

Queuing Theory Perspective in e-Banking and Service Performance: A Conceptual Approach

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Abstract: This study examines electronic banking and its effect on service performance, the application of queuing model in Nigerian banks. The emergence of global economy made an electronic banking an unavoidable tool used by banks in their business strategy and also serve as a strong catalyst for economic growth. This study adopted archival method in gathering and reviewing of extant literatures. The study found that there is a significant relationship between electronic banking and service performance. And that e-Banking became popular as a result of its convenience and suppleness and it accelerate transaction speed, efficiency and accessibility. Despite, it benefits as mentioned before, customers are still affected by long queues in the banking halls of which the causes are not far from power, network challenges, insecurity, inadequate skills and most importantly insufficient ICT products. This study therefore, suggests that critical infrastructure like power, network, security and ICT products should be strengthened as well as proper analysis of queuing model to ensure the effect of electronic banking and service performance in Nigeria with optimum satisfaction on the part of customers.

Key words: Customers, power, products, security, satisfaction, literatures

INTRODUCTION

The creation of electronic banking, help banks to make use of different types of technologies which help to assist the services they provide. The daily spread of new technology have effects upon how banks organise and deliver their services. The effects of the innovative technologies are felt by banks in every facet such as computing technology, communication technology and mass storage technology, accuracy of records as well as timely provision of services which are some of the areas in which banks have experienced continuous growth that help to remould the way banks deliver their services to satisfy customers (Salawu, 2008).

The use of e-Banking (ICT) concepts, methods, policies and operation strategies to banking services is a major importance subject matter and worries to all banks and of course a requirement for local and world wide aggressive willingness to compete. ICT openly impacts managers in such way they agree and design whatever products and services to be offered in the banking industry. However, e-Banking (ICT) continuously alter the manner in which banks as well as their corporate relationships are structured globally and the diversity of innovative devices obtainable to increase the speed as well as excellence in service delivery (Alawode and Kaka, 2011).

According to Alabi e-Banking the grouping of 'Information Technology' and 'Communication Technology' that unites computing through great and high speed communications connection transporting data, sound and video. On the other hand, Information Technology (IT) deals with the gathering, storing, handling and transference of information using electronic means. While 'Communication Technology' on the other hand is classified as the physical devices and software which connect several computer hardware elements and transport data from one physical location to a different location (Laudon and Laudon, 2001).

The improvement in information communication technology (e-Banking) presently in the world stirred the delivery of services in nearly all organisations. Nigeria banks are not exceptional, like other service industries have their own share of ICT influence. This study examines the effect of the implementation of ICT products on queuing experience in Nigerian banking industry.

The desires of all business organization is to satisfy their customers. But for the banking business, the customers are driven by the exactitude of records and appropriate delivery of services. The services standard of banks are measured thru the way transactions are properly completed because a long-lasting queue could lead to loss of friendly hope to succeed as well as make profit of which any of them is unpalatable condition for

banks. Though, more of management efforts are focused towards improving the situation. In order to try solving wait in line problems most managers do hire extra workers or secure more facilities to lessen the time customer spend on queue which must be measured with appropriate analysis of the waiting line situation so as to avoid rise in the employment cost as well as redundancy in both human and material resources (Salawu, 2008).

Salawu (2008) see the use of e-Banking as another strategy put into consideration through almost every managers for effectual time management for improving services performance in the bank as well as reducing the waiting time. Proper scrutiny of the queuing condition help most managers to define the type, nature and level of ICT products needed for effectiveness and efficiency.

The appropriate use of ICT is capable of increasing optimal performance in the bank services with the assistance of appropriate queuing investigation to decide the type, nature, degree and spread of ICT products necessary in banks. According to Gupta (2008), electronic banking is vital in the change drive of banks such as in the areas of products and services as well as the way in which they are delivered to customers. However, it is perceived as a vital and potent tool for expansion, growth, advancement of invention and increasing competition among banks. Looking at the important role of e-Banking in the growing drive of banks by Kannabiran and Narayan (2005), ICT has led to the development in business efficiency and service quality and therefore, entice customers as well as retain them.

