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Analysis of Security Mechanisms in Nigeria E-Banking Platform

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Article Info	ABSTRACT
	Electronic banking system has become an important practice among all banks in Nigeria. The introduction of this electronic banking has improved banking efficiency in rendering sales and services to customer, which is the 24-hour access to cash and retrieval of banking data i.e. statements, transaction details etc. It was in line with this that the studies aim at the Security Mechanisms of E-banking System. Through the cluster sampling technique, data was collected by means of questionnaires from 25 Banks officers and the result shows Electronic Banking is barely secure for the financial institutions. And through the hypothesis carried out in this research, it shows us that all banking transaction can be done anywhere is the world as long as your access device is connected to the internet service through any service provider. This Mechanism was initialized and found to be very effective for securing the banking transactions. It's being recommended for banks and other financial institutions for maximum security. With all these in the banking Industry, the bank has an effective electronic banking system which has improve its customer's relationship and satisfaction. To this end, it is recommended that the bank information and Communication technology training programme should be encourage among all the banks staff, necessary legal codes banking should be established in order to enhance growth of the industry.

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1. INTRODUCTION

Today's business environment is extremely dynamic and experience rapid changes as a result of technological improvement, increased awareness and demands Banks to serve their customers electronically. Banks have traditionally been in the forefront of harnessing technology to improve their products and services. The Banking industry of the 21st century operates in a complex and competitive environment characterized by these changing conditions and highly unpredictable economic climate. Information and Communication Technology (ICT) is at the centre of this global change curve of Electronic Banking System in Nigeria today. Due to increase in technology usage in the banking industry, performance increases day-by-day. E-banking is becoming an indispensable part of modern day banking services. Banking industry is also one of the industries that adopt technology which helped in providing better services to customers. Quality of services is improved by using technological innovations. Online banking is time saving.

Assert that they have over the time, been using electronic and telecommunication networks for delivering a wide range of value added products and services, managers in Banking industry in Nigeria

cannot ignore Information Systems because they play a critical impact in current Banking system. These point out that the entire cash flow of most fortune Banks are linked to Information System. The application of information and communication technology concepts, techniques, policies and implementation strategies to banking services has become a subject of fundamental importance and concerns to all Banks and indeed a prerequisite for local and global competitiveness Banking.

The advancement in Technology has played an important role in improving service delivery standards in the Banking industry. In its simplest form, Automated Teller Machines (ATMs) and deposit machines now allow consumers carry out banking transactions beyond banking hours. The delivery channels today in Nigeria electronic Banking are quite numerous has it is mentioned here Automatic Teller Machine (ATM), Point of Sales (POS), Telephone Banking, Smart Cards, Internet Banking etc Personal computers in the Banking industry was first introduced into Nigeria by Society Generale Bank as the popular PC easy access to the internet and World Wide Web (www) and internet is increasingly used by Bank's as a channel of delivering the products and services to the numerous customers. Virtually almost all Banks in Nigeria have a web presence; this form of Banking is referred to as Internet Banking which is generally part of Electronic Banking (E-Banking).

With online banking, individuals can check their account balances and make payments without having to go to the bank hall. As most people now own mobile phones, banks have also introduced mobile banking to cater for customers who are always on the move. Mobile banking allows individuals to check their account balances and make fund transfers using their mobile phones. This was popularized by First Atlantic Bank (now First Inland Bank) through its "Flash me cash" product Customers can also recharge their mobile phones via SMS. E-Banking has made banking transactions easier around the World and it is fast gaining acceptance in Nigeria. Electronic banking, also known as electronic fund transfer (EFT), uses computer and electronic technology as a substitute for checks and other paper transactions. EFTs is initiated through devices like cards or codes that let you, or those you authorize, access your account. Many financial institutions use ATM or debit cards and Personal Identification Numbers (PINs) for this purpose. Some use other forms of debit cards such as those that require, at the most, your signature or a scan. The federal Electronic Fund Transfer Act (EFT Act) covers some electronic consumer transactions.

