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# TECHNOLOGY TRENDS IN ACCOUNTING AND SERVICE PRODUCTIVITY: EVIDENCE FROM LISTED INTERNATIONAL BANKS IN NIGERIA

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**Abstract**

Proliferation of technologies and the rise of (global) inter-organizational networks generate more complexity between firms, triggering the demand for professional and business services to reallocate firm operations and remain competitive. This paper examines technology trends in Accounting and service productivity of listed international banks in Nigeria. The study adopted descriptive survey research design. The population of the study was the entire customers of the listed international Banks in Nigeria such as, Access Bank, FCMB, Fidelity Bank, First Bank, GTB, Union Bank, UBA and Zenith Bank. Purposive sampling method was adopted to select fifty (50) customers from each Bank, making a total of four-hundred customers. Primary data collected using structured questionnaire was analysed using multiple regression analysis. Findings revealed that artificial intelligence had a positive and significant effect on service productivity with the p value (0.02) less than 0.05 and a coefficient of 0.107; also e-payment had a positive and significant effect on service productivity of selected listed deposit money banks in Nigeria, the p value (0.00) is less than 0.05 with a coefficient of 0.316. The paper recommends further investment in technology infrastructure and proper maintenance for capacity utilization.

**Keywords**: Accounting, technology trends, international banks, service productivity

**JEL Classification Codes**: M11; M15; M41

## 1. Introduction

Technology continues to be a primary catalyst for change in the world. Technology advances give businesses, governments, and social-sector institutions more possibilities to lift their productivity, invent or reinvent offerings, and contribute to humanity's wellbeing. And while it remains difficult to predict how technology trends will play out, executives can plan ahead better by tracking the development of new technologies, anticipating how companies might use them, and understanding the factors that affect innovation and adoption (Chui et al, 2022) According to Zhavoronkova et al (2021) The country's ability to create and implement its own innovations and develop high technologies is becoming a key resource for sustainable economic development, financial stability, and competitiveness. Accountants

have always exploited emerging technologies to help them to complete their tasks more accurately, quickly or simply: from the incised clay tablets of the Sumerian scribes, through the adding machines of the 19th century, to the calculators and computers of the 20th century. But all of these technology developments were simple propositions by comparison with the myriad technologies that are now rapidly reshaping the worlds of business and accountancy (ACCA, 2013). Accountants in practice and in the finance function are part of that connected world. This is changing the ways in which they communicate and collaborate with those in the businesses they work with and for, and shaping new working patterns. It is providing accountants with the opportunity to automate and de-skill time-consuming and repetitive work and focus on higher value work, so that they can consolidate their role as advisers on finance and business.

According to Continuum Learning, productivity is a concept used to manage production efficiency in manufacturing. It is normally stated in a simplified form as the effective transformation of input resources into outputs, with a constant quality assumption. In services, productivity is related to how effectively input resources in a service process are transformed into economic results for the service provider and value for its customers. However, the problem with being an effective service organization is that productivity and perceived service quality are inseparable phenomena. Improving productivity may have a neutral or positive impact on service quality, but equally well it may reduce perceived service quality. If the latter happens, customer satisfaction with quality declines, customer value goes down, and the risk that the firm will lose customers increases.

Bansal *et al* (2015) posit that for service organisations, it is important to understand that merely cost cutting may or may not lead to enhancement in the service productivity. The organisation should focus to improve the consumer satisfaction while attempting to propose any cost reduction measure in service production and transaction. If any attempt of cost cutting results in the deteriorating perception of the service quality, thereby leading to a reduced customer satisfaction, they may start looking for other options in the service provider's category. This would result in decreased profitability of the service firm in question and hence, end up losing its productivity. It is important to note here that the cost cutting may have actually enhanced the productivity but if it perceived as reduced quality by the consumers, the firm loses its customers. Therefore, the level of satisfaction of the consumers and the level of perceived service quality are the determinants of Service productivity.

However, the rise of technology, infused services creates significant challenges for measuring (digital) value creation. Nevertheless, although technological advancements progress and services become more pivotal to economic growth, service productivity is declining in many developed countries (OECD 2021; Schweikl & Obermaier 2020), highlighting the need for further research to address these puzzlingly low service productivity levels (Andreassen 2021).