Chang (2003) posits that e-Banking has significantly adds to the delivery channels of banks such as Automatic Teller Machine (ATM), telephon e-Banking, PC-banking as well as internet banking. As a result of ICT, the “transfer of funds, viewing and checking, savings account balances, paying mortgages, paying bills and purchasing financial instruments and certificates of deposits processes have improved significantly as a result of internet banking”.

With the development, it shows the efficiency of e-Banking in service delivery in the banking sector as it enables customer to manage their business all over the countries in both long and short distance. However, according to other scholars “e-Banking brought about transformation into the traditional banking practices to the extent of creating a paradigm shift in the marketing practices which result in positive service performance in the sector” (Malhotra and Singh, 2007; Gonzalez *et al.*, 2008).

Christopher *et al.* (2006) specified e-Banking to be a provider of a vital avenue for banks to selling their products and services perceived to be essential for the

success of banks thereby, improving immensely the quality of service and efficiency in the banking industry globally due to the combination of information and communication technology into banking set-up. Therefore, this study investigate the extent to which the e-Banking concept has impact service quality in the service delivery of Nigeria banks and to further offer better understanding of the basic concerns involving service performance in the electronic market place. This study, endeavours to draw a broad model to measure customer views of service performance of ICT products used by commercial banks in Nigeria. The study is defensible as it offers a model that incorporate the major proportions to be measured when assessing customer views of e-Banking services which permits bank managers to advance in knowledge and appreciate the significant and quality matters linked with e-Banking thus, creating for them a better chance to develop their service performance and improve customer satisfaction as well as gain a competitive advantage.

Literature review: According to “Electronic Banking (EB) is the newest delivery channel of banking services”. While refers to electronic banking as the use of the internet, a device that can be used to control a machine or apparatus from a distance through electronic network so as to provide services such as “opening a deposit account, transferring funds among different accounts and electronic bill presentment and payment” of which it can be presented in such a way that existing bank with physical offices can create a website to render services to its customers alongside the traditional way of delivery it services as well as create a virtual bank where the computer server will be kept in an office to be used as the legal address of the bank. The virtual banks enables customers the power to carry out their transactions such as (deposits and withdrawals) of funds through ATMs or other electronic devices put in place by other establishments of which service fee can be incurred.

Queuing theory is used as a mathematical tool studying waiting lines or queue. The theory allows mathematical analysis to different real life situations where customers queue for services “including the arrival at the (back of the) queue, waiting in the queue (essentially, a storage process) and being served at the front of the queue” (Odunukwe, 2013). The queue allows proper account and control of various performance measures such as the average time spent in the queue or system, the anticipated number waiting to be served or receiving services and the chance of meeting the system in a state such as empty, full having an accessible server or have to wait for some time before being served.

Conceptualisation of the relationships and propositions:

The concept of electronic banking has been distinct in many ways, according to Daniel (1999) and Karjaluoto (2002) the delivery of bank's information and services to customers through different delivery stages that can be used with diverse terminal devices such as, a personal computer and a mobile phone with browser or desktop software, telephone or digital television. Karjaluoto (2002) sees electronic banking as a greater concept than banking through the internet and "the internet is a main delivery channel for electronic banking and its value to customers and banks is continuously increasing" (Mattila, 2001).

It is imperative to recognise those things that influence people to receive new technologies and information systems and use them. Though, some concepts are accessible in this respect. Theories like decomposed theory of planned behaviour (Taylor and Todd, 1995), Theory of Planned Behaviour (Ajzen, 1991), Technology Adoption Model (Davis, 1989), Theory of Reasoned Action (Fishbein and Ajzen, 1975) and Theory of Innovation Diffusion (Rogers, 1983). These concepts are debated to explore the position of customers towards the use of internet banking services. Pedersen (2005) the concept of reasoned action is one of the most essential models that are used to explaining human conducts.

