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Research Article

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Proposed Model for Digital Banking in Nigeria

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Abstract Expert system is a highly interdisciplinary sub area of Computer Aided Engineering that attempts to mimic the thought process of experts and make their expertise available to less skilled individuals. Some functions formerly performed by humans, especially dangerous, monotonous, or tedious tasks, are now carried out by the use of expert systems and robots. Banks adopt expert system in a number of ways which include the following: get advice on regulatory compliance, commercial and consumer lending systems, expert auditing, portfolio risk management systems and provide electronic banking services. The most widely used form of expert system in the banking industry is digital banking, which has being abused by cybercriminals. Hence the need to build an enhanced expert system that will serve as a strong deterrent to the menace of cybercriminals. This work identified the challenges of authentication that is associated with the adoption of digital banking in Nigeria; developed a model that adopts the use of biometric authentication system and customer enquiry/support system. The biometric module manages the users' biometric data for biometric verification during authentication process. The customer enquiries/support system employs the use of Experts system to improve level of service quality on the digital banking platform. The customer enquiries system comprises of the basic components of experts system: inference engine, knowledge base and user interface. This work is an improvement on the existing digital banking model in Nigeria; will be a stronger fraud deterrent and improve customer satisfaction. It is recommended that the digital banking model proposed in this work be adopted by banks.

Keywords digital banking, technology, biometric, verification, authentication

Introduction

Electronic banking is the provision of banking services to customers through Internet technology [1]. Digital platform businesses are changing the way companies can do business and thrive in the digital age. Banks can combine stronger ethics with tighter security, using their massive data and digital technologies to enhance safety of traditional banking and grow relationship trust by:

- Exploiting regulatory compliance for service advantages. For example, analytics enables banks to use Know Your Customer data to sense customers' life events and offer personalized services at the right time. Other providers may also value such predictive insight.
- Taking ethical guidance from customers on what matters to them, reassuring their data privacy and better balancing data value with moral limits for key transactions.
- Mastering ethical ways to collect, secure, access, manage, use and, possibly, monetize data to benefit customers with minimal, if any, risky insider activity. Eighty-three percent of bankers see a strong or very strong demand for increased ethical controls of data among their knowledge workers.
- Employing digital technology to be more transparent, helping customers to better follow processes for their banking services and to hold banks accountable.

- Adopting a zero-tolerance approach, supported by security innovation (such as behavioral biometrics and security-embedded products) [2].

Innovations in information and communication technologies are incessant. Increasingly firms are turning to the Internet and related information technologies to improve business efficiency and service quality, and attracting new customers. The use of the Internet in the conduct of business is growing at a rapid pace. According to a recent study more than 90% of firms studied have plans to buy and sell on the Internet [3]. With the overwhelming success of online banking, banks in Nigeria have gone a step further in adopting expert system. This is evident in the introduction of electronic banking; banks now provide banking services through the internet. Customers can now enjoy sitting at the comfort of their home or workplace, with their computer system connected to the bank server and carry out banking transactions [4]. This is often described as virtual banking. Financial services being offered through the Internet were more frequently described as "virtual banking". This is simply because there is no physical contact between the customer and banks' personnel [5].

Banks are already using technology innovation to empower their workforce and operate more effectively. Bankers reported that 55 percent of the jobs in their organization have a digital component today and expect that number to increase to 61 percent in three years [4, 6].

Internet Profit Generation

E-commerce, when properly integrated into existing banking operations, can lead to substantial cost savings and higher profitability. Cost savings occur by virtue of automating customer transactions such as funds transfers, payments, and account balance inquiries [7].

Strategic alliances with insurance companies, mortgage companies, and stock brokerage firms can lead to additional business opportunities that otherwise will go unrealized. Furthermore, banks are able to retain customers more effectively when offering services that are value-added. When customers moved online with Wells Fargo, the percentage of customers taking their business elsewhere dropped 50 percent. As a result of these positive experiences with online banking, one in six of the bank's new customers are referrals from existing customers and, thus, did not cost the bank anything to acquire them [8]. There is now a rapid growth and patterns of digital ecosystems inside and outside of banking. Platform businesses, like the connected car, can quickly ripple out to multiple industries. Most will rely on banks' financial services in one form or another, such as for payments or loans.

There is the possibility of shifts in consumer income and spending that may indicate needs and point to new bank products or services. The path from ride-sharing to the driverless car economy implies new demands on banking and financial services.