Therefore, Electronic banking is the use of a computer to retrieve and process banking data (statements, transaction details, etc.) And to initiate transactions (payments, transfers, requests for services, etc.) directly with a bank or other financial services provider remotely via a telecommunications network also electronic banking means 24-hour access to cash through an automated teller machine (ATM) or Direct Deposit of pay checks into checking or savings accounts. But electronic banking now involves many different types of transactions e.g. (i) Personal computer banking; to view account balance, request transfers between accounts, and pay bills electronically. (ii) Debit Card Purchase Transactions; to make purchases with a debit card, which also may be ATM card. (iii) Electronic check Conversion; converts a paper check into an electronic payment in a store or when a company receives your check in the mail.

The electronic banking system addresses several emerging trends: customers' demand for anytime, anywhere service, product time-to-market imperatives and increasingly complex back-office integration challenges. The challenges that oppose electronic banking are the concerns of security and privacy of information. For instance, Dr. David Chaum, CEO of DigiCash said that "Security is simply the protection of interests. People want to protect their own money and bank their own exposure. The role of government is to maintain the integrity of and confidence in the whole system. With electronic cash, just as with paper cash today, it will be the responsibility of government to protect against systemic risk. This is a serious role that cannot be left to the micro-economic interests of commercial organizations".

The security of information may be one of the biggest concerns to the Internet users. For electronic banking users who most likely connect to the Internet via dial-up modem, is faced with a smaller risk of someone breaking into their computers. Only organizations such as banks with dedicated Internet connections face the risk of someone from the Internet gaining unauthorized access to their computer or network. However, the electronic banking system users still face the security risks with unauthorized access into their banking accounts. Moreover, the electronic banking system users also concern about non-reputability which requires a reliable identification of both the sender and the receiver of on-line transactions. Non-secure electronic transaction can be altered to change the apparent sender. Therefore, it is extremely important to build in non-reputability which means that the identity of both the sender and the receiver can be attested to by a trusted third party who holds the identity certificates.

2. ELECTRONIC BANKING OVERVIEW

Electronic banking system is a conventional banking system which stated in Nigeria in 1952 [1]. Since then, the industry has witnessed a lot of regulatory and institutional advances. The industry was being

controlled by at most five out the 89 banks in existence before the commencement of the merger and acquisition of banks in Nigeria economy. Multiple branch systems is also one of the notable features of Nigerian Banks, with a total of 89 banks accounting for about 3017 bank branches nationwide as at 2004. As well, the industry was faced with heavy challenges including the overbearing impact of fraud and corruption. Nigerian banks are not left out in utilizing Information Technology (IT) in order to improve their general service delivery. For example, some of the Information and Communication Technology (ICT) processes that are being used by banks in Nigeria include: mobile telephony, facsimile, wireless radio phone, very small aperture terminal satellite (VSAT), Automated Teller Machine (ATM), Internet Banking and Local Area Network (LAN) among other [7].

According to Idowu [7], Nigerian banks have realized that the way in which they can gain competitive advantage over their competitors is through the use of technology. It was observed that there is growing rates of technology adoption in the Nigerian banking operations [12]. The Central Bank of Nigeria (2007) maintains that among the e-banking processes adopted by Nigerian banks the ATM is the most patronized by customers. In addition, it was found that attitudinal dispositions significantly influenced their ATM usage. Klynveld in this regard found that Nigerian bank customers give special consideration to banking particularly ATM [9]. With this, it seems that Nigerian bank customers are increasingly associating quality of bank services with online real time. They are now more alert and meticulous in choosing banks to patronize [7]. Nigerian banks have no doubt invested much on technology; and have widely adopted electronic and telecommunication networks for delivering a wide range of value added products and services. They have in the last few years transformed from manual to automated systems. Unlike before when ledge-cards were used, today banking has been connected to information technology networks, thereby facilitating the practice of inter-banking and inter-branch banking transactions.

Electronic Banking (E- Banking) refers to systems that enable bank customers to get access to their accounts and general information on bank products and services through the use of bank's website, without the intervention of or inconvenience of sending letters, faxes, original signatures and telephone conformations [15] [17] explicitly stated the benefits of adoption of information and communication technology as it facilitates speed operation, better communication, timely management, improvement of product quality and gaining competitive advantage.

Development domestically has the introduction of mobile telephone in 2001 and improved access to personal computers and internet service facilities have also added to the growth of electronic banking in the Nigeria banking sector. However, whereas local banks most commonly practice real time online internet banking, the integration of customers into the process is far from been realized. Many of the reasons are attributed to the high prevalence of internet fraud and lack of an adequate regulatory framework to protect the banks from the volatility of risks associated with internet banking, especially at the levels of communication and transaction. In the main, Nigeria is globally regarded as the headquarters of Advance Fee Fraud which is perpetrate mostly via the internet [6].