According to Laukkanen and Cruz (2008) behavioural intention towards the use of knowledge is described through people's attitudes to that manners and individual norms. If the behaviour is willingly controlled by the individual and can elucidate precisely the issues influencing technology implementation.

Eriksson *et al.* (2008) studied innovation implementation in the context of internet banking in Estonia which is one of the highest levels of internet banking in the world. Based on an investigation of 1831 bank's customers they note that comparative advantage and complication have the strongest influence in the adoption of internet banking. Apparent risk and compatibility have major but weak negative effects on adoption. And it was proved that the factors influencing the use of internet banking are exclusive and not mixed with factors influencing banking in general. A similar study carried out by Muniruddeen (2007) for Malaysia indicates that perceived security and privacy have the most important influence on the intention to use internet banking in a sample of 187 customers. Padachi *et al.* (2007) perceive that transfer to credit card account, inter account transfer, recharge mobile phones, payment to other personal account among others were the frequently used services among 200 customers in Mauritius. Ease of use, trust, cost of computers, internet

accessibility and security concerns are vital elements for the adoption of internet banking. Other models developed to measure customer perceptions of service performance put to use "face-to-face interaction between customers and the employees of service providers to gestate service performance measurement models however, developments in information and communications technology (e-Banking) have provided a podium by which companies can design, develop and deliver services that can be perceived by customers as superior" (Surjadjaja *et al.*, 2003). The numerous competitive advantages allied with the implementation of technology in service organizations, comprise the establishment of entry barriers, improvement of efficiency and increase in proceeds generated from innovative services. Service excellence is one of the key factors that defines whether electronic business is successful or not (Santos, 2003).

"The role of technology in service organizations as discussed by Kelley (1989) has been predominantly employed to reduce costs and eliminate uncertainties". In the service sector, technology is used to regulate services in order to cut down the link between employee and customer. More than enough of consumers choose to go for a technology-based service transfer over that of the employee. This developing movement raises some vital questions about the effect technology have on service performance and customer consumption levels.

The various information and communication technology strategies developed are to augment the promptness and excellence in service delivery as well as modifies how banking services are being carried out worldwide. However, Werthner and Klein identified, "electronic fund transfer at point of sale, electronic cheque, electronic letter of credit, electronic card, debit card, electronic billing and automated teller machine". While Agboola encapsulates ICT products relevant to banks into three groups which are.

Bankers automated clearing services: Automated clearing services involve the use of Magnetic Ink Character Reader (MICR) for cheque processing. MICR is a system that provides for encoding of cheques and documents with characters in magnetic ink so that they can be electronically read. MICR is capable of encoding, reading and sorting cheques for timely clearing.

Automated payment systems: Automated payment systems include products such as Automatic Teller Machine (ATM), plastic cards and electronic funds transfer. ATM is a remote cash dispenser that assists customers to have access to withdrawal outside the banking hall. Electronic cards are microchips that store

electronic cash to use for online and off line micro payments. They include credit cards, debit cards and store value cards. Electronic Fund Transfer (EFT) is an electronic oriented payment mechanism. That is an electronic tool that is used to effectively transfer the value of exchange process for goods and services, ideas or information from one bank account to another account in another bank. Electronic letter of credit, electronic cheque and electronic cash fall under automated payment system.

Automated delivery channels: These include interactive television and the internet. They offer an excellent environment for banks to experiment with the delivery of Electronic home and office banking. This technology provides for exchange of data between computer applications supporting the process of business partners by using agreed-to standardized, data format. This device enables customers to carry out transactions with their banks through connection between the customer's terminals in their homes and/or offices and the bank's computer system. VSAT (Very Small Aperture Terminal) is a satellite communications system that serves home and business users. Customers with such terminals are able to contact the bank for any form of information required. Information on bank balances, deposits into and withdrawals from accounts may be gotten through this medium.