There can also be use of new technologies to reshape industry processes, products and services. An example is Google Chauffer software. Already with more than 1.5 million self-driven miles logged, the software processes all the information to help a driverless car safely navigate the road without getting tired or distracted [9].

Banks have certainly seen their share of disruption over the last few years-from online banking to peer-to-peer lending to block chain-based payments and money transfers to everything else in between. Fast-emerging digital ecosystems with record high market caps and asymmetrical growth will likely spur the next major stage of banking disruption. Unfortunately, there is no crystal ball bankers can look into to know their future. Still, because ecosystems are inherently tied to industries and business models, banks can gain a proactive grasp on the upside of disruption [2].

Methodology

Artificial Intelligence

In the early 1950s Herbert Simon, Allen Newell and Cliff Shaw conducted experiments in writing programs to imitate human thought processes [10].

The experiments resulted in a program called Logic Theorist, which consisted of rules of already proved axioms. When a new logical expression was given to it, it would search through all possible operations to discover a proof of the new expression, using heuristics. This was a major step in the development of Artificial

intelligence. The Logic Theorist was capable of quickly solving thirty-eight out of fifty-two problems with proofs.

There are many important components of integrating the computer into mechanical engineering, a wide variety of these integration schemes are used in engineering practice, ranging from artificial intelligence applications oriented toward removing the engineer from the design/analysis cycle, to "engineer in the loop" simulations - intended to offload to the computer the quantitative tedium of design and analysis in order to permit the engineer to concentrate instead on qualitative issues of professional judgment.

Artificial intelligence as a whole is highly interdisciplinary. It requires concept of engineering, computer science, logic probability and statistics. Thus working in this field requires the collaboration of many researchers in different areas of specialization.

Expert System

Expert systems are a subarea of Artificial intelligence. Expert systems also known as knowledge based expert systems (KBES) are computer programs designed to model the knowledge and experience of human experts. This 'expertise' is often the key ingredient used in solving difficult problem such as fraud detection or assessing risk. Its highly complex and stochastic systems that hitherto, can only be tackled by humans, because their formulations and solutions require some abilities that are found only in humans, e.g. ability to think, observe, memorize, see and smell [10].

Typical Components of Expert Systems.