The vast majority of the recent literature on electronic money and banking suffers from a narrow focus. It generally ignores electronic banking entirely and equates electronic money with the substitution of currency through electronic gadget such as smart cards and virtual currency. For example, Freedman [3] proposes that electronic banking and electronic money consist of three devices; access devices, stored value cards, and network money. Many others present models that identify conditions under which alternative electronic payments substitute for currency. Most of these models indicate that there is at least the possibility for electronic substitutes for currency to emerge and flourish on a large scale, depending on the characteristic of the various technologies as well [11] [13] [14] as the characteristics of the potential users.

Friedman point out that electronic banking presents the possibility that an entire alternative payment system, not under the control of the Central Bank of Nigeria may arise [4]. In an extreme variant of Friedman [4] and King [8] argues that today computers make it at least possible to bypass the payment system altogether, instead using direct bilateral clearing and settlement; the responses to Friedman. Berentsen considers the impact that the substitution of smart cards for currency will have on monetary policy, arguing that although electronic substitutes for currency will become widespread, monetary policy will continue to work as before because this currency substitution will leave the demand for central Bank reserves largely intact [2].

The application of e-banking has been proven as an effective way to reduce the costs of operation for the financial institutions. For instance, e-banking services will allow banks to reduce expenditures on physical structures. It is believed that the e-banking will help banks to cut costs, increase revenue, and become more convenient for customers [5]. Another important benefit from e-banking is a more effective information collection and management. A combination of a low percentage of customers using e-banking services on a consistent basis and a relatively low start-up cost in developing e-banking services in the banking industry–will make the impact of e-banking (positive or negative) quite limited on financial

institutions [10]. Finally, the development of e-banking service has encouraged the adoption of a decentralized approach to give banks more needed flexibility to distribute Internet access to a much larger number of employees and potential customers.

3.   TECHNOLOGICAL KEY ISSUES

In order to provide effective and secure banking transactions, there are three (3) technology issues needed to be resolved. The key areas are:

3.1. Security

Security of the transactions is the primary concern of the Internet-based industries. The lack of security may result in serious damages. Examples of potential hazards of the electronic banking system are during on-line transactions, transferring funds, and minting electric currency, etc.

3.2. Anonymity (Privacy)

Privacy issue is a subset of the security issue and by strengthening the privacy technology; it will ensure the secrecy of sender's personal information and further enhance the security of the transactions. The examples of the private information relating to the banking industry are: the amount of the transaction, the date and time of the transaction, and the name of the merchant and where the transaction will take place.

3.3. Authentication

Encryption may help make the transactions more secure, but there is also a need to guarantee that no one alters the data at either end of the transaction. There are two possible ways to verify the integrity of the message. One form of verification is the secure Hash algorithm which is "a check that protects data against most modification." The sender transmits the Hash algorithm generated data. The recipient performs the same calculation and compares the two to make sure everything arrived correctly. If the two results are different, a change has occurred in the message. The other form of verification is through a third party called Certification Authority (CA) with the trust of both the sender and the receiver to verify that the electronic currency or the digital signature that they received is real.

The solutions to the security issues require the use of software-based systems or hardware-based systems. These software-based solutions involve the use of encryption algorithms, private and public keys, and digital signatures to form software packets known as Secure Electronic Transaction used by MasterCard and Pretty Good Privacy. Hardware-based solutions such as the Smartcard and the MeChip provide better protection for the confidentiality of personal information .Software-based solutions have the advantage over hardware-based solutions in that they are easy to distribute and are generally less expensive.

4.   ELECTRONIC BANKING DEVICES

E-banking (electronic banking) is defined as the automated delivery of new and traditional banking products and services directly to customers through electronic, interactive communication channels.
There are various types of electronic banking devices which include:
- Personal computers (PCs)
- Personal digital assistants (PDAs)
- Automated teller machines (ATMs)
- Kiosks
- Touch Tone Telephone
- Cellular & Smart Phones

5.   ELECTRONIC MONEY APPROACHES

E-banking as well as e-money are rather generic terms and we need to specify what we are talking about. It is well accepted that e-banking can be separated into two streams: one is e-money products, mainly in the form of stored value products; the other is electronic delivery channel products or access products. The latter are products that allow consumers to use electronic means of communication to access conventional payment services, for example, use of a standard personal computer and a computer network such as the Internet to make a credit card payment or to transmit instructions to make funds transfers between bank accounts.