Bulo and Nenbee (2013) opined that the banking industry of the 21st century operates in a complex and competitive environment characterized by ever-changing economic and financial environment with information and communication technology (ICT) at the center of this change. Only banks that overhaul the whole of their payment and delivery systems, and apply ICT to their operations are likely to survive and prosper in the new millennium (Agboola, 2006; Woherem, 2000). Automation is a by-product of the innovation and the banking industry is expected to link with the development in ICT to survive. However, the quest for survival, global relevance, maintenance of existing market share and sustainable growth seems to have made exploitation of the technological trend devices. The use of automated devices is a sin-qua-non to a healthy banking industry.

According to Dobmeier (2016) managers in service industries aim to achieve high efficiency and high quality at the same time to be profitable. This dual emphasis might lead to a trade-off as a focus on efficiency often results in decreasing service quality and vice versa. Even as this trade-off is generally acknowledged, research on service performance measurement often focuses only on either operational efficiency or service quality. A research stream that deals with the problem of achieving both efficiency and effectiveness is service productivity. Also, United Capital Plc said "most recent data from the Nigeria Inter-Bank Settlement System (NIBSS) revealed that the total value of cashless transactions in the Nigerian economy declined by 4.8% in February 2023 to print at ₦37.7 trillion relative to ₦39.6 trillion recorded in January 2023; the key driver of the observed decline in the value of e-transactions was the increased failed payment experienced in February 2023, particularly owing to a short-fall in network infrastructure. The increasing traffic arising from customers' e-transactions which is due to the CBN's currency redesign policy has led to infrastructural collapse as most transactions were left unexecuted, thereby leaving customers stranded. The report observed that the 41.3% increase in the use of e-payment gateways within the reviewed period could

not translate into increment in the value of electronic transactions.

The contemporary classification of banks in Nigeria are: International Banks, National Banks and Regional Banks. National banks are banks with international presence; the choice of international bank is based on the fact that they are expected to invest more in digital infrastructure. These banks are: Access Bank, First City Molument Bank (FCMB), Fidelity Bank, First Bank, Guarantee Trust Bank (GTB), Union Bank, United Bank for Africa (UBA) and Zenith Bank

Even though numerous literatures pointing to the influence of emerging technologies on financial services, productivity and accounting profession abound; to the best of the researcher's knowledge, no such study has attempted to evaluate the extent to which these emerging technologies impact on service productivity, which places emphasis on quality and customer satisfaction. This paper therefore evaluates technology trends in accounting as a panacea for service productivity of listed international Banks in Nigeria.

## 2.0 Literature Review

### 2.1 Service Productivity

Gronroose and Ojasalo (2000) report that the productivity of a process is related to how effectively input resources are transformed into value for customers. For the needs of manufacturers of physical products there are widely used productivity concepts and measurements instruments. However, in service processes the underlying assumptions of these concepts and models do not hold. For example, manufacturing-based productivity models assume that an altered configuration of input resources in the production process does not lead to quality changes in outputs (the *constant-quality assumption*). However, in a service context changes in the production resources and productions systems do affect the perceived quality of services. Therefore, using manufacturing-oriented productivity models in service contexts are likely to give managers wrong directions for action.

It has been claimed that productivity is low in many service organisations and that services are produced with excess resources and at unnecessarily high costs. With another resource structure the service provider could cut costs and still produce as much as earlier. For example, banks are urging their customers to use ATMs, PCs and the Internet to take care of regular bank transactions instead of coming to a bank in person taking up the bank employees' time. The reason for these changes in the resource structures is of course to shift from more expensive resources in the service process to more cost-effective resources. If customers perceive that they get the same quality or better quality than before, these changes have been successful. They

have been *cost effective* and at the same time they have maintained or sometimes even improved customer value and the firm's *revenue-generating capability*; however, cost-cutting changes in the resources used may equally well have the opposite effect. Perceived quality may deteriorate, and customers become dissatisfied with the value they get and start to look for other options. The service provider's revenue-generating capability declines, as less value for customers than before is created in the service process.

Hofmeister et al. (2023) analyse 190 publications focusing on service productivity to link previously dispersed studies as a next step in theory development. By clustering existing service productivity research into macroeconomic, mesoeconomic, and microeconomic dimensions, the study reveals that much progress has been made in advancing the open-ended theory of optimal service productivity. Reviewing key insights from the existing literature, they show that the majority of service productivity research adopts a one-sided industrial perspective that primarily focuses on firm productivity. Dongjun, et al. (2018) investigate the relationship between productivity and customer satisfaction and its effect on a firm's performance. A sample of 127 firms from data sets of the American Customer Satisfaction Index and COMPUSTAT was collected; the study used ordinal least squares analysis and path analysis. Findings verified that a positive relationship exists between productivity and customer satisfaction and that service productivity and customer satisfaction are positively associated with a firm's performance. Gianfrano et al. (2016) assert that productivity measurement poses a challenge for service organizations. Conventional management wisdom holds that this challenge is rooted in the difficulty of accurately quantifying service inputs and outputs.