Queue systems or "Q-matic systems": A queue is a line of waiting customers who require service from one or more server. Queue systems or "Q-matic systems" is said to be very useful in bringing orderliness to a disordered queues in the branches (Sangeetha, 1970). "The banks try to explore the innovate versions of Q-matic systems to market their services where customers look at TV screens to keep track of their number in the queue while still getting information about services" (Sangeetha, 1970). According to Salawu (2008), Queuing Model was used to appraise the standard of service in Nigerian banks and that queuing or waiting-line problem comes up anytime the call for customer service cannot be faultlessly co-ordinated by a set of definite service facilities. Correct calculation of the queuing situation can help in the appropriate usage of resources.

The simple assembly and mechanisms of a queuing system include "input source, service system, queue and queue discipline" by Salawu (2008). Hence, "the input source generates customers into the service facilities while the features of the input source are given by the size of the calling population, arrival size, arrival control, arrival distribution and the attitude of the customers" (Salawu, 2008). Therefore, good and appropriate

appreciation of these features will help in selecting or designing suitable ICT products to enable the ideal service.

Operational changes within the banking sector lean towards increasing pressure for enhancements in transfer of information between the service provider and the customer. Though in the time past, the course of long-term relationship development happened primarily over direct contact with staff. Zineldin (2000) added that though the necessity for relationship improvement is vital. however, it is not complete if it lacks the use of technology. Kapoulas *et al.* (2002) refer to this sensation as "technologicalship" marketing that was regarded as a mutualism of technology and marketing that has the tendency to develop the relationship-building procedure.

Commercial banks battered by the pressure of globalization and competition from nonbanking innovative ways to add value to the services. The question of what energies performance is at the top in understanding superior performance and therefore, striving for it. Considerable research efforts have gone into addressing this question, beginning from the strategic level and going down to operational details. A vital study bench marking the strategies of leading retail banks was investigated by the bank strategies of leading retail banks by Ngango *et al.* (2015). The study according to Ngango *et al.* (2015) is based on the views of heads of retail banks at all commercial banks established the link between marketing, operations, organizing excellence. The finding also led to the formulation of the "service management strategy encapsulated in the trail operational capabilities service quality-performance" according to Ngango *et al.* (2015) "the capabilities service quality-performance trail" is in turn, a motivated view of the service profit chain" described by Ngango *et al.* (2015) based on their investigation of successful service organizations.

However, for the case of Nigeria, despite the effort of banks trying to enforce the e-Banking services, Nigeria is still faced with some challenges which need to be addressed in order to promote effective and efficient banking performance and these are: the development of an efficient monetary transfer system in Nigeria has been hindered by so many factors. For instance, Nigeria is faced with infrastructural deficiency such as erratic power supply and communication link in some areas, inadequate skilled managers and essential tools on end users and client systems, inadequate e-Payment terminals such as ATMs, POS among others. The banking legislation set up sufficient e-Payment services because these factors are believed to hindered e-Banking services performance in the country thereby affecting banks performance. Though

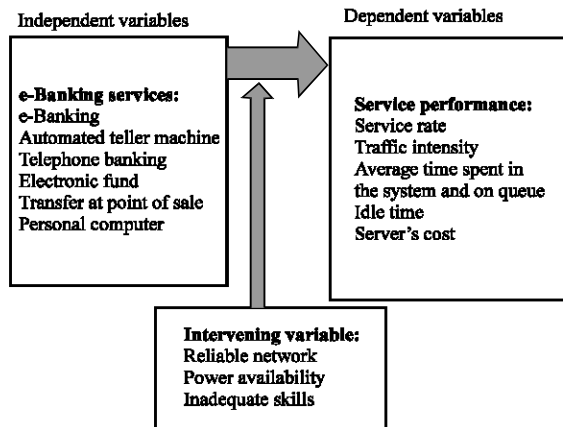


Fig. 1: The conceptual model

some academic research has been done in Nigeria in the area of performance of commercial banks however the researcher would like to examine e-Banking and its effect on service performance of commercial banks in Nigeria with the application of queuing model, despite the above factors in order to come up with recommendations to improving e-Banking services in the country.