There are two different types of approaches to electronic money: on-line and off-line electronic money.

5.1. On-Line

On-line means there is a need to interact with a bank or another "trusted third party" (via modem or network) to conduct a transaction. On-line systems prevent fraud by requiring merchants to contact the bank's computer with every sale. The bank's computer maintains a database that can indicate to the merchant if a given piece of electronic money is still valid. This is similar to the way merchants currently verify credit cards at the point of sale.

5.2. Off-Line

Off-line means that a transaction can be conducted without having to involve a bank directly. Off-line electronic money systems prevent fraud in basically two different ways. There is hardware and a software approach. The hardware approach relies on some kind of a tamper-proof chip in a smart card that keeps a mini database. The software approach is to structure the electronic money and cryptographic protocols to reveal the identity of the double spender by the time the piece of e-money makes it back to the bank. If users of the off-line Electronic Money knows they will get caught; the incidence of double spending will be minimized, at least in the theory.

On-line or off-line, those six characteristics (independence, security, privacy, transferability, divisibility, and ease of use) define the problem space that each electronic money system promoter attempts to solve for one goal: public acceptance wide enough to make the system profitable for those who run it.

6. ELECTRONIC BANKING ARCHITECTURE

When people are hard pressed for time, the needs for anytime and anywhere banking gains utmost importance. Bearing this in mind, banks provide a novel service which gives retail customers account information and real-time transaction capabilities from their cell phones. With SMS (Short Message Service) banking the following services can be obtained:
- Get account balance details
- Request a cheque book
- Request last three transaction details
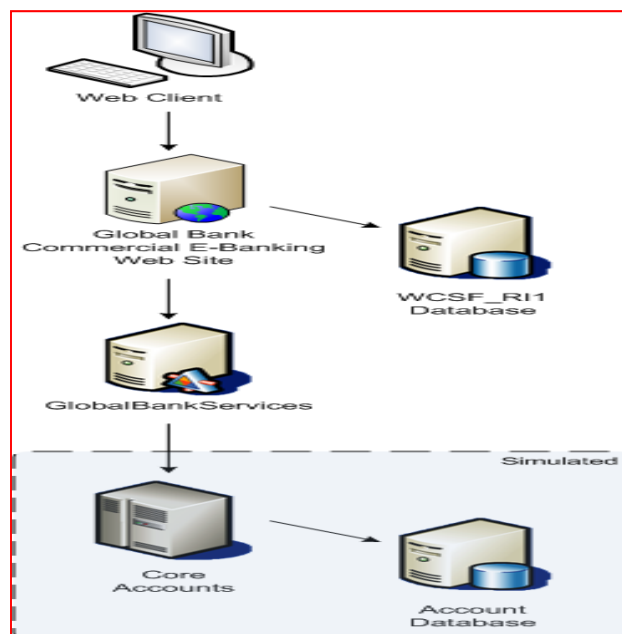- Pay bills for electricity, mobile, insurance etc.

Figure 1. E-Banking Architecture

6.1. E-banking Network

E-banking is embodied in Internet-based computing and wired or wireless networking, which is supported by the standard protocol－TCP/IP. By relying on the open infrastructure and standardized

protocol, the Internet provides an interoperable and worldwide networking model. Contrary to the limited bandwidth of the Private Network, the capacity of public Internet is abundant and nearly free. Moreover, the World Wide Web (WWW) can support the transmission of multimedia data. Based on the application platform, the web-based e-banking applications can be characterized as intense hypermedia systems. The e-banking applications are frequently multifunctional systems that must integrate with existing front office, back office, and legacy information systems within the bank and often need to connect with trading partners and external stakeholders. Developing e-banking applications therefore require a combination of web site development techniques such as content and user interface design together with object-oriented IS (Internet Solutions) development techniques.

