Designing a Reliable E-payment System: Nigeria a Case Study

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Abstract

The Nigerian economy is largely cash-based with a lot of money residing outside the
banking system. To a greater extent, this has hindered the participation of her citizens in
e-commerce where e-payment is the acceptable means of settling transactions. This paper
reviews the e-readiness of Nigeria as a country: the available payment methods: the
motivation and opportunity for e-commerce; and the challenges motivating its wider
applications. We propose: a legal framework among the stakeholders and government to

guide the operations of the scheme; a public-private-partnership (PPP) initiative to manage the entire system with a view to guaranteeing security, confidence and effective control; and a robust e-payment architecture.

1. Introduction

In Nigeria, the modernization of the payment process started with the introduction of the MICR. This was followed by the establishment of ATMs for cash dispensing, account balance enquiry and payment of utility cheques.

In 1993, the Central Bank of Nigeria (CBN), introduced the use of payment cards (smartcard) and paper-based instrument. Similarly in 2004, CBN introduced a broad guideline on e-banking which included the introduction of ATM, e-money products such as credit and debit cards (Salimon, 2006).

Currently, there is a real-time gross settlement (RTGS) system that eliminates the risks involved in large-value payment. However, not much result have been achieved in terms of evolving an efficient payment system arising from some attitudinal and social problems as manifested in the huge amount of money that resides outside the banking sector (Ojo, 2004).

Nigeria is largely a cash-based economy with over 90% of funds residing outside the banking sector as against the developed world where the money in circulation is 4% and 9% in the UK and US respectively (Ojo, 2004 and Ovia, 2003). The cash-based economy is characterized by the psychology to physically hold and touch cash: a culture informed by ignorance, illiteracy, and lack of security consciousness and appreciation of merits digital payment (Ovia, 2002).

2. Statements of Problem

Bickersteth (2005) attributed the slow space of development of e-payment to lack of adequate infrastructure, low Internet penetration, absence of open standards/trust among banks and providers as well as absence of adequate legislation or national policy on IT development.

According to Olesin (2006) and Ezeoha (2006a), image problem was another issue. The Advance Fee Fraud code-named 419, is one of the most popular Internet frauds and it probably had its origin from Nigeria. Lately, the country has been very prominent among the list of fraudulent nations. Consequently, there has been outright rejection of payment cards issued by Nigerian banks on the international arena.

Generally, Denny (1998) attributed e-payment problems to the issues of customer identification and account verification of online purchaser. Another issue is lack of security. There is need to put in place effective security measures to safeguard the client, server as well as the media of transmission (Ghosh, 1997).

3. Current Efforts of the Nigerian Government

The government had instituted a number of regulatory measures to curb the tide of frauds. These include: the National Drug Law Enforcement Agency (NDLEA) Act of 1989; the Failed Bank (recovery of debt and financial malpractice of banks) Act of 1994; the Money Laundering Act of

1995; and the Anti-corruption Act of 1999 (Ezeoha, 2006b).

Similarly, the other bodies constituted to check the menace of fraud are: the National Cybercrime Working Group (NCWG); the Economic and Financial Crimes Commission (EFCC) among others. All these have not yielded much fruits because it takes more than legislation and enforcement to effect a change, but it also demands general attitudinal, cultural and social change on the part of all and sundry.

Government had equally instituted a number of systems to facilitate interbank settlement and funds dispensation to individuals. The systems include: the Nigerian Interbank Settlements System (NIBSS); the Nigerian Electronic Funds Transfer (NEFT); the Nigerian Automated Clearing System (NACS); and the Society of Worldwide Interbank Financial Telecommunication (SWIFT), of which Nigeria is a member.

According to Tooki (2006), the Nigerian consumers are gradually embracing the concept of card payment but the reputation crisis is a major impediment. However, with the attitudinal change and provision of adequate infrastructure, Nigeria has the potentials to be the e-payment market leader in Africa (Gavin, 2006).

Currently, InterSwitch is at the forefront of providing facilities for e-payment implementation in Nigeria. It operates an integrated, secure, auditable and open platform for financial transactions, e-commerce, telecommunications, value-added services, e-billing and payment collection and monitoring (InterSwtch,). The other parties involved in the e-payment revolution include some banks, switching companies, cards companies and the telecoms operators in Nigeria (E-payment Revolution, 2005).