## 2.2 Technology Trends in Accounting

Srinivas (2021) reports that the accounting world is ever changing due to the rapid advancements in information technology; today's corporate environment is tremendously dynamic. Big Data, Data Analytics & Forecasting Tools, Mobile Technologies, Automated Accounting Processes, Cloud computing platforms, Block Chain, and Forensic Accountancy, all of which are geared to meet a wide range of business requirements. The new accounting technologies are reducing the work of accountants and improving better decision making through their automated processing systems by proving the data quality; beyond this, the new accounting technologies also provides data visualisation and eliminate unnecessary data through data cleaning and

data profiling tasks. ACCA (2013) assert that the internet and cloud-based technology resources are reshaping myriad aspects of business: from the way we finance resource and develop new and existing enterprises, to the way we create, buy and sell products and services. Nothing in the future is certain, and the unforeseen interactions between these technologies promise to be both interesting and challenging.

### 2.2.1 Artificial Intelligent

Artificial Intelligence AI coined by John McCarthy in 1956. Was defined as "the science and engineering of making intelligent machines." AI is the branch of computer science which deals with the study and design of intelligent agents that perceives its environment and takes actions which maximize its chances of success. Artificial intelligence (AI) describes a machine or software that can demonstrate behaviour indistinguishable from that of the human brain. This is not yet possible but there are many examples of software that can demonstrate limited 'intelligence' (depending on how you define this) (ACCA, 2013). Artificial Intelligence (AI) is the ability of a digital computer, computer-controlled machine, or robot to do tasks that would normally be performed by intelligent entities such as humans (Reagan, 2018). Artificial intelligence, according to Dinesh et al. (2019), is any task completed by a computer or machine that would normally require a human to use intelligence to complete.

Artificial Intelligence is being implemented in almost every facet of society, including accounting and finance. The advantages of using Artificial Intelligence to facilitate financial transactions cannot be overstated, as its implementation will ensure accuracy, reliability, and long-term revenue creation while also positively impacting value for money (Samuel & Rhuoma, 2020). Artificial intelligence is sought to have transformative power of modern economies (Ernst, 2021). According to Aravala et al. (2020) AI moved beyond the tag of buzzword and penetrated as an essential entity in this competitive arena. Artificial intelligence created a revolution globally at an amazing pace with the raising awareness about the positive impacts on organizational efficiency. AI drawn immense visibility with the advent of Internet of Things (IOT) at forefront by facilitating cultural shift in terms of providing promising insights in order to ensure high amount of accuracy in the desired output.

Perifanis and Kitsios (2023) stated that for organizations, the development of new business models and competitive advantages through the integration of artificial intelligence (AI) in business and IT strategies holds considerable promise. Czarnitzki, Fernandez and Rammer (2022) exploit unique survey data on firms' adoption of AI

technology and estimate its productivity effects with a sample of German firms. Employ both a cross-sectional dataset and a panel database. Findings revels positive and significant effects of the use of AI on firm productivity.

Marcello et al. (2023) opine that Artificial intelligence (AI) is increasingly embedded into service firms' operations. However, production systems and operations management scholars have not yet examined if AI-empowered service operations are positively judged by service customers; the study draws on the three-factor theory of customer satisfaction applied to online review data. Findings reveal that the effects of customer interaction with mechanical AI on customer satisfaction with service operations are asymmetric: positive customer interaction with mechanical AI positively and significantly influences overall customer satisfaction with AI-empowered service operations, whereas negative customer interaction with mechanical AI does not significantly alter customer satisfaction. Agarwall et al. (2021) assess the difference in operational performance in pre and post AI era. The study found that artificial Intelligence has a significant influence on companies operating cost as well as operating profit.