6.2. Electronic Communication Network

An electronic communication network (ECN) is a financial term for a type of computer system that facilitates trading of financial products outside of stock exchanges. The primary products that are traded on ECNs are stocks and currencies. The first ECN, Instinet, was created in 1969. ECNs increase competition among trading firms by lowering transaction costs, giving clients full access to their order books, and offering order matching outside of traditional exchange hours. ECNs are sometimes also referred to as Alternative Trading Systems or Alternative Trading Networks. To trade with an ECN, one must be a subscriber or have an account with a broker that provides direct access trading. ECN subscribers can enter orders into the ECN via a custom computer terminal or network protocols. The ECN will then match contra-side orders (i.e. a sell-order is "contra-side" to a buy-order with the same price and share count) for execution. The ECN will post unmatched orders on the system for other subscribers to view. Generally, the buyer and seller are anonymous, with the trade execution reports listing the ECN as the party.

Some ECN brokers may offer additional features to subscribers such as negotiation, reserve size, and pegging, and may have access to the entire ECN book (as opposed to the "top of the book") that real-time market data regarding depth of trading interest. ECNs are generally facilitated by electronic negotiation, a type of communication between agents that allows cooperative and competitive sharing of information to determine a proper price. An ECN connects major brokerages and individual traders so that they can trade directly between themselves without having to go through a middleman.

6.3. Communication Network

A telecommunications network is a collection of terminals, links and nodes which connect to enable telecommunication between users of the terminals. Networks may use circuit switching or message switching. Each terminal in the network must have a unique address so messages or connections can be routed to the correct recipients. The collection of addresses in the network is called the address space.

The links connect the nodes together and are themselves built upon an underlying transmission network which physically pushes the message across the link. Examples of telecommunications networks includes: Computer Networks, the Internet, the Telephone Network, the Global Telex Network, and the Aeronautical ACARS Network.

7.   QUESTIONNAIRES ANALYSIS

Table 1. Questionnaire Analysis

RESPONDENT	NO. FILLED	NO. REJECTED	RISK IN E-BANKING (%)	BENEFITS	CONTINUITY OF E-BANKING	PERCENTAGE (%)
ECO BANK	5	3	40	Dependable	YES	60
FCMB	4	4	50	Good	YES	50
FIDELITY BANK	7	3	30	Fast	YES	70
GTB	6	3	20	Reliable	YES	80
ZENITH BANK	3	2	40	Secure	YES	60

8.   DEVELOPMENTAL PROCEDURES

Below are the steps to be followed to demonstrate Security Mechanism in an E-banking System:
- Create a project flow design (figure 2).

- Web pages and site flow with Hypertext markup language (HTML) and Cascading Style Sheets (CSS).
- Database structure to store the registered user's contact, log in and other details.
- Dynamic navigation of the application
- Testing of application and debugging.
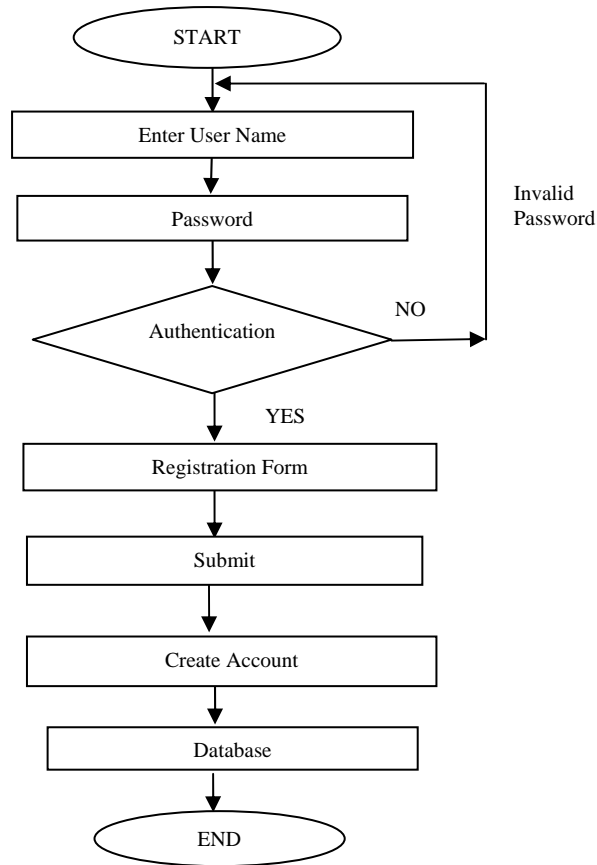- Compilation and deploying files on the server.