MATERIALS AND METHODS

The conceptual model: The conceptual model presented in Fig. 1 the complex relational links between e-Banking and service performance relationship. The model anticipated in this study embraces the following ICT (e-Banking) products: ATM, telephone banking, electronic fund transfer and point of sales machines that possibly will shape customer sensitivities of service performance. The first part of the model hypothesizing the relationships between the use of e-Banking and service performance which covers the primary research focus of this study. The relationships between independent variables and dependent variables are conceptualized and widely tested to demonstrate the effects of e-Banking on banking service performance. They are analysed and propositions are made.

e-Banking and service performance: e-Banking encompasses the use of intelligent electronic device such as Personal Computer (PC), personal digital assistant (PDA), Automated Teller Machine (ATM) among others that allows customers, individuals or businesses, to access accounts, do business transactions as well as get information on financial products and services via a public or private system including the internet or mobile phone (Daniel, 1999; Ngango *et al.*, 2015). Customer's choose to make use of the diverse service delivery

networks in the banking sector in a complementary manner. And the usage of diverse service delivery electronic network depends on their appraisal of each network and in what way it adds to the "overall service offering". The service fulfilment is not only built on inaccessible service encounters and experiences, however, it will otherwise be built on the overall feelings of fulfilment. Therefore, building a relationship with customer according to Lang and Colgate (2003) can be accomplished through one of the media or possibly, a combination of them. Dabholkar (1996) and Sangeetha (1970) proposes that customer assessment of technology based service choices and the aim to using a specific choice are directly influenced by their awareness toward the features associated with the choice. Each electronic delivery network has its own features which differentiate every one of them from each other. Hence, it is fundamental to measure the superiority of each of them unconnectedly in order to get the exact depiction of customer views of e-Banking and service performance. The feature of all technology-based delivery network is helpful and of great importance to form the overall customer's perception of e-Banking and service performance and every one of them is considered as an influence in the suggested model. This study therefore, is to examine the overall effect of e-Banking on service performance in the banking system in general.

Proposition 1: There is a positive relationship between e-Banking and eervice performance.

e-Banking through Automated Teller Machine (ATM) and service rate: ATM is the most frequently used electronic distribution channel that allows customers to perform their main banking transactions such as deposits (transfer of fund from one account to another), cash withdrawals and check account balances at any time (24/7) without the need for a human teller. While service rate is the average rate at which customers can be served and is expressed as customers per time period. In other words, the number of customers that can be served at 100% operation by each individual server per unit time (usually per hour a day). The average service rate is given as:

$$\mu = \text{Service rate} = \frac{\text{Total number of customers}}{\text{Total number of unit time}} \quad (1)$$

However, what determines customer's evaluation of a product or service meeting their needs and expectations is the level of satisfaction derived from such product or service. Virtually all Nigerian banks faces the same challenges in this respects as regard customers

expectation and satisfaction. For example, the issue of the use of e-Banking through ATM is to help facilitates bank service rate and performance. However, customers are still somehow dissatisfied with the type of services they get due to inadequate facilities, unreliable network and constant power failure. These deficiencies in infrastructures such as ATMs slow down the rate of electronic transaction which affects the service rate and thereby having a negative effect on customer behaviour. This call for this study once more to investigate the use of e-Banking through ATM and service rate.