### 2.2.2 E-Payment

According to World Economic Forum (2018) modern technological developments have altered the way consumers interact with financial institutions, disrupting the payments system. The rise of the internet, digitization, shifting consumer preferences and, in some but not all cases, regulatory reform, has accelerated the uptake and use of electronic payments (e-payments). The Committee on Payments and Market Infrastructures (CPMI) of the Bank for International Settlements defines e- payments as payments in which the transmission of the payment message and the availability of final funds to the payee occur in real time or near real time and on as near to a 24-hour and 7-day (24/7) basis as possible. E-payment services are how transactions involving different types of payment instruments are processed and through which transfers of funds are managed. While the term "e-payments" encompasses a broad range of instruments, their distinctive feature is that the whole transaction is carried out through electronic means (World Economic Forum, 2018). Digital or electronic payments are money transfers from an account related to the buyer to another related to the provider of a good or service, using a digital device to transfer the information (CEPAL & CENPROMYPE, 2022) (CEPAL, 2022). E-payments can be widely defined as payments that are initiated, processed and received

electronically (European Central Bank, 2004) Nteegah and Oladosu (2022) examined the effect of electronic payment system channels on the performance of deposit money banks in Nigeria from 2010Q1 to 2020Q4. Electronic payment system channels were proxies by Automated Teller Machine, Point of Sale, mobile payment and web-based payment while performance of deposit money banks was measured by deposit penetration. Time series properties of the data were tested using the Augmented Dickey Fuller (ADF) and Philip Perron (PP) Test. The result of the ARDL estimation showed that: Automated Teller Machine had a positive and significant effect on deposit penetration. Mobile payment also had a positive and significant effect on deposit penetration. The result further revealed that web-based payment had a positive and significant effect on deposit penetration while point of sale had a positive but non-significant effect on deposit penetration.

Alduasi and Al-Smadi (2022) explores the challenges facing the current e-payment systems and investigates the main factors that support using the e-payment system. The study used a cross-sectional approach. An online survey was conducted on Yemeni consumers as part of the collection of data. Statistically, the intention to use e-payment systems was significantly and positively influenced by performance and effort expectancies and social influence. In contrast, facilitation conditions are significantly and negatively correlated with behavioral intention. This is attributed to consumers' view of the infrastructure of Internet services, which does not contribute to the behavioral intention and acceptance of using electronic payment in Yemen. YouBin and Tinfah (2022) assert that the increasing speed of e-payment adoption in Malaysia is driven by multiple factors: Generation Z (individuals born between 1990s to early 2010s), easy payment methods, open banking ecosystem, rewards incentive, network, and the onset of COVID-19 in 2020.

## 2.3 Theoretical Review

This study is underpinned by two theories: Transaction cost theory and theory of optimal service productivity.

### 2.3.1 Transaction Cost Innovative Theory

The transaction cost innovation theory was developed by Hicks and Niehans in 1983, and the theory stated that the main motive for embracing financial innovation in firm is the reduction of transaction cost. According to the theory, transaction costs play an essential role with respect to innovation and innovation is the response of the advance in technology which caused the transaction cost to reduce. In this case, the theory clarifies its connection to other feature of business development, that the main rationale of financial innovation in

financial organization is service productivity. According to Hick and Niehans (1983), the reduction of transaction cost could inspire financial innovation and they also believe that money related innovations decrease the costs involved in making transactions.

The theory explained from another perspective that the radical motive of financial innovation is the firms' purpose of earning/increasing shareholders' wealth or benefits. Transaction costs Innovation theory is also relevant in different context. For example, the application of Internet connected Information Technology (IT) can significantly trim down a firm's transaction costs as it facilitates efficient coordination, management and use of information. Mobile or Internet connected IT may further lower transaction costs as it offers also virtual access to the firm's internal database and other relevant sources of information

### 2.3.2 Theory of Optimal Service Delivery

The theory of service delivery guiding the present research has been developed over several years. According to Levin and Roberts (1976) the theory assumed that the interaction between a service program and its clients or patients is at the heart of the service delivery process. The two sectors of the system, one representing the service program, the other representing the client or client population, are linked together through services that are rendered by the program in response to demands generated by the client. The circles that represent the two sectors are, in reality, highly complex and differentiated; each contains many variables that operate through time and may cause the client to demand services and the program to respond by rendering these services in varying quantity. A variety of circumstances may call the system into active operation. Forces either within the client or impinging upon him or her from outside the system, such as economic emergency or serious illness, have the potential to produce a significant need for services. The first articulation of the theory emerged in the context of a multiple-year study with Hanover Insurance Company (Kim, 1989; Senge, 1990a; Senge, 1990b; Senge and Lannon, 1990; Senge and Sterman, 1992). That study focused attention on the rising costs of claims settlements and litigation and the declining overall financial health of the property and casualty insurance industry.

