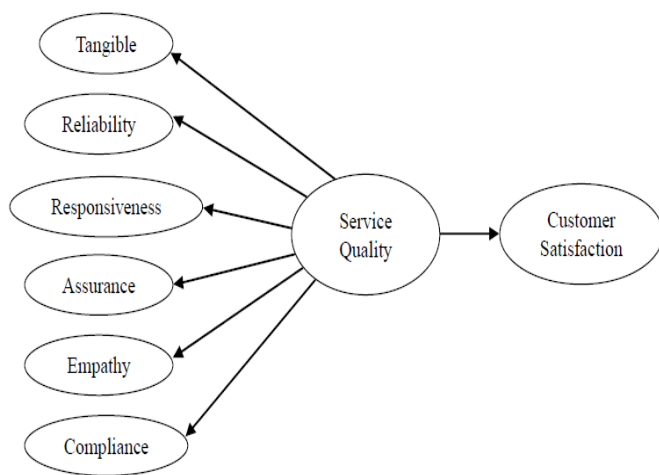


Figure 1: Amin and Isa (2008) Model Representation

Structural Equation Modeling (SEM) utilizes Partial Least Square (PLS) and consists of two parts: (a) the structural part linking latent variables to each other through a systems of simultaneous equations, and (b) the measurement part which links latent variables to observable variables through a restricted (confirmatory) factor model. The structural part of the model can be written as

$$\eta = C\eta + K\gamma + \varepsilon \tag{1}$$

Here  $\eta$  represents endogenous latent variables,  $\gamma$  is a vector of exogenous latent variables,  $\varepsilon$  is the error or disturbance term vector, and  $C$  and  $K$  are the regression coefficients of endogenous and exogenous variables.

The equation for endogenous and exogenous latent factors, which is related to observable variable via measurement equations, is defined as:

$$y = \Lambda_y + \delta \tag{2}$$

And

$$X = \Lambda_x + \tau \tag{3}$$

Where  $\Lambda_y$  and  $\Lambda_x$  are the regression coefficients of observable variables, and  $\delta$  and  $\tau$  are residual errors.

The observable variables are the proxies of the latent unobserved SERVIQUAL measured by five-point -likert scale ranging from strongly disagree (1) , disagree (2), undecided (3) agree (4), and strongly agree (5) and customer satisfaction measured by five point –likert scale ranging from very unsatisfied (1), Unsatisfied (2), Neural (3), Satisfied (4) and very satisfied (5) (see appendix 1 and 2)

## III. RESULTS AND ANALYSIS

### 3.1 Measurement model

The measurement model displays the relationships between the constructs and the indicator variables. This study measured six models from the first-order constructs (tangible, reliability, responsiveness, assurance, empathy, and compliance), and two second-order construct (service quality and customer satisfaction). The dimension of tangible was measured by three indicators, reliability by three indicators, responsiveness by three indicators, assurance by three indicators, empathy by three indicators, and compliance by three indicators. As part of the measurement model evaluation, indicators with low factor loadings (<0.60) were removed (Latif *et al.*, 2020). No indicator has a factor loadings below 0.60, thus all the indicators were retained for the analysis (see figure 2). Composite reliability is used to test the reliability of the measurement model. Table 1 indicated that all latent constructs of the model attained composite reliability since the desirable cutoff value is 0.7 (Ringle *et al.*, 2018). Similarly, table 1 contains average variance extracted (AVE) as the measure of convergent validity. It indicated that all constructs possessed convergent validity in the measurement model since the AVE cutoff criterion value is

0.5 ( Ringle *et al.*, 2018). Heterotrait Monotrait (HTMT) Ratio approach is used to measure discriminant validity of the constructs. According to Henseler *et al.* (2015), to check for the discriminant validity, the most conservative threshold values of HTMT ratio is less than or equal to 0.90. Table 2 indicated that all the values of HTMT are less than the threshold value of 0.90. Hence, discriminant validity is attained.