Proposition 2: There is a positive relationship between e-Banking through ATM and service rate.

e-Banking through Telephone Banking (TB) and traffic intensity: Telephone banking include banking services whereby customers of any financial institution can assess the use of a telephone line to link the financial institution's computer centre. The type of services customers can assess through telephone banking are such as "account balance funds transfer, change of pin and recharge phones and bills payment". While traffic intensity refers to the average load of each server in a queuing system, the proportion of time a server actually spends with the customers. In other words it is known as capacity or service utilization or system load factor and when expressed in percentage, it gives the measure of percentage of average time in which the attendant is busy. Traffic intensity is expressed as:

$$\rho = \frac{\text{Mean arrival rate } (\lambda)}{\text{Mean arrival rate } (\mu)} \quad (2)$$

Akingbade refers to "Telephone banking as a tele-banking devices which allow customers to transact banking business over the phone". And that TB has several benefits together for the customers as well as the banks. For the customers, it is convenient, expound access, provides expedient services and as such saves significant time. And as for the bank's view, it lowers meaningfully the costs of delivering telephone-based services than that of branch based services and offers also retail banking services twenty four hours a day even after bank closes thereby, constantly increasing bank productivity. Therefore, customers receive retail banking services at their offices and homes instead of going to the bank branch or ATM, this will help to reduce the load of each server in queuing system for such services that would have taken their time and comfort. And since, TB saves customer time and increase convenience for higher productivity. Again, this study examines the use of e-Banking through TB and traffic intensity.

Proposition 3: There is no significant positive relationship between e-Banking through TB and traffic intensity.

e-Banking Through Electronic Fund Transfer at Point of Sales (EFTPOS) and average time customer spent in the system and on queue: Electronic Fund Transfer (EFT) according to Fox and Beier refers to a part of e-Banking that uses computer and electronic technology as an alternative choice for bank check and any other form of paper transactions and it is introduced via devices such as, cards or codes which enables individual or those they endowed with authority to access their account. Chorafas and Akingbade defined Electronic Funds Transfer at Point of Sale (EFTPoS) as an on-line channel which enables customer to carry out transaction such as fund transfer outright from his/her bank account to business accounts while getting somethings at purchase points. And POS as a system that make use of a debit card to actuate an electronic fund transfer procedure. The use of EFTPoS to service customer's payments for their shopping demands rather than the religious burden of going about with cheques or cash withdrawals for shopping increases banking efficiency. Moreover, even after banking hours the system still system carry on and of course bank productivity continues without interruption. This also saves time and energy for customers that can be put to use for other productive activities rather than waste them in going to bank branches or ATMs to withdraw cash before going for shopping. Because this payment device is electronic oriented and allow customer's accounts to be credit electronically within 24 h, it is also designed such a way that can ease international transfer of money.

Average time customer spent in the system and on queue refers to the amount of time a customer spend in the system and in line to be served. The average number of customers in the system, the time it takes one server to complete customers service, the average time a customer spends in the system and on queue will determine whether customers are satisfied with the service performances of the bank. Average time customer spent in the system is given as:

$$W = 1/\mu \lambda$$

Average time customer spent on queue is given as:

$$W = PQ$$

Since, most of the services performed through EFTPoS are done conveniently outside bank branches

and ATMs, this study is to determine the use of e-Banking through EFTPoS and Average time customer spends in the system and on queue.

Proposition 4: There is no significant positive relationship between e-Banking through EFTPoS and average time customer spends in the system and on queue.

e-Banking through personal computer and idle time: Dauda and Akingbade, posits Personal Computer banking (PC) as a system that permits the bank’s customers to get information about their accounts through their own network which is normally done by installing the software on their personal computer. As soon as access is attained it allows customer todaa great deal of retail banking tasks. Due to increase in the knowledge of the position of computer literacy, there have being an increase in the use of personal computers. And as such have increase positively supports the growth of PC banking that effectivly forms a branch in the home or office of customers which eventually provides 24/7 h services. The benefits are usually not different from that of telephone banking and (ATMs). “Along with significant growth in the usage of mobile phones in banking practice, personal computers have also come to the fore which to an even greater extent facilitate and modernize banking service provision. In an information society this communication instrument plays an irreplaceable role and is indispensable for the present day banking sphere. The area of electronic banking realized through personal computers can be divided into home banking, internet banking and mail banking”.