What has given the country a respite is the fact that InterSwitch has currently been appointed a Gold Partner by Thales e-security: a global industry leader in WAN data encryption (Oronsaye, 2006). By this feat, InterSwitch will be handling the security infrastructure of West and Central African region. Therefore, the problem of the country is not the technical know-how to safeguard a secure e-payment transaction but attitudinal.

4. Objectives of Study

The objectives of this work include:

• to access the ability, motivation and opportunities for individuals and corporate bodies to embrace the e-payment culture;

• to propose a public-private-partnership initiative among the stakeholders to effectively manage the e-payment system; and

• to develop a framework for a secure, reliable, efficient, auditable and traceable e-payment system.

5. Research Methodology

We recognize two major groups in the e-payment industry. One of them is the service providers which include the: banks, telecoms, cards manufacturers and switching companies. The second group is the consumers, and it involves the generality of the populace. The major tools for collecting data are personal observation, interview and questionnaire.

The Service Providers

Currently, most of the existing 25 banks in Nigeria engage in one form of e-payment or the other. The variables in the questionnaire include the name of the payment card; the origin:

whether indigenous or foreign; the denomination of account; means of authentication and security; and the customer base. In this group are the card producers and the switching companies. There are four of them consulted. They are e-Tranzact, Interswitch, Card Technology Ltd, and Charms Ltd.

The Consumers

A set of questionnaires was administered randomly to individuals in Lagos State of Nigeria, which is the commercial nerve centre of the country. The respondents included individuals that are resident in Lagos State and some others on one business transaction or the other.
The variables in the questionnaire include: type of employment, nature of business, location of business, availability of Internet facilities, possession of payment card as well as the level of usage.

Method of Analysis

The collected data was analysed based on descriptive statistics using frequency and cross-tabulation. The statistical package for social sciences (SPSS) was used.

Research Questions

1. What is the level of patronage of e-commerce?
2. What are the denominations of E-payment cards?
3. What is the level of participation in E-commerce in Nigeria?
4. What is the level of availability of E-payment cards?

Research Hypotheses

1. The nature of business is influenced by the level of e-commerce and vise versa.
2. The level of e-commerce is positively influenced by the denominations of e-cards.

6. Analysis of Results

6.1 Availability of IT Facilities
The table below presents the distribution of IT facilities in Nigeria.

Table 1. IT Facilities

Facility	Distribution
Number of PCs	867,000
Number of Internet Users	1,769,661
Number of Telephone (Fixed and Mobile) Lines	22,912,917
Number of Payment Cards	600,000

Sources:

- http://www.nationmaster.com/graph/med_pc-media-number-of-pcs,
- http://www.internetworldstats.com/africa.htm#ng,
- http://www.telegeography.com/cu/article.php?article_id=13189

Discussion

From the above statistics, the level of facilities and participation is rather low for a country of a population between 130 and 150 million. There is need for an awareness campaign to sensitize the populace, while government has the major task of making available the needed infrastructures for efficient and effective implementation.

6.2 Available Payment Instruments

Out of the available 25 banks in the county, only 20 of them responded to the administered questionnaire. The banks that responded included the major IT leaders in the banking industry. Our findings are as follows:
1. 19 out of 20 banks that responded have a range of e-payment cards.
2. The major payment cards include: MasterCard, ValuCard, Visa card, ATM card and a number of branded payment cards.
3. 7 banks of the 20 have MarsterCard, which is Dollar denominated and used mostly for International transactions.
4. However, all of the 20 banks have one or more of the following: ValuCard, Visa card, MaestroCard, BankCard and ATM card branded after the bank's name.
5. The other payment cards besides the MasterCard are mostly Naira (local currency) denominated to foster local transactions.
6. A 4-digit PIN is used for authentication and authorization.