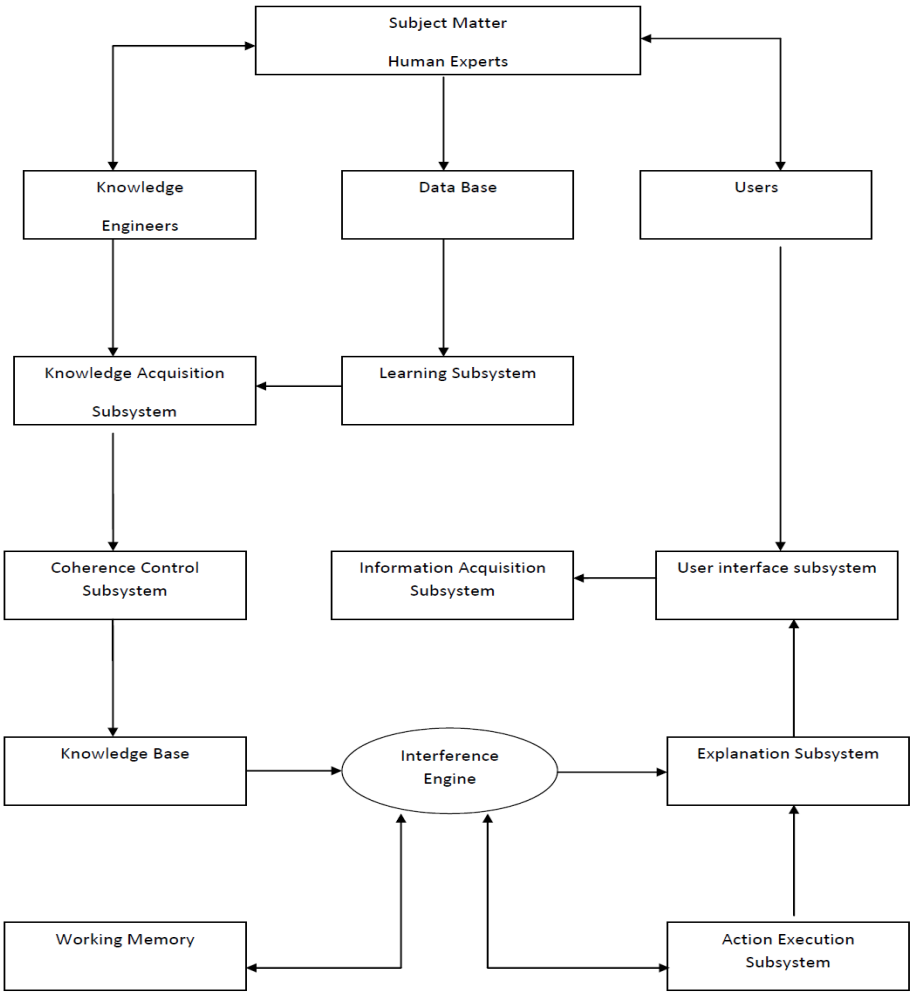

Figure 1: Components of expert system [11]

Expert system can be broadly defined as a computer system (hardware or software) that simulates human expert in a given area of specialization. ATMs are example of expert system. Expert systems are computer programs designed to model the knowledge and experience of human experts. This expertise is often the key ingredient used in solving difficult problems.

Thus expert systems are well suited to address most of the challenges in the banking industry because they conveniently mimic the thought processes of experts and make the expertise available for less skilled staff and customers. From banks' perspective expert system provides economic leverage by performing the types of tasks that occupy a large percentage of their highly paid employees' time. Though expert system do not replace these people, but it augment them and make them more effective. Banks embrace experts system to sustain their competitive advantage.