Idle time: Refers to an unproductive time on the part of employees or machines as a result of factors beyond their control. It is associated with a time a customer is waiting, or when a piece of machinery is not being used but could be. Idle time could also be associated with computing and in that case refers to processing time.

Prior to discussion as regards unreliable network and power failure, this deficiencies in infrastructures such as computer slow down the rate of electronic transaction that can lead to idle time. This call for this study once again to investigate the use of e-Banking through personal computer banking and idle time.

Proposition 5: There is a positive relationship between e-Banking through PC and idle time.

The use of e-Banking services and server’s cost: As discussed before that e-Banking encompasses the use

of intelligent electronic device such as Personal Computer (PC), Personal Digital Assistant (PDA), Automated Teller Machine (ATM) among others that allows customers, individuals or businesses to access accounts, do business transactions as well as get information on financial products and services via a public or private system including the internet or mobile phone (Daniel, 1999; Ngango *et al.*, 2015). Server’s cost is the labour cost of service including any expenditure incurred as a direct consequence of providing services and customer waiting cost is based on the average number of customers in the system. Therefor:

$$\text{Total cost} = W_c \frac{\lambda}{\mu - \lambda} + S_c$$

Where:

- W_c = Waiting cost
- λ = Arrival rate
- μ = Service rate
- S_c = Service facility cost

According to James the rate of commission or charges enforced by banks for using some of the e-Banking services such ATMs and online transfer is so highand thus discourage customers from using suchdevices for exchange of transactions. The study therefore, examine the use of e-Banking services and server’s costs.

Proposition 6: There is a positive relationship between the use of e-Banking services and server’s costs.

e-Banking through Automated Teller Machine (ATM) and traffic intensity and average time spent in the system and on queue: “Automated Teller Machines (ATMs) is a combination of a computer terminal, record-keeping system and cash vault in one unit, permitting customers to enter the bank’s book keeping system with a plastic card containing a Personal Identification Number (PIN) or by punching a special code number into the computer terminal linked to the bank’s computerized records 24 h a day. The combined services of both the automated and human tellers imply more productivity for the bank during banking hours. Also, as it saves customers time in service delivery as alternative to queuing in bank halls, customers can invest such time saved into other productive activities. ATMs are a cost-efficient way of yielding higher productivity as they achieve higher productivity per period of time than human tellers”.

Due to deficiencies in infrastructures such as, ATMs long queues still takes the other of the day in the banking halls as well as ATMs stand. This therefore, affects the service utilization or system load factor and the level of

efficiency of the queuing system. It also affects the average time customer spends in the system and on queue, waiting to be served.

Proposition 7: There is positive relationship between the use of ATM and traffic intensity.

Proposition 8: There is positive relationship between the use of ATM and average time customer spend in the system and on queue.

The above concept implies that e-Banking through, automatic teller machine, telephone banking, electronic fund transfer at point of sales, personal computer improves banks performances and service rate, traffic intensity, average time customer spent in the system and on queue if other factors remain constant. Such factors as; network coverage, reliable internet service provider and adequate skills on how to use the system, government view on IT, power supply amongst other influences.

RESULTS AND DISCUSSION

Theoretical framework

Queuing theory: Queuing theory is one of the most vital, appreciated and debatable tool that is universally used operational researchers because of its application to different areas of profession such as telecommunications, traffic engineering, computing and design of factories, shops, offices, banks and hospitals.

