

# Biometric Enabled E-Banking in Nigeria: Management and Customers' Perspectives

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## Abstract

The adoption of biometric technology is rapidly increasing around the globe due to the increasing sensitivity of security issues. With the recent 2015-plan and collaborations of the Central Bank of Nigeria to incorporate biometrics into her banking system, it is imperative to assess the perception of the managers and customers to the use of the long-awaited biometrics for secure, seamless and successful transactions. The banking sector touches the daily lives of at least 60% of the over 150-million Nigerian population and it is expected to increase as more security measures are put in place. Therefore, this empirical evaluation captures the factors influencing the perception of the bank management and ATM users. A total of 740 respondents participated in the survey cutting across different age groups and educational backgrounds. Descriptive statistics and T-test analysis of the survey showed that management and customers strongly support the adoption of biometric ATM in Nigeria.

**Keywords:** E-Banking, Biometric, ATM, Security

## 1. Introduction

The advances in electronic communication has changed greatly world over, many facets of human lives and the banking industry are not spared. Electronic banking (e-banking) has become the order of the day and has taken over from the traditional ways of banking. The following services can be classified as e-banking: automated teller machine (ATM), debit and credit cards, internet banking, mobile banking, smart cards, electronic fund transfer (EFT) system, and cheques truncation payment system. A common thing to all these services is the automated delivery of the traditional and new ways of banking which is information and communication technology (ICT) driven and places a bank on competitive edge [1, 2]. The ATM is the commonest e-banking platform in Nigeria and will be the focus of this paper.

Meanwhile, as mentioned in [1, 4], competitiveness and customer satisfaction brought about the introduction of e-banking to Nigeria. The number of commercial banks in Nigeria had grown from 25 in 1985 to 125 in 1991 as a result of the introduction of Structural Adjustment Programme (SAP) in 1986 by the federal military government. The competition was very keen among the commercial banks in Nigeria and Societe General Bank led the journey to e-banking when they commissioned the first ATM in 1990.

ATM reduces operation cost for banks and transaction cost for the customers. A typical bank withdrawal transaction that could warrant a cost of transaction (CoT) of one hundred naira (N100) at the counter will not cost more than twenty naira (N20) CoT at the ATM. Sunita Bishnoi [2] mentioned same for India. Some other advantages of e-banking include, anytime (24/7) service availability, low cases of transaction errors, easy fund transfer, discounts from retail outlets for credit/debit cards and so on. More worrisome are the disadvantages of e-banking especially the fraud related ones which include advance fee fraud, systems exposure to hackers, sniffing, piggybacking and so on [4, 5].

The Central Bank of Nigeria (CBN) as the financial services regulatory body in Nigeria established by CBN Act of 1958 has been concerned with the high rate of e-banking frauds especially with the ATM being the commonest. In a bid to curb the alarming crime rate, the CBN had issued a circular to all banks in Nigeria to enforce migration from Magstripe type of debit card to chip and PIN type of debit card. Fraudsters were unable to clone debit cards as was the case before the migration and according to the CBN governor's statement in July 2013, "statistics showed that ATM fraud has been reduced by 90% in Nigeria", this has boosted customers' confidence in the use of ATM cards. Moreover, consolidating on this achievement, the CBN is presently driving cash-less policy in order to strengthen the payment system in Nigeria and biometric authentication is being considered for point of sales and automated teller machine e-banking services [3]. It is pertinent therefore, to know how banks managements and customers have received this news of biometric ATM bearing in mind the plurality of the Nigerian states, a culturally and religiously biased nation. The section II of this article is the literature review followed by the methodology of research. The results and analysis were discussed in the fourth section followed by conclusion and recommendation in the last section.

## 2. Literature Review

Automatic personal recognition has evolved with current technology moving us from what we know (password, token, ID) or possess (cards) to who we are (traits). The last decade had witnessed the growth of biometric-based systems fuelled by the advancements in the area of digital signal processing, pattern recognition, communication and computer technology, offering increased processing power, speed and storage capacity. Today, a lot of commercial systems with human-machine interface such as access control, electronic banking, national ID, electronic voters' and border control systems; deployed are enabled with biometrics [6].