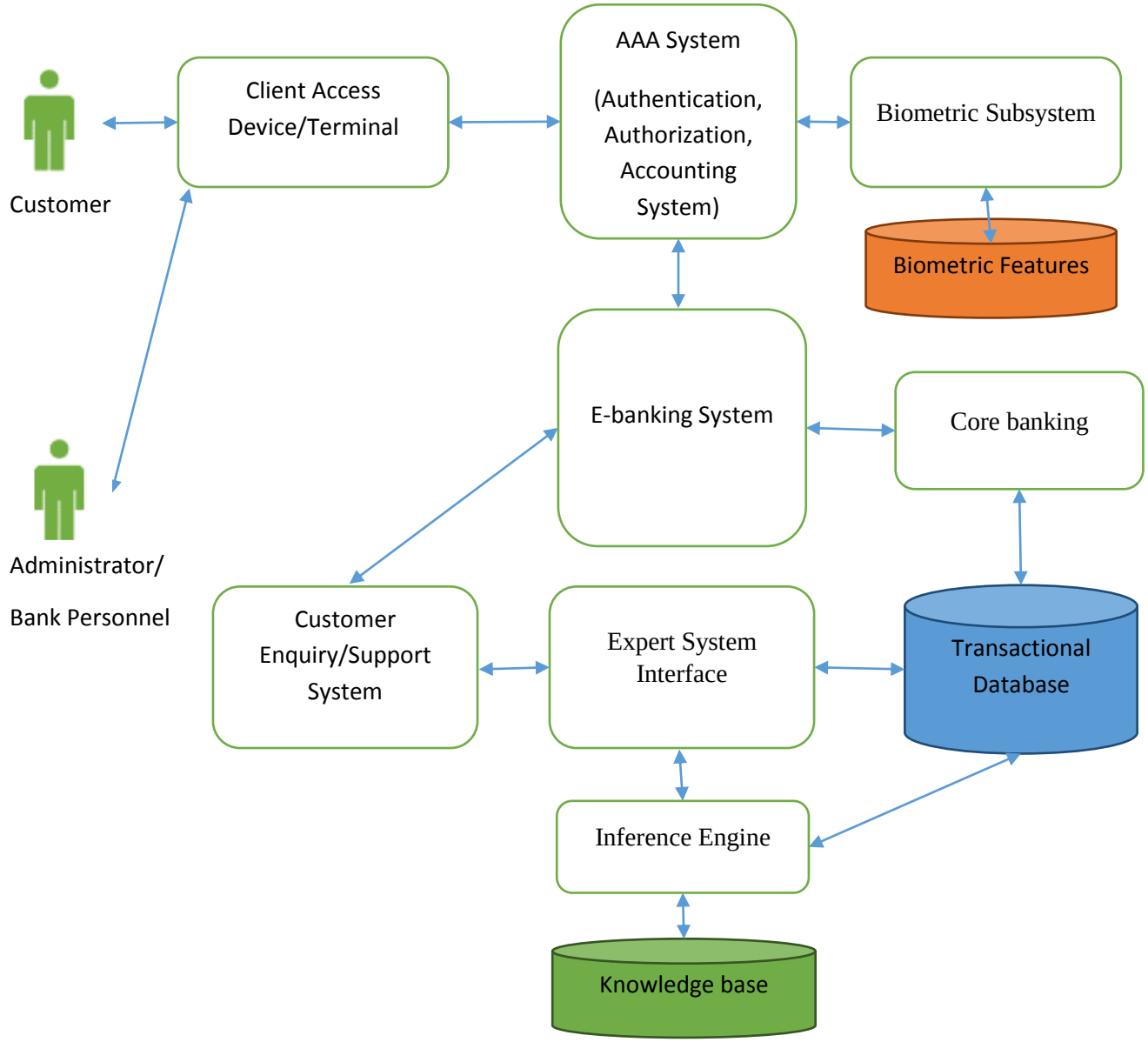

Figure 2: Proposed Architecture of Secured E-banking with Enquiry System

Components of Secured E-Banking with Enquiry Expert System

The conceptual designs for the enquiry expect system is displayed in Figure 1 and its components are analyzed as follow:

Customer: This is someone who has registered to use the e-banking platform to carry out some or all of his/her banking services.

E-banking terminals/Access Devices: These are devices (light/thin or heavy) that provide users of e-banking platform interface to interact or carryout operations on the platform. Examples are ATM, Kiosk, Smart Phone, Personal computer or even basic phone.

Authentication, Authorization and Accounting System: This is the security module of the proposed system. Authentication provides a way of identifying a user, typically by having the user enter a valid user name and valid password or capturing the user's biometric feature before access is granted. The process of authentication is based on each user having a unique set of criteria for gaining access. This system compares a user's authentication credentials (username/password or fingerprint) with other user credentials stored in a database. If the credentials match, the user is granted access to the platform. If the credentials are at variance, the authentication should fail and access is to be denied. Authorization grants specific rights and privileges to individual user. Authorization is the process of enforcing policies: determining what types or qualities of activities, resources, or services a user is to be permitted.

Biometric Sub-System: This sub-module manages the users' biometric data for biometric verification during authentication.

E-Banking System: This system that provides access for users to banking services over the internet or other communication networks. It usually has multiple interfaces across different platforms e.g GTBank has web access at (https://www.gtbank.com) [12].

Customer Support/Enquiry System: This is the innovation we are bringing to add intelligence to conventional e-banking system available today. The level of Service Quality offered by the current e-banking systems is impaired by lack of integrated expert system into their platform hence our urge to include this. The components of the system is detailed in the next section.

Results and Discussion

Presently Internet Banking customers only need a computer with access to the internet to use internet banking services. Customers can access their banking accounts from anywhere in the world. Each customer is provided with a login ID and a password to access the service. It is indeed easy and convenient for customers. However, the use of password does not provide adequate protection against internet fraud such as phishing. The problem with password is that when it is compromised, the fraudster can easily take full control of all transactions. In this case the password no longer works as an authentication because we can't be sure who is behind the keyboard typing that password in.

However, easy access and convenience should not be at the expense and mercy of the security of information. This is important in order to ensure the confidentiality of information and that it is not being manipulated or compromised by the fraudsters.

Prior to any transaction the following components of Secured E-Banking with Enquiry Expert System as given in Figure 2 must be put into consideration:

Customer: This is someone who has registered to use the e-banking platform to carry out some or all of his/her banking services.

E-banking terminals/ Access Devices: These are devices (light/thin or heavy) that provide users of e-banking platform interface to interact or carryout operations on the platform. Examples are ATM, Kiosk, Smart Phone, PC or even basic phone.

AAA System (Authentication, Authorization and Accounting System): This is the security module of the proposed system.

Authentication provides a way of identifying a user, typically by having the user enter a valid user name and valid password or capturing the user's biometric feature before access is granted. The process of authentication is based on each user having a unique set of criteria for gaining access. The AAA system compares a user's authentication credentials (username/password or fingerprint) with other user credentials stored in a database. If the credentials match, the user is granted access to the platform. If the credentials are at variance, authentication fails and access is denied.