Queuing theory according to Odirichukwu *et al.* “branch of operations research, also known as stochastic service system theory or wait for the line theory is use to study the object of a service request generated by the randomness of customer arrivals and services rate”. For the purpose of research the followings are the various performance metrics of the theory put together:

- The average queue length L_q of customers in the system
- The average waiting time W_q of customers in the system
- The average length of stay W_s in system
- The average number of customers L

The other respective regularly used quantitative indicators include:

- Average arrival rate
- The average service rate
- The average service time

Odirichukwu *et al.* Refers to:

$$X/Y/Z/A/B/C. X$$

Where:

- X = The distribution of interval between successive arrivals
- Y = The distribution of service time
- Z = The number of help desk; a refers to system capacity limitations
- B = The number of client’s source
- C = States the service rules

The arrangement of banking customer service system is in the order of parallel multi-server system, however, the common practice in the banks these days is to use the window on account of automatic calling system; nevertheless customer’s service needs also came in to the same queue. To achieve easy analysis of issues, can be multi-server as a whole and so the queuing system is proper for single-queue model.

Patel *et al.* (2012) indicate that expected waiting time in the queue, the average waiting time in the system, the expected queue length, the expected number of customers served at one time, the probability of balking customers as well as the probability of the system to be in certain states are more or less of the analysis derived by using queuing theory.

Performance measurement: Ngango *et al.* (2015) refers to performance measurement as the course of steady and orderly manner of collecting data, analysing them and recording the reports to be used by an organization so, as to be able to follow up its resource utilization and the results gotten through the produced goods and services. Also, they postulated performance to be evaluated through the usage of the Balanced Score Card (BSC) it talks about the other facets which do not include financial measurements however, addresses the intangible and intellectual effects which include high quality services or noble customers that are so, significant to the success of the business. Measuring performance is aimed at enabling employee’s development, form major reasons such as providing feedback and direction in order to set the performance goals, recognise training needs and requirements so as to make available input for managing pay administration, recompense and promotion. The followings are the steps to be followed for effective performance: recognising the main performance areas to set annually objectives for individual basic performance indicator, identifying of the importance of the qualities of effective performance, intermittent evaluation of performance and dialogue the performance with workforces and recognise training and development needs.

Business performance dimensions: According to Ngango *et al.* (2015) competitiveness in business is defined as a comparison amid a firm's performance and average performance in the business with respect to relative market share and position, growth in sales as well as customer base measurement. Also, Ngango *et al.* (2015) describes financial performance with respect to profitability, liquidity, capital structure and market ratio, quality of services as regards dependability, receptiveness, appearance, cleanliness and neatness, well-being, sociability, communicate, good manners, admittance and accessibility of security, flexibility regarding delivery promptness and description, resource utilization concerning productivity and efficacy, invention.

CONCLUSION

As information technology produces vital changes in the nature and presentation of skill in business. e-Banking (ICT) provides operational strategic and tactical tools for organizations including banks such that if well applied and used, could promote and strengthen their competitive advantages. The explosion of the different e-Banking tools like ATM is a key stream communication media and as a substructure for business transactions generates a wide choice of strategic inferences for businesses in general as well as for the banking industries in particular (Ngango *et al.*, 2015). Therefore, this research assumes that customer's perceived e-Banking products for service performance is based fundamentally on these elements: ATM, telephone banking, electronic fund transfer at point of sales and personal computer banking services, service rate, traffic intensity. Average time customer spent in the system and on queue, idle time and server's costs. The e-Banking system has impacted greatly on bank performance. In other words, e-Banking has enhanced profitability, bank asset, improved bank management quality as well as promoted bank growth and expansion. The contributions of this research show a significant relationship between e-Banking and service performance of banks in Nigeria.

SUGGESTIONS

However, for more effective and efficient performance/service delivery of the banking system in Nigeria, the followings should be put into consideration: for easy accessibility of e-Banking by customers, ATM for example, should be made available in different locations to ensure maintenance of quick service and convenience thus, improve bank operations. And at the

same time, constant servicing of the machine will make the services more reliable for usage, the banks should endeavour to subscribe to reliable internet providers, the banks should subscribe to employing expert and experienced personnel on network management to ensure consistency in network. Also, clients should be trained on how to use the service effectively and efficiently, there is need for constant power backup to avoid the problems of power interruptions and fluctuations which slow down transactions process and finally, an appropriate application of queuing models is ensure to solve the problems of waiting line.

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