For over 50 years, there was a rising trend in 'loss ratios' (settlement costs and litigation costs relative to premiums) and a decline in 'expense ratios' (operating expense relative to premiums) for the property and casualty insurance industry. Within the industry, rising settlement and litigation costs are often blamed on external factors, such as the high number of lawyers in the US, increasing

litigiousness of society, the tendency for juries to side with victims rather than 'big business' insurers, and increasing risks born of technological complexity (Huber, 1987). Additionally, one might interpret the falling expense ratios as evidence of increasing productivity and management innovation. The study illuminated internal sources of the problems and suggested a different explanation for the falling expense ratios.

The central hypothesis that emerged from the study is that rising settlement costs and falling expense costs are causally related: there has been a long-term trend of underinvestment in service capacity that has resulted in erosion of quality of investigation, negotiation, and customer service, resulting in rising costs of settlement and litigation. Moreover, the savings in expenses have been more than offset by the increases in costs of poor quality. The consequent long-term increase in total costs and erosion of profitability have led to increasing focus on expense control and productivity (normally defined as customers served per service person per time unit), thereby reinforcing under investment in service capacity.

**2.4 Empirical Review**

Smith (2024) provides an in-depth exploration of the multifaceted impact of technology on sales performance within B2B companies. It delves into how digital transformation and the integration of advanced technologies such as artificial intelligence, machine learning, and big data analytics have revolutionized traditional sales processes, enhancing efficiency, customer engagement, and ultimately, sales outcomes. Patel et al. (2024) assessed how cutting-edge medical innovations from the pharmaceutical and healthcare sectors as well as contemporary technologies is able to understand the connection between different formulations and process factors. Block chain is an intricate database that secures data to keep the system safe from hacking or alteration. The use of cloud computing technology enhances drug discovery.

Sodokin et al. (2023) explored the impact of e-commerce on company productivity by considering both formal and informal sectors. It leverages data from the 2018 General Business Census of Togo. By applying endogenous switching regression and smoothed instrumental variable quantile regression tools, the study demonstrates that online businesses can significantly increase productivity, particularly in firms within the informal sector. Chin et al. (2022) examined how the evolution of digital transformation (DT) in the service industry through real-world application cases and articles published in journals that are related to DT. The research collected 2,897,024 papers published in Scopus journals from 1991 to March 4, 2022.

From this population of papers, 2,683 were reclassified and finally, 1831 were chosen for examination. Among these papers, 437 DT-related articles that focused on service fields were analysed through word cloud analysis of keywords. The paper delineated evolutionary processes of DT in service sectors by reviewing and comparing both the commonalities and differences between the practice (actual cases) and research (published journal articles) of DT.

Hsieh and Rossi-Hansberg (2021) assert that the U.S. has experienced an industrial revolution in services. Firms in service industries, those where output has to be supplied locally, increasingly operate in more markets. Employment, sales, and spending on fixed costs such as R&D and managerial employment have increased rapidly in these industries. These changes have favoured top firms the most and have led to increasing national concentration in service industries. Top firms in service industries have grown entirely by expanding into new local markets that are predominantly small and mid-sized U.S. cities. Market concentration at the local level has decreased in all U.S. cities but by significantly more in cities that were initially small. These facts are consistent with the availability of a new menu of fixed-cost-intensive technologies in service sectors that enable adopters to produce at lower marginal costs in any markets. The entry of top service firms into new local markets has led to substantial unmeasured productivity growth, particularly in small markets.

Lai, Wang and He (2023) assert that the digital transformation of producer services contributes to the development of manufacturing technology innovation through an intermediary role, providing an important policy basis for the effective implementation of China's innovation-driven development strategy and digital transformation. The study adopted panel data collected from 30 provinces, autonomous regions, and municipalities in China from 2013 to 2020 and applied a spatial Durbin model that included mediating effects to examine the mediating transmission paths of the effect of the digital transformation of producer services on manufacturing technology innovation. Findings showed that: (i) The digital transformation of producer services positively affects local manufacturing technology innovation and generates positive spatial spillover effects on neighbouring regions.