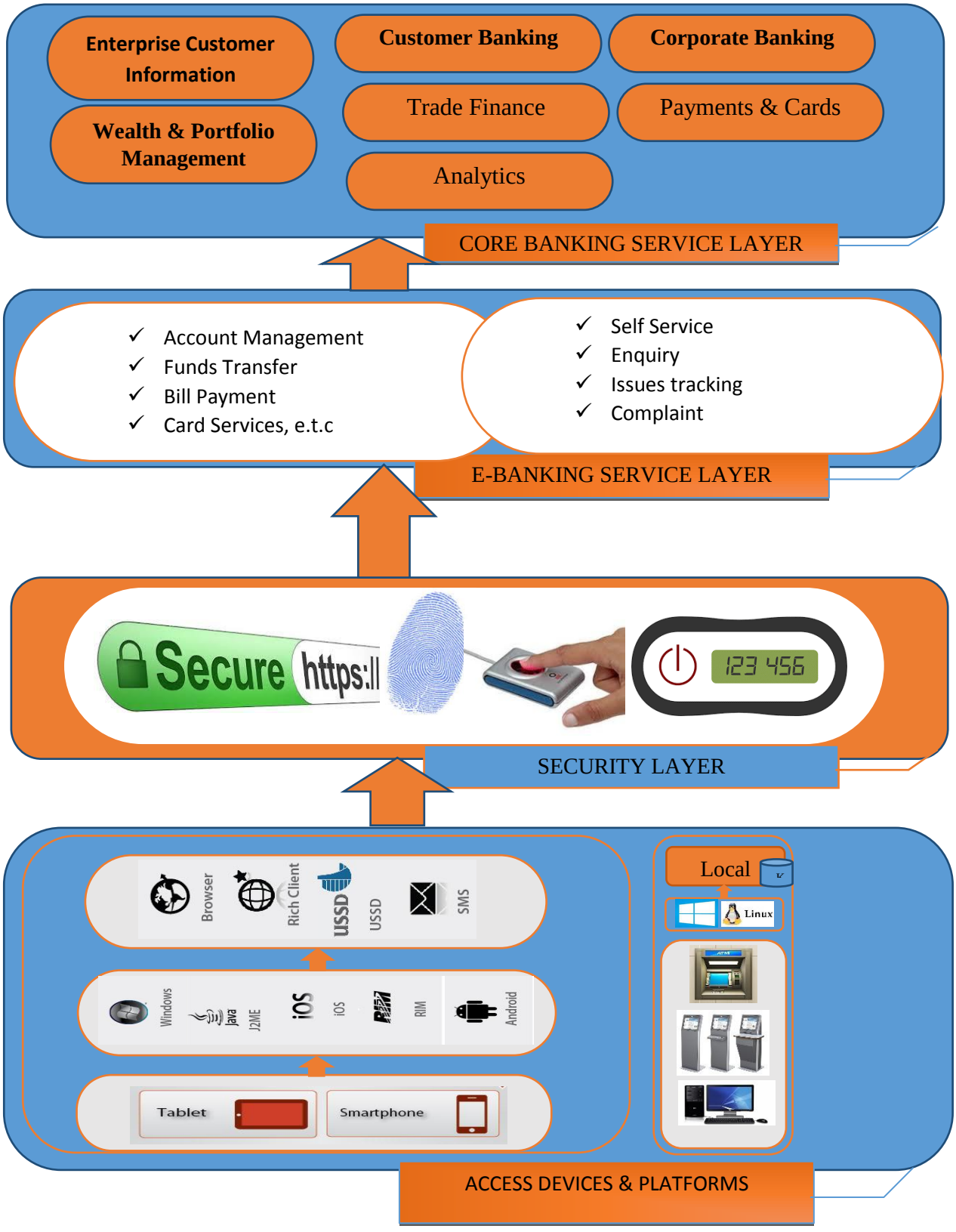

Figure 3: Layers of Secured E-banking

Authorization grants specific rights and privileges to individual user. For instance, a user may want to transfer fund from Account A to Account B, the authorization process determines whether the user has the authority to

issue to carry out such transfer. Simply put, authorization is the process of enforcing policies: determining what types or qualities of activities, resources, or services a user is permitted. Usually, authorization occurs within the context of authentication. Once a user is authenticated, it is authorized for different types of access or activity on the platform. Authorization allows us to ensure Quality Control for different services in the system by making sure users are granted access only to the services they have right and not below certain quality threshold.