Figure 2. Project Flow Design

9. SYSTEM DESIGN

This stage has to do with the development and design of the proposed system to meet the set Aim and Objectives of this research.
The design of the new system contains the following:
- Input design specification
- Form Design
- Output design specification
- Database Design

9.1. Input Design Specification

Input design specification makes specification to accept data at the right time and those data will be entered through an input device e.g. Keyboard and mouse. The system contains operational data in the database. The data collected from the customers during their registration or opening of account/transfer process will be used to create their account. Also data can be collected from the customer care representative of the bank, from individual customers which can then be put together in the proposed E- banking system.
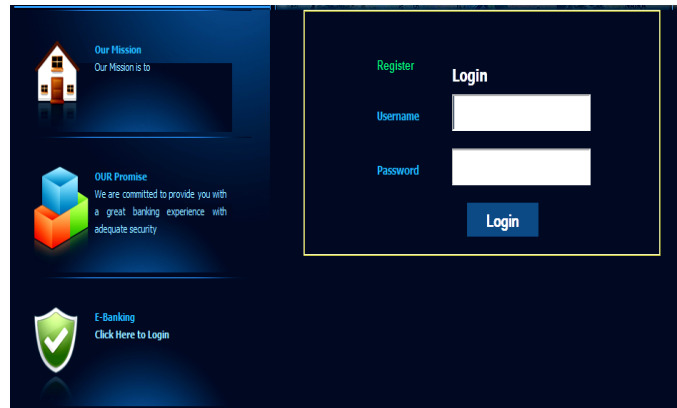
Figure 3. Login Design

9.2. Form Design

A form is for capturing customer's information to identify each customer. The information contained on the form will be entered into the database through the user friendly interface that has been designed after logging in. (Figure 3). This leads to an online registration form issued to customers that want to register to E-banking Network. All the necessary information are expected to be filled online for the new customer. These information includes name, sex, age, date of birth etc. which will be sent into the database of the proposed system immediately after clicking on submit button (figure 4).

Figure 4. Online Application Form

9.3. Output Design

A clear picture of what is to be developed is very essential before development or actual design of a system to implement it. The system back end is mostly paramount and synonymous in the mind of the administrator as users are less concerned on how the systems achieve this. Output is the information delivered to users through the information system. Some data do not require any process before they can become an output. They are stored and retrieved as output while some require extensive processing before

they can be served as output. It is the information displayed on the screen that will determine the user friendliness of the system.

These Outputs are designed with the following objectives:

- to display the valid username and the encrypted password when logging in.
- to complete the online registration before submission.
- to a perform a complete transaction with a valid account number.
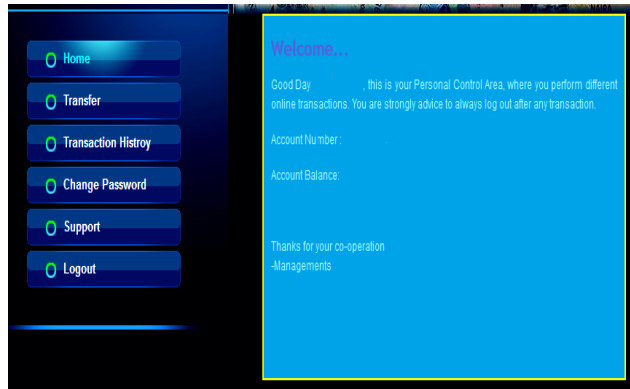- to log out the site after all transaction have being carried out.

Figure 5. Main Output Interface

9.4. Database Design

Database design is the process of producing a detailed data model of a database. This logical data model contains all the needed logical and physical design choices and physical storage parameters needed to generate a design in a data definition language, which can then be used to create a database. A fully attributed data model contains detailed attributes for each entity. The database is principally needed to make logical design of the base structure used to store data. However, database could also be used to apply the overall process of designing, not just for the base structures alone but can also in forms and queries in the overall database application within the database management system (DBMS).