Granadino et al. (2021) examined the impact of ICT on the service sector productivity and employment in the Philippines through quantitative research methods. Findings on the relationship between ICT and Productivity show that all the independent variables have a linear relationship on the dependent variable

while the findings on the relationship of ICT and Employment, only Labor Force Participation Rate shows a nonlinear relationship to the dependent variable. Sala et al. (2019) addressed the employment of cutting-edge technologies for product-service systems (PSS) through the definition of a comprehensive classification framework embracing both business and technology-related dimensions taken from literature. Assert that technologies have been increasingly playing a key role in enabling new product and service offerings.

Ezzaouia and Bulchand-Gidumal (2022) investigated the impact of IT adoption on hotel performance (HP) in Morocco, a developing country. The proposed research model includes two constructs, namely, employee performance and financial performance. A quantitative approach was used, and the sample includes 100 general managers from three-, four-, and five-star hotels. The hypotheses were tested using a partial least squares (PLS) method, and findings indicate that the major impact of IT adoption on HP can be seen in employee performance rather than in financial performance. The results also revealed a significant relationship between employee performance and financial performance in hotels, Fayomi et al. (2019) observed that technological innovation which implies the development of new thoughts, items, administrations, and procedures that will improve technology solutions has provided a better lifestyle by improving the standard of living in the area of production. Due to the rapid developments made by human kind in terms of scientific and technological innovations. Edu et al. (2022) identified several effects of technological change on customers' satisfaction of the banking industry using 245 copies of questionnaire distributed to Zenith bank headquarters customers in Lagos. The result showed that technological change significantly affects customers' satisfaction.

Zhixin et al. (2021) studied the impact of the application of IT technology on service marketing using TikTok as an example. The article adopted qualitative research methods, to explain the technical application and influence of TikTok in the service marketing process. Through research, the application of IT technology enables users to have a good experience, enhances the user's sense of participation, and thus improves word of mouth. The application of IT technology has dramatically promoted service marketing.

## 3.0 Methodology

The study adopted descriptive survey research design. The population of the study was the entire customers of the listed international Banks (Access Bank, FCMB, Fidelity Bank, First Bank, GTB, Union Bank, UBA and

Zenith Bank) in Nigeria. Purposive sampling method was adopted to select fifty (50) customers from each Bank, making a total of four-hundred customers. Primary data through well-structured questionnaire was adopted; and the data was analysed using multiple regression.

**Model Specification**

The coefficient of the variables estimated the residual impacts of the independent variables on service productivity. The dependent variable is service productivity (SP), while the independent variable is technology trend which has the following proxies: Artificial intelligent (AI), and E- Payment (EP).

The model is specified in econometric form as follows:

$$SP = f(TT) \quad (3.1)$$

$$SP = \beta_o + \beta_1 AI + \beta_2 EP + \mu_i \quad (3.2)$$

Where: TT = an indicator representing Technology trend, SP = Service productivity; AI = Artificial intelligent; EP = E-Payment; $\beta_o$ = a constant and $\beta_{1-2}$ = coefficients of independent variables; μ= Stochastic error term; *i*= Cross sectional; and *f* = Functional relationship.

**Table 3.1.: Reliability Statistic test for variables**

**Reliability Statistics**

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|
| .987 | .988 | 24 |

**Sources: SPSS 23 output, 2023.**

Using the rule of Geory and Mallery (2003), the Table 3.1 shows the reliability test of the variables. The result for the variable shows an excellent result of 0.987. Based on this we assumed that the degree to which an instrument yields is consistent.

## 4. Data Presentation and Analysis

**Table 4.1 Effect of Artificial Intelligence on Service productivity**

| AI | Artificial Intelligence | SA | A | U | D | SD |
|---|---|---|---|---|---|---|
| AI1 | Use of artificial intelligence has facilitated delivery of goods services to the customers | 173 (46.4%) | 165 (44.5%) | 32 (8.6%) | 1 (0.3%) | 0 (0%) |
| AI2 | It has improvement in the accuracy reliability and revenue and revenue generation in our bank | 271 (73%) | 92 (24.8%) | 8 (2.2%) | 0 (0%) | 0 (0%) |
| AI3 | It has drawn immense visibility with advent of internet of things at forefront by facilitating cultural shift in terms of providing promising insight in order to ensure desired output | 269 (72.5%) | 93 (25.1%) | 9 (2.4%) | 0 (0%) | 0 (0%) |

| | | | | | | |
|---|---|---|---|---|---|---|
| AI4 | It has improved the service delivery in the bank industry for better performance. | 271 (73%) | 90 (24.3%) | 3 (0.8%) | 4 (0.1%) | 3 (0.8%) |