Accounting measures resources used by each user and log users' activity in the database. The data generated by the accounting module is fed into Planning of the Quality Assurance Phase. Also in Figure 3 the following features have to be addressed in securing both the bank and customers from fraudulent.

Biometric Sub-System: This sub-module manages the users' biometric data for biometric verification during authentication process.

Core banking: This is the traditional banking system that is only available at the branches of a typical bank. It houses the customer data and transaction records. It is usually a Server-Client system or intranet based system. The Server resides in the datacenter of the bank or dedicated remote infrastructure. It can only be accessed by the authorized users or applications of the bank.

Figure 4 provides the components of Enquiry Expert Sub-System for digital banking and for prevention against any attempted fraudulent transaction.

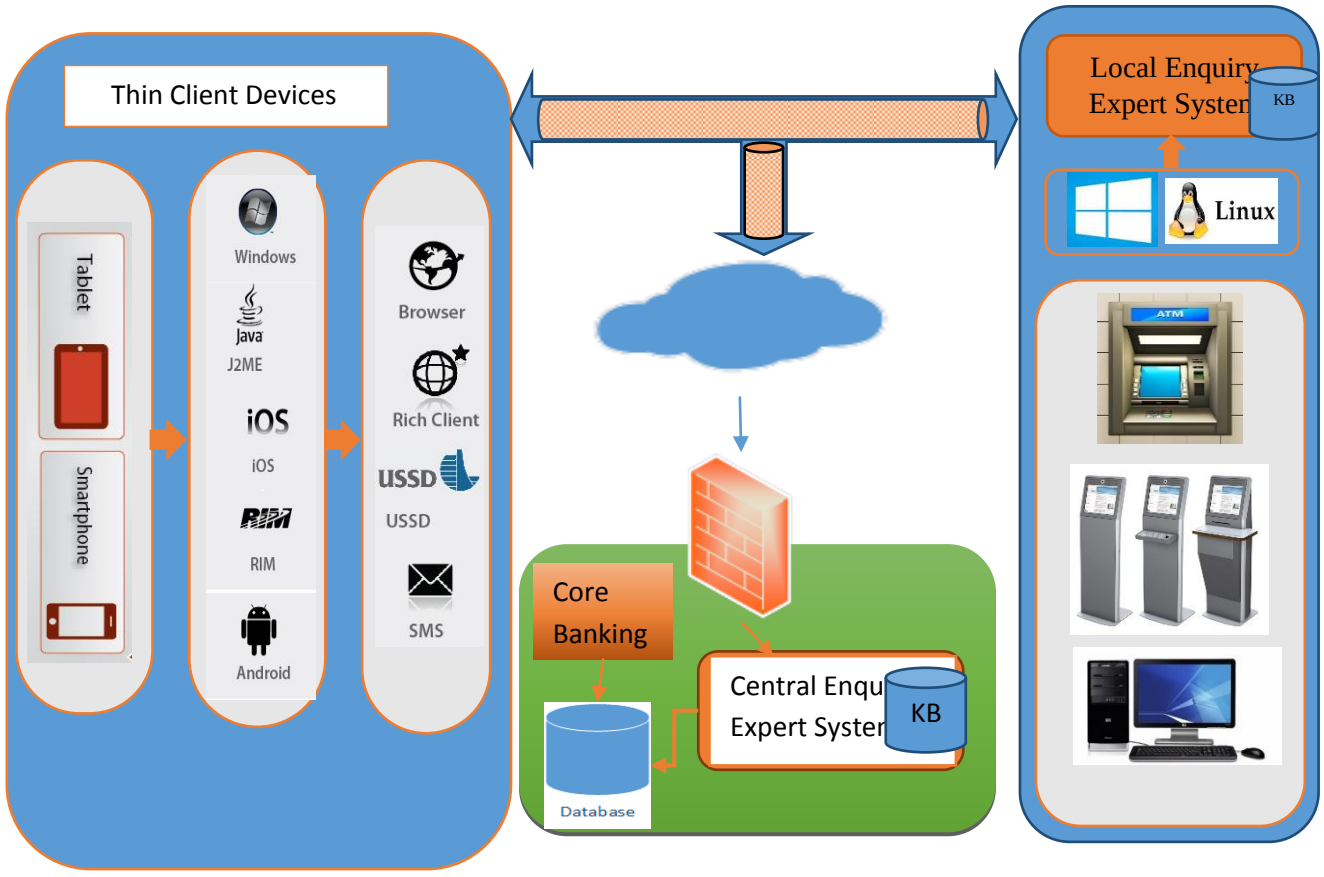

Figure 4: Proposed Enquiry Subsystem Architecture

Access Devices: Thin Client – Tablet, Smart Phones, and Basic Phones that are running Operating System such as Windows Mobile, Lumia, J2ME, iOS for mobiles, RIM for blackberry and Android. These devices have lesser computing power compared to a Personal Computer PC, therefore, cannot run its own local enquiry

expert system. They will be accessing the central Enquiry System via Web Browser, Mobile Apps, USSD or SMS.