Table 1: Reliability and Validity

Constructs	Composite Reliability	AVE
Assurance	0.853	0.662
Compliance	0.796	0.571
Customer satisfaction	0.876	0.641
Empathy	0.969	0.913
Reliability	0.911	0.776
Responsiveness	0.951	0.865
Tangible	0.954	0.900

Table 2: Discriminant Validity using HTMT

	A	C	CS	E	R	RS	T
A							
C	0.400						
CS	0.261	0.250					
E	0.208	0.135	0.433				
R	0.191	0.541	0.397	0.078			
RS	0.177	0.150	0.190	0.199	0.104		
T	0.097	0.160	0.295	0.099	0.296		0.061

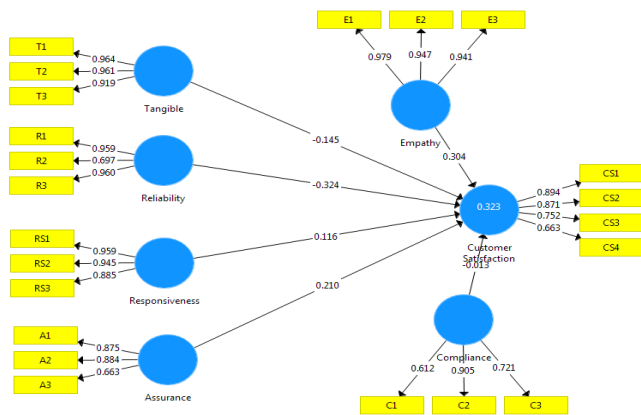


Figure 2: Factor Loadings Path Diagram

### 3.2 Structural model

The structural model displays the relationship (paths) between the constructs on the proposed model. Table 3 indicated that all the service quality dimensions were positively related to customer satisfaction. This therefore, suggested that the hypotheses which state that there are no significant relationships between service quality dimensions of assurance, compliance, empathy, reliability, responsiveness and tangible

were all rejected as their respective p-values are all less 5% level of significance ( $p < 0.05$ ). This finding coincided with that of (Latif *et al.*, 2020, Amin & Isa 2008, John, (2016)) Table 4 showed that the goodness of fit for both the measurement and structural model is acceptable. The chi-square values of 7.148 and 4.872 measurement and structural models yielded a significant value less than even 1% level of significance suggesting good fit. GFI and CFI values having met the threshold value of 0.9 indicated that the model is parsimonious.

Table 3: Hypothesis testing

Path	Path coefficients	Standard deviation	T-statistics	P-values
Assurance-> Customer satisfaction	0.244	0.081	3.097	0.003
Compliance->Customer satisfaction	0.542	0.032	6.165	0.000
Empathy->Customer satisfaction	0.985	0.027	22.325	0.000
Reliability->Customer satisfaction	0.682	0.043	4.781	0.000
Responsiveness-> Customer satisfaction	0.613	0.038	4.883	0.000
Tangible->Customer satisfaction	0.539	0.063	3.577	0.001

Table 4: Goodness of fit statistics for measurement and initial models

Model	GFI	CFI	$\chi^2$	RMSEA	Sig
Measurement model	0.93	0.96	7.148	0.02	0.000
Structural model	0.90	0.97	4.872	0.06	0.000

## IV. CONCLUSION

The purpose of this study is to measure service quality perceptions of banks' ATM users and to examine the relationship between service quality and customer satisfaction in the context of conventional banking system in Nigeria. The SEM approach was used to test the constructs framework that customer satisfaction was influenced by the perception of ATM banking service quality. The results of this study established that the higher the levels of ATM service quality will lead to better satisfaction level of customer satisfaction. As a result, the study indicate that ATM service quality is positively associated with customer satisfaction in Nigerian banking system. In addition, the findings of this study are consistent with previous studies by Amin and Isa (2008) who stated that there was a strong link between service quality and customer satisfaction in Malaysian Islamic banking. John (2016) who concluded that ATM service qualities are antecedents to customer satisfaction and the higher the level of service quality, the higher the satisfaction its offers.

## REFERENCE

- [1] Akinmayowa J.T and Ogbeide D.O. (2014). Automated Teller Machine Service Quality and Customer Satisfaction in the Nigeria Banking Sector, *Covenant Journal of Business and Social Sciences (CJBSS)*, 65(1),52-72
- [2] Amin M and Isa Z. (2008).An examination of the relationship between service quality perception and customer satisfaction A SEM approach towards Malaysian Islamic banking. *International*