***Source: Field Survey, 2023***

From Table 4.1 shows that most of the respondent shows a level of support with the statement that cloud computing has significant effect on service productivity. 46.4% (173) and 44.5 % (165) strongly agreed and agreed respectively that the *Use of artificial intelligence has facilitated delivery of goods services to the customers (AI1),* 8.6 % (32) were neutral and 0.3% (1) were disagreed with the statement. 73% (271) and 24.8% (92) are strongly agreed and agreed respectively and 2.2%(8) were neutral to the second statement "*It has improvement in the accuracy reliability and revenue and revenue generation in our bank" (AI2).* Also, 72.5 %(269) and 25.1 %(93) are strongly agreed and agreed respectively to the third statement "*It has drawn immense visibility with advent of internet of things at forefront by facilitating cultural shift in terms of providing promising insight in order to ensure desired output" (AI3)* while 2.4 %(9) were neutral.73% (271) and 24.3% (90) were strongly agreed and agreed respectively with the fourth statement "*It has improved the service delivery in the bank industry for better performance" (AI4)* while 0.8% (3) were neutral, 0.1% (4) were disagreed and 0.8% (3) were strongly agreed.

**Table 4.2- Effect of E-Payment on Service Productivity.**

| EP | E- payment | SA | A | U | D | SD |
|---|---|---|---|---|---|---|
| EP1 | E- payment has improve openness in the banking sector | 228 (61.5%) | 137 (36.9%) | 2 (0.5%) | 4 (1.1%) | 0 (0%) |
| EP2 | E- payment bring about proper accountability to the customer in real time | 146 (39.4%) | 216 (58.2%) | 2 (0.5%) | 6 (1.6%) | 1 (0.3%) |
| EP3 | It speedup the initiation, process and reception of a particular transaction electronically | 241 (65%) | 124 (33.4%) | 2 (0.5%) | 4 (1.1%) | 0 (0%) |
| EP4 | E- payment has introduce modern interaction | 185 (49.9%) | 180 (48.5%) | 2 (0.5%) | 3 (0.8%) | 1 (0.3%) |

***Source: Field Survey, 2023***

Table 4.2 shows that most of the respondent shows a level of support with the statement that E-payment have effect on service productivity 61.5% (228) and 36.9% (137) strongly agreed and agreed respectively that "*E- payment has improve openness in the banking sector" (EP1)* 0.5% (2) were neutral and 1.1% (4) were disagreed.39.4% (146) and

58.2% (216) are strongly agreed and agreed respectively, 0.5% (2) were neutral, 1.6%(6) were disagreed and 0.3% (1) were strongly disagreed to the second statement "*E-payment bring about proper accountability to the customer in real time" (EP2).* Also, 65% (241), 33.4% (124), 0.5%(2) and 1.1% (4) are strongly agreed, agreed, neutral and disagreed respectively to the third statement "*Its speedup the initiation, process and reception of a particular transaction electronically" (EP3)*. 49.9% (185), 48.5% (180), 0.5% (2), 0.8% (3) and 0.3% (1) were strongly agreed, agreed, neutral, disagreed and strongly agreed respectively with the fourth statement "*E-payment has introduce modern interaction" (EP4).*

**Table 4.3 Service Productivity**

| SP | Service Productivity | SA | A | U | D | SD |
|---|---|---|---|---|---|---|
| SP1 | Our customers confirm that our services are efficient and effective through our different feedback platform | 186 (50.1%) | 153 (42%) | 6 (1.6%) | 2 (5.7%) | 5 (1.3%) |
| SP2 | We have a well and quality service process that yield a good output to our customer | 220 (59.3%) | 128 (34.5%) | 9 (2.4%) | 12 (3.2%) | 2 (0.5%) |
| SP3 | We effectively use the capacity of the service process in achieving capacity efficiency. | 261 (70.45) | 88 (23.7%) | 2 (0.5%) | 8 (2.2%) | 12 (3.2%) |
| SP4 | We utilized our available resources in achieving best service delivery to all customer | 239 (64.4%) | 110 (29.6%) | 9 (2.4%) | 8 (2.2%) | 5 (1.3%) |

***Source: Field Survey, 2023***

Table 4.3 shows that most of the respondent shows a level of agreement on the statements that artificial intelligence has significant effect on service productivity. 50.1% (186) and 42% (153) for strongly agreed and agreed