Thick Client – ATM terminals, KIOSK, and PCs that are running full Operating System such as Windows, 7, 8, or 10, Linux, Apple OS with sufficient computing power. These machines will host a local instance of Enquiry Expert System but periodically synchronized with the Central Enquiry System. They will provide support for their users even when there is poor connectivity with the central system.

Core Banking Interface (CBI): The core banking interface provides transactions briefs to be utilized by the Central Enquiry System to produce personalized information/responses to the inquirer.

Central Enquiry Expert System (CEES): It consists of the three key component of an expert system namely:

Inference Engine: The processes each of the domain knowledge stored in the knowledge base either as IF-ELSE rules or Artificial Neural network (ANN) to give response to a customer enquiry. In addition, it has access to the core banking interface to merge the facts in the transactional database, derived domain experience and customer enquiry thereby making a strongly proposition for the customer problem/trouble.

Knowledge Base: This houses the domain knowledge either as IF-ELSE rules or ANN to be used by inference engine during response generation.

User Interface: This gives access to other e-banking system modules to submit customer enquiry for processing. It responds to inquiry submitted directly to its interface from the thin clients and syncs its knowledge base with the local instances on the thick clients.

Local Enquiry Expert System (LEES): it functions as CEES however syncs with CEES periodically for updates; Inference Engine, Knowledge Base and Interface.

Conclusion

Still, banks need more than the right technology. They need to harness that technology to enable the right people to do the right things in an adaptable, change-ready, and responsive liquid workforce. The outcome of this research work proffers solutions that policy makers, executive of banks and financial institution can adopt in making strategic management decision. This work made an invaluable asset to banks' executives; in that it will afford them the opportunity to align their adoption of electronic banking to international best practices. This sub-module manages the users' biometric data for biometric verification during authentication technique and protects the financial transaction for more safety. We can as well make more flowcharts for user verification and make financial operations outside the bank premises, protect the user accounts, their authenticity in a better and safe process.

References

[1]. Daniel, E. 1999. Provision of Electronic Banking in the UK and the Republic of Ireland. *International Journal of Bank Marketing*, 17(2):72-82.

[2]. Westland, S, Viale, E. and Lillis, S. 1996. Accenture Technology Vision for Banking. Lead, Global Financial Services Research, Accenture. Accenture Technology Labs-Europe.

[3]. Forrester Research. 1999. E-Marketplaces Will Lead US Business e-Commerce to $2.7 Trillion. http://www.forrester.com/ER/Press/Release/0,1769,243,ff.html

[4]. Devlin, J. F. 1995. Technology and Innovation in Retail Banking Distribution. *International Journal of Bank Marketing*, 13(4):19-25.

[5]. Ovia, J. 2001. Internet Banking: Practices and Potentials in Nigeria.

[6]. Young, R. D., Lang, W. W. and Nolle, D. L. 2007. How the Internet affects output and performance at community banks. Journal of Banking & Finance, 31:1033–1060.

[7]. Berger, S. C., and Gensler, S. 2007. Online Banking Customers: Insights from Germany. Journal of Internet Banking and Commerce, 12(1). http://www.arraydev.com/commerce/jibc/2007-04/SvenBerger Final_PDF Version.pdf.

[8]. Meckbach, G. 1999. Rush to E-Commerce puts Customer Experience Last, Computing Canada (25:36)1.

[9]. Mizuho, T. 2015. Introduction of Soft Bank's Pepper robot to Tokyo bank branch. The Japan Times, July 17 2015. http://www.japantimes.
[10]. Krishnamoorthy, C.S. and Rajeev, S. 1996. Artificial Intelligence and Expert Systems for Engineers. CRC press.
[11]. Castillo, Enrique, Gutierrez, Jose M., Hadi, Ali S. (1997). Expert Systems and Probabilistic Network Models. Springer.
[12]. https://www.gtbank.com