Biometrics, the distinctive physiological and behavioural traits peculiar to an individual or a group of individuals, is pivotal to security, surveillance and personal identification in any community. Common biometric recognition systems deployed in real life applications are face, fingerprint and iris based systems; in order of increasing level of security offered especially for a large-scale system. Today, large-scale systems such as the banking system depend heavily on information and communication technology for rendering its services to customers. Electronic banking, also known as e-Banking gives individual banks competitive edge over others. Therefore, identity management is essential and vital for secure and seamless banking transactions via mobile devices, PCs(Personal Computers), POS (Point-of-Sale) terminals or ATM (Automated Teller Machine). The banking sector touches the daily lives of at least 60% of the Nigerian population and it is expected to increase as more security measures are put in place.

### 2.1 Electronic Banking

Electronic banking employs the use of information and communication technology to render services to customers beyond the borders of the physical banks 24/7. With the banking sector playing a vital role in economic growth, most banks have adopted newer technology as one of their strengths in reaching their local and global customers. Common electronic banking services subscribed for include fund transfer, cash withdrawal and deposit, bill payment, payment for goods and services, account enquiries, airtime purchase via the mobile devices, the PC or dedicated machines such as the Automated Teller machine, ATM. An ATM gives a bank customer access to the bank account from almost any other ATM around the globe via the debit cards. Nigeria is currently one of the fastest growing ATM market in Africa rising from 83% in 2006 to 89% in 2007; with over 900 ATMs deployed by the banks in the last three years and the issuance of over 26 million ATM cards by 16 commercial banks and 14 microfinance banks. The cards are issued by three global payment card players - InterSwitch, MasterCard and Visa [15, 16, 17]. This has greatly improved the e-commerce entrepreneurial activities in the nation though identity frauds, web scams and other technological frauds are still hampering absolute user acceptability.

The January 2013 working paper published by the Center for Global Development, identified the use of biometric technology for identification as a potential revolution for developing countries; indicated by the 34 percent annual growth rates recorded in developing regions. "Biometrics is expected to strengthen core identity systems such as civil registries and national ID cards and serve more functional purposes like voting, transfers or enabling financial access or health insurance markets; to facilitate developmental interactions and strengthen public accountability" [14]. Also, the International Biometric Group [13] elaborates the importance of high-confidence recognition of individuals as citizens, employees, or visitors, as well as in consumer-related applications using the biometrics technology. Therefore, biometrics such as voice biometrics, signature verification, fingerprint, iris scans and face; can be considered for integration in to the current e-banking system to curb fraud. Coventry [12] stresses "the use of a biometrics security system to confirm the presence of a person potentially reduces the chances of identification or other technological fraud".

### 2.2 Biometrics

Biometrics as categorised by Unar et al [7], can be from physical body regions, medico-chemical body features or behavioural traits, defining high (for individuals) to low (for groups) levels of distinction. Examples of biometrics from body regions include the ocular (iris, retina, sclera vasculature), hand (fingerprint, palmprint, finger knuckle print, hand geometry, hand veins) and facial (face, ear shape, teeth); medico-chemical body features include body odour, DNA and heart sound; while behavioural traits include voice, gait, signature. A biometric recognition system is a pattern recognition system that acquires biometric data from an individual, extracts a feature set from the acquired data, and compares this feature set with the template set in the database to decide whether to accept (genuine) or reject (impostor) the individual[8]. The feature set must successfully capture the distinctiveness of an individual.

The choice of a biometric for any application depends on its characteristics (e.g. enrolment convenience, distinctiveness, universality) and the application requirements (e.g. accuracy, cost, speed, robustness to fraudulent methods and attacks etc.) [9].

Biometric-recognition systems operate either in user verification or personal identification mode. A user authentication or verification system conducts a one-to-one comparison to determine whether a claimed identity

(via a username or identification number) is true or false from a database of authorised users. It is used for positive recognition, where the aim is to prevent multiple people from using the same identity. On the other hand, a personal identification system conducts a one-to-many comparison to establish an individual's identity from a database of authorised users without the subject having to claim an identity. It is used in negative recognition, where the aim is to prevent a single person from using multiple identities, or in positive recognition for user convenience [10]. It is important to note that the acceptability of the biometric technology depends on unimodal or multimodal biometric system as it relates to the convenience and speed of authentication. The mode of the biometric system will be authentication as reflected by most of the transactions conducted daily.