6.3 Analysis of Research Questions

A total of 500 questionnaires were administered but only 389 of them were submitted. 100 of them were in self employment, 200 in private employment and 89 in public employment. Similarly, the distribution of the respondents is 26 (6.7%) from the North, 76 (19.5%) from the South, 10 (2.6%) from the East, 266 (68.4%) from the West and 11 of them abstained from the question. However the number of respondents from the West justifies the area of administration of the questionnaire.

Research Question 1: What is the level of patronage of e-commerce?

Out of the 389 respondents, 82 (21.8%) of them have engaged in online purchase, while 294 (75.6%) have not used the medium. The remaining 13 (3.3%) respondents did not answer the question.

Research Question 2: What are the denominations of E-payment cards?

144 out of 389 responded. 96 (24.7%) are based on local currency, 32 (8.2%) are based on international, while 16 (4.1%) are based on both. 245 of the respondents abstained.

Research Question 3: What is the level of participation in E-commerce in Nigeria?

6 (1.5%) of the respondents rated the level of commerce as very high, 41 (10.5%) rated it as

high, 121 (31.1%) rated it as average, while 190 (48.9%) rated it as low. The remaining 31 (8%) respondents abstained.

Research Question 4: What is the level of availability of E-payment cards?

140 (36%) of the respondents possessed a payment card, 240 (61.7%) do not possess one, while 9 (2.3%) did not answer the question.

Generally, the discrepancy between the number of patronage of e-commerce and the number in possession of e-card is traceable to the availability of ATM card, which are not necessarily used for e-commerce transactions.

6.4 Analysis of Research Hypotheses

Research Hypothesis 1

Ho: The nature of business is influenced by the level of e-commerce and vise versa.
H1: The nature of business is not influenced by the level of e-commerce and vise versa.

Table 2. Nature of Business * Rate the level of web commerce in Nigeria Crosstabulation

			Rate the level of web commerce in Nigeria				Total
			Very High	High	Average	Low	
Nature of Business	Production	Count		7	28	26	61
		% within Nature of Business		11.5%	45.9%	42.6%	100.0%
		% of Total		2.0%	7.9%	7.3%	17.2%
	Service/ marketing	Count	6	28	83	142	259
		% within Nature of Business	2.3%	10.8%	32.0%	54.8%	100.0%
		% of Total	1.7%	7.9%	23.4%	40.1%	73.2%
	Trading	Count		5	9	20	34
		% within Nature of Business		14.7%	26.5%	58.8%	100.0%
		% of Total		1.4%	2.5%	5.6%	9.6%
Total		Count	6	40	120	188	354
		% within Nature of	1.7%	11.3%	33.9%	53.1%	100.0%

		Business					
		% of Total	1.7%		11.3%	33.9%	53.1%	100.0%

Table 3. Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.630	6	.266
Likelihood Ratio	9.022	6	.172
Linear-by-Linear Association	.772	1	.380
N of Valid Cases	354		

Table value at 95% Significant Level is given as 12.59

Calculated value is 7.63

Since the calculated value is less than the table value, then we accept the null hypothesis (Ho). Th

Research Hypothesis 2

Ho: The level of e-commerce is positively influenced by the denomination of the e-cards.
H1: The level of e-commerce is negatively influenced by the denomination of the e-cards.

Table 4. What is the denomination of the card? * Rate the level of web commerce in Nigeria

What is the denomination of the card?	Local Currency	Count
		% within What is the c
		% of Total
	International	Count
		% within What is the c
		% of Total
	Both	Count
		% within What is the c
		% of Total
Total		Count
		% within What is the c
		% of Total

Table 5. Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.991	6	.089
Likelihood Ratio	13.326	6	.038
Linear-by-Linear Association	1.950	1	.163
N of Valid Cases	144		

Table value at 95% Significant Level is given as 12.59

Calculated value is 10.99

The calculated value is less than the table value, therefore, we accept the null hypothesis (Ho). Therefore, the level of e-commerce is positively influenced by the denomination of the e-cards.