Database can be maintained by defining a set of proactive tasks that a DBA (Database Administrator) needs to perform on a periodic basis to help ensure that their databases perform optimally and maintain high availability. Securing a database can be defined as preventing unauthorized or accidental disclosure, alternation or destruction of data. Ways of securing the database includes Encryption, Access control, Three-Tier Design e.t.c. The database of the proposed system to log-in into the system is shown below (figure 6).
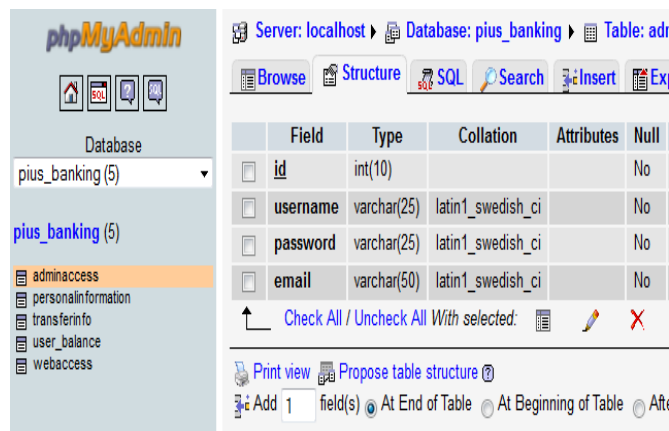

Figure 6. Log- in Database Outlook

However, the figure below (figure 7) displays the database schema for customer registration/account creation.

firstname	lastname	dob	sex	streetadd	city	statepro	zipcode	country	GSM	GSMII	fax	email	acctnumb
Pius	Borode	20/07/1986	Male	Estsate	Osogbo	Osun	234035		89438488389	9848984389		ganiquad@gmail.com	1343572381
Bimbo	Odewale	15/03/1989	Male	dada estate	Osogbo	Osun	234035	Nigeria	0696945843734	74877847	7437	omibabs98@yahoo.co.uk	1343572497
adetola pius	borode	20/07/1986	Male	dada estate	osogbo	osun	234		07038921347	07062650408	12334	piusadetola@yahoo.com	1343583290
alfred	nortey	17/10/1985	Male	oloyede estate	osogbo	osun	234	Nigeria	08060058391		23456	werth2oo7@gmail.com	1343583892
bisola	akande	23/03/1976	Male	igbona estate	osogbo	osun	234	Nigeria	07035456789		76543	prettynurse_0001@yahoo.com	1343584120
funke	abosede	12/12/1988	Male	akanni street, mokola.	Ibadan	Oyo	234	Nigeria	08054347689		45673	abosede@yahoo.com	1343584304
adekola	adeniji	27/09/1981	Male	adeniyi street,	oojo	lagos	234	Nigeria	08091236587		786756	adekola@gmail.com	1343584560
peters	micheal	01/10/1990	Male	no, 32 okefia	osogbo	state	234	Nigeria	07034678923		980712	petermicheals@yahoo.com	1343584837
oluwaseun	deborah	04/12/1984	Female	no. 4 akinyemi str.	ikirun	osun	234	Nigeria	08035678754		8765	deborah@gmail.com	1343585115

Figure 7. Registration Database

10. CONCLUSION

E-banks are easy to set up so lots of new entrants will arrive. 'Old-World' systems, cultures and structures will not encumber these new entrants. Instead, they will be adaptable and responsive. Therefore, e-banking gives consumers much more choice. Consumers and merchants may be able to increase the efficiency and enjoy greater convenience. E-money may also increase access to the financial system for consumers who have previously found access limited. However, the development of e-banking and e-money is also a new challenge to traditional banks. As mentioned above, e-money transactions are much cheaper than ever. This could turn yesterday's competitive advantage (a large branch network) into a comparative disadvantage, allowing e-banks to undercut bricks-and-mortar banks. On the other hand, e-banking will lead to an erosion of the 'endowment effect' currently enjoyed by the major traditional banks. Deposit will go elsewhere with the consequence that these banks will have to fight to regain and retain their customer base. This will increase their cost of funds possibly making their business less viable. Lost revenue may even result in these banks taking more risk to breach the gap. Portal providers are likely to attract the most significant share of banking profits.

Furthermore, the e-money products will be provided by monoclines i.e. business that focuses on operating in one specific financial area. Traditional banks may simply be left with payment and settlement business; even this could be cast into doubt. Traditional banks will find it difficult to evolve. Not only will they be unable to make acquisitions for cash as opposed to being able to offer shares, they will be unable to obtain for whom it seem relatively easy to attract investment.

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