### 3. Research Methodology

This research work adopted the survey research design. The choice for the survey method lies in the fact that it focuses on obtaining subjective opinion of respondents and aims at drawing an accurate assessment of the entire population by studying samples derived from the population. The relevant populations for the study include commercial banks and ATM users in Ado-Odo, Ota local government area of Ogun States, Nigeria. The selected banks for this study included the first nine most viable commercial banks in Nigeria based on the rankings of Bankers' magazine, reported on Thisday Newspaper (2013). These banks were selected based on their reputation, as such the researchers thought it wise to administer questionnaires that can gather the genuine opinion of their staff. In each of the banks, respondents were purposively selected. The top and middle level management staff formed the respondents to the research. This is due to the fact that the quality opinion and discretionary information they can provide best fit the objective of this research. On the other hand, ATM users in Ado-Odo, Ota were selected by convenience.

Two separate questionnaires were designed. One questionnaire was addressed to gather opinion from the commercial bank staff, while the other gathered data from ATM users. Questionnaire for bank officials was divided into sections A and B. Section A contained questions that examined the background and bio-data of the respondent, while section B focused on specific issues to the research, that is, opinions about biometric ATM features and the card operated ATM. Questionnaire for ATM users was divided into three sections A, B and C. Section A contains background questions, sections B and C focused on the specific issues questions that are specific to the study and challenges that these customers often encounter with the ATM machines and their cards.

### 4. Results and Discussion

Two separate questionnaires were designed. Data collected from the field was analyzed using descriptive statistics derived through the aid of SPSS version 20. The following table shows the breakdown of questionnaire distribution and respondents.

Table 1 Breakdown of Questionnaire Distribution and Respondents

Respondents	No. of Administered Questionnaires	Responses	%
Banks	150	142	94.67
ATM Users	610	600	98.36
	760	742	

Table 1 shows that 150 Questionnaires were administered to Banks and a total of 142 was retrieved and adjudged suitable, also another 610 Questionnaires were administered to ATM users within the environs of Ado-Ota, Ota, Ogun State and 600 was retrieved. These formed the basis of the analysis in this study, which is 94.67 and 98.36 percent response rate for bank management and ATM users respectively.

Table 2 Descriptive Statistics on Customer Perception

	N	Mean	Std. Deviation
A biometric ATM machine that uses more than one biometric feature will be more effective in checking fraud	600	3.8917	1.02552
Fraud reduction and avoidance can be better achieved through biometric means of ATM than the Traditional ATM	600	4.1150	.93625
Overall Customer Satisfaction is better achieved through the biometric ATM	600	4.2367	.88993
Customer relationship with management of banks is better achieved and managed through the use of biometric ATM	600	3.9650	.97401
The biometric ATM will be more convenient and customer friendly than the traditional ATM	600	4.4950	.82933
Valid N (listwise)	600		

Table 2 shows the perception of six hundred ATM users on the adoption of biometric ATM in Nigeria. The yardstick for measuring the overall effectiveness and efficiency of the biometric ATM is in terms of fraud prevention and detection, ability to achieve overall customer satisfaction, attainment of customer relationship management, and customer friendliness. A unique attribute of the yardstick measured here reveals that although the traditional ATM that uses pin number is beneficial within the Nigeria business environment, these benefits can be far more achieved and enhanced through the use of ATMs that operates with biometric features. From the table, fraudulent practices which accounts for a major challenge in the banking sector can be reduced and even prevented through biometric ATM (mean = 4.1). Customers also claim that they would be better satisfied with the services of their bankers if biometric ATM is introduced (mean = 4.2). Customer relationship management which serves as a strategic measure through which an organization gets to build intimate relationship with its customers beyond the peripheral business relationship can be better achieved by banking institutions through the use of biometric ATM. This is very important since ATM facilities have the potential of creating a gap between the people in the banking organization and the customers of the banking organization (mean = 3.9). As such biometric ATM could serve as a measure through which bankers place a check on their customers' state of health and perhaps other more personal attributes that could enhance better service to the customer. Again, customers strongly suggest that a biometric ATM will achieve better customer friendliness when it has more than one biometric feature (mean = 4.4). It is also believed that a biometric ATM that makes use of more than one biometric feature will be more effective in checking fraudulent practices (mean = 3.9).