7. The Proposed E-payment Architecture

The architecture is composed of three modules. The Customer, the Merchant, and the Central Huh modules. The Central Huh module is the only modification to the existing e-payment configurations and it is introduced because of the peculiarity of the Nigeria situation.
The Central Huh module is the PPP implementation. It is composed of the banks (the issuers and the acquirers), the switching company, the national data bank (NDB), and the stakeholders.
We propose a smartcard-based payment card with fingerprint scanner. The card is based on a two –factor authentication (PIN and Fingerprint), but primarily fingerprint activated. The NDB contains the biodata of the citizenry and maintained by the government. The sakeholders include: Central Bank, Card manufacturers, IT professionals, Government officials (NDLEA, EFCC, NCWG etc), and Switching/Security firms.
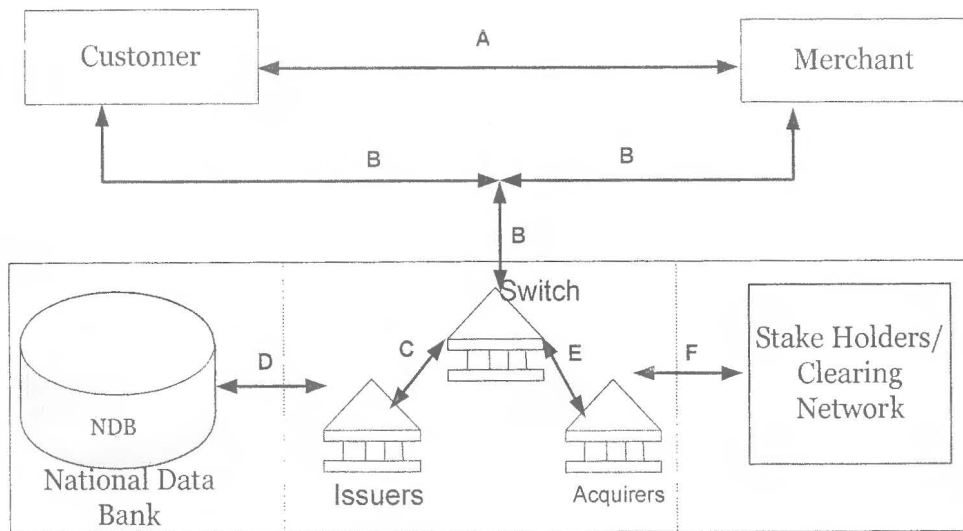

Fig. 1 : Secure Payment Architecture

The activities labeled A to F are described as follow:

A: The Customer indicates intention to procure goods/services. The Merchant requests for personal and payment card information.
B: The Merchant embarks on Customer's identity authentication and credit worthiness.
C: The identity of the Customer is verified and authenticated.
D: The identity of the client is further clarified with NDB.
E: The amount of money is set aside, and the acquirer advises the Merchant to proceed with the transaction.
F: Stakeholders (designated government officials, Card manufacturers, Banks, IT firms, Security agent) manages and controls the activities of the system. They regulate and formulate policies as may be deemed fit.

The architecture is people oriented as stakeholders are place at the centre of the design as proposed by Singh (1996). However the design does not agree with the demand of the government of Nigeria to appoint a central switching system to be operated by NIBSS. The stakeholders prefer having the system managed by a consortium of operators rather than being managed by government.

8. Conclusion

The number of available facilities as presented in table 1 is grossly inadequate. An improvement in infrastructural development is desired to foster e-payment participation. Most banks have e-payment facilities, but most respondents (over 60%) do not have one. This has further corroborated the fact that there are less than 1million payment cards in circulation for a population of 130 to 150 million people.
From the formulated hypotheses, it was proved that: the nature of business is influenced by the level e-commerce and vise versa; and the level of e-commerce in the country is influenced by the denomination of e-payment cards. Enormous opportunities abound for e-payment patronage but for low ability and motivation. To improve the level of patronage, the citizens must be motivated by offering a secure, fraud free, and efficient system.
Therefore, with the proposed payment system architecture that revolves around government officials, banks, IT firms, and major players in the finance industry, tremendous improvement is envisaged in terms of policy formulation and legal framework design. This will have a resultant effect on enhanced participation in e-commerce; enhanced trust, integrity and efficiency; and a reduced level of fraud as actors are traced to NDB and apprehended if need be.
With this robust architecture being used in the country, the international communities are bound to trust the system and hence, increase the level of acceptability of the cards.

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