- Journal of Islamic and Middle Eastern Finance and Management, 1(3); 191-209
- [3] Bollen K (1989) Structural equations with latent variables, John Wiley & Sons, New York
- [4] Burodo M.S., Suleiman S. and Shaba Y.(2019), Queuing Theory and ATM Service Optimization: Empirical Evidence from First Bank Plc, Kaura Namoda Branch, Zamfara State. American Journal of Operations Management and Information Systems. 4(3),80-86. doi: 10.11648/j.ajomis.20190403.12
- [5] Burodo M.S., Suleiman S. and Yusuf G. (2021). An assessment of Queue management and Patient Satisfaction of Some Selected Hospitals in North-Western Nigeria, International Journal of Mathematics and Statistics Invention (IJMSI), 9(8), 14-24
- [6] Carne S. and Germà C. (2002). Predicting Overall Service Quality. A Structural Equation Modelling Approach, Developments in Social Science Methodology, 217-238
- [7] Giau H.N.K., (2019), Customer Satisfaction towards ATM Services: A Case of Vietcombank Vinh Long, Vietnam, Journal of Asian Finance, Economics and Business 6 (1) : 141-148 141
- [8] Henseler, J., Ringle, C.M. and Sarstedt, M. (2015), "A new criterion for assessing discriminant validity in variance-based structural equation modeling", Journal of the Academy of Marketing Science, 43 (1), 1- 21.
- [9] Ijeoma C., Akujor J.C. and Mbah J.C. (2020). Electronic Banking and Customer Satisfaction in Imo State (A Study of Selected Commercial Banks in Imo State), European Journal of Business and Management Research, 5(6), 1-9, DOI: <http://dx.doi.org/10.24018/ejbmr.2020.5.6.607>
- [10] John A.S. (2016) .The Influence of ATM Service Quality on Customer Satisfaction in the Banking Sector of Nigeria, Global Journal of Human Resource Management, 4,(5), 65-79.
- [11] Koko M.A., Burodo M.S., Suleiman S. (2018). Queuing Theory and Its Application Analysis on Bus Services Using Single Server and Multiple Servers Model. American Journal of Operations Management and Information Systems. 3(4), 81-85. doi: 10.11648/j.ajomis.20180304.12
- [12] Krejcie, R.V. & Morgan, D. W. 1970). Determining sample size for research activities. Educational and psychological measurement, 30(3), 607-610.
- [13] Latif K.F., Nazeer A., Shahzad F., Ullah M., Imranullah M., and Sahibzada U.F (2020). Impact of entrepreneurial leadership on project success: Mediating role of knowledge management processes. Leadership & Organizational Development Journal, 41(2),237-256
- [14] Ringle, C.M., Sarstedt, M., Mitchell, R. and Gudergan, S.P. (2018), "Partial least squares structural equation modeling in HRM research", The International Journal of Human Resource Management, pp. 1-27, doi: [10.1080/09585192.2017.1416655](https://doi.org/10.1080/09585192.2017.1416655).
- [15] Suleiman S., Lawal A., Usman U., Gulumbe S.U. and Muhammad A.B (2019), Student's Academic Performance Prediction Using Factor Analysis Based Neural Network. International Journal of Data Science and Analysis. 5(4), 61-66. doi: 10.11648/j.ijdsa.20190504.12
- [16] Suleiman S., Burodo M.S., and Ahmed Z. (2022). An Application of Single and Multi-server Exponential Queuing Model in Some Selected Hospitals of the North-Western Nigeria, Asian Journal of Probability and Statistics, 16(2): 1-9 DOI: 10.9734/AJPAS/2022/v16i230396
- [17] Suleiman S. and Usman U. (2016). Prediction of Customer Accessibility of Electronic Banking Logistic Regression in Nigeria, Equity Journal of Science and Technology, 4(1): 93-97
- [18] Vucovic M., Pivac S. and kundid D. (2019) Structural equation modeling in the acceptance of internet banking in the city of Split, Croatian Operational Research Review, 10, 141-152

## APPENDIX

## Appendix 1: Service Quality observable variables and their corresponding Latent Variables

Observable variables	Latent
T1=Visually appealing materials associated with services	Tangible
T2=Speed and Efficiency of transactions	
T3= Bank has convenient opening business transactions	
R1= Bank keeps its records accurately	Reliability
R2= The Bank employees provide services at the promised time	
R3= When you have problems, bank is able to solve problem and cooperate	
RS1=Employees of bank are always willing to help customers	Responsiveness
RS2=Employees of bank respond to customer request promptly	
RS3= Fast and efficient counter services	
A1=Employees of bank are polite and friendly staff	Assurance
A2=The bank employees are knowledgeable and give precise answers to our inquiries	
A3= Bank provides financial advice	
E1= ATM machines work 24/7 hours	Empathy
E2= ATM machines are easily accessible	
E3= Banks provide ATM service at lower charges	
C1=There is adequate lightening at ATMs terminals	Compliance
C2= There are standalone/closed ATMs	
C3=There is privacy in the design and installation features of ATMs	

## Appendix 2: Constructs for Customer Satisfaction

CS1= I am satisfied with products and services provided by my banks
CS2= I am satisfied with employees respond and prompt services
CS3= I am satisfied with financial services advice
CS4= The overall service quality provided by my banks is excellent