Table 3 Descriptive Statistics on Management Perception

	N	Mean	Std. Deviation
Fraud reduction traceable to ATM operations will be more feasible with the adoption of biometric ATM	142	4.4014	.63088
A biometric ATM machine that uses more than one biometric feature will be more effective in checking fraud	142	4.6056	.54523
Biometric means of ATM are more effective in reducing customer complaints (especially relating to PIN issues)	142	4.3944	.73376
Customer relationship with management is better achieved and managed through the biometric ATM	142	4.4648	.69100
A biometric ATM machine that uses more than one biometric feature will be more customer friendly	142	4.3803	.73158
Valid N (listwise)	142		

Table 3 shows the perception of staff across nine Nigerian banks on the adoption of biometric ATM in Nigeria. The same questions administered to the customers were fielded to the staff for measuring the overall effectiveness and efficiency of the biometric ATM in terms of fraud prevention, detection, ability to achieve overall customer satisfaction, attainment of customer relationship management, and customer friendliness. Bank Management hold a strong opinion that a biometric ATM that makes use of more than one biometric feature will be more effective in checking fraudulent practices (mean = 4.4). The table also reveals that fraudulent practices which accounts for a major challenge in the banking sector will be consequently reduced and even prevented through biometric ATM (mean = 4.6). Respondents also claim that they would be better satisfied and issues that cause complaints about e-banking will be curtailed if biometric ATM is introduced (mean = 4.4). Customer relationship management which serves as a strategic measure through which an organization gets to build intimate relationship with its customers beyond the peripheral business relationship can be better achieved by banking institutions through the use of biometric ATM (mean = 4.5). Again, bank staff strongly suggest that a biometric ATM will achieve better customer friendliness when it has more than one biometric feature (mean = 4.4).

Generally, both customers and bank management seem to strongly support the adoption of biometric ATM in Nigeria. It appears that the bank staff hold a stronger position on this and the result seem to reveal an eagerness on their part to see a revolution in the Nigerian banking industry.

Table 4 shows the T-test result on the difference in management and customers' perception on the adoption of biometric ATM while Table 5 shows the independent sample test. The statistical result reveals a customers' perception based on 2-tailed test (0.422) and management perception (0.132) are both above the recommended significant limits of 0.05, indicating that there is no significant difference in the perceptions of management and customers on the adoption of biometric ATM in Nigeria. As such, both groups hold a position for biometric adoption in the e-banking system.

Table 4 T-test Table of Perception of Management and Customers on Adoption of Biometric ATM

	Biometric	N	Mean	Std. Deviation	Std. Error Mean
Customer Perception	1.00	17	3.9706	.45828	.11115
	2.00	46	4.0924	.68589	.10113
Management Perception	1.00	2	4.2500	.00000	.00000
	2.00	4	4.7500	.35355	.17678

Table 5: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Customer Perception	Equal variances assumed	5.619	.021	-.677	61	.501	-.12180	.17999	-.48172	.23811
	Equal variances not assumed			-.811	42.982	.422	-.12180	.15027	-.42485	.18125
Mgt Perception	Equal variances assumed	2.667	.178	-1.886	4	.132	-.50000	.26517	-1.23622	.23622
	Equal variances not assumed			-2.828	3.000	.066	-.50000	.17678	-1.06258	.06258

## 5. Conclusion and Recommendation

A solution to e-banking related fraud, particularly ATM seems in view with the plan by the CBN to introduce biometric ATM to Nigeria. This position is buttressed by the results from the analysis of survey conducted in this research. Both customer and management support the notion that biometric ATM will reduce and curtail ATM frauds activities, enhance overall customer satisfaction and achieve more effective relationships between customers and their bankers. The findings from this study also provide a platform to enhance the integration of biometrics into national identity management as strongly advocated by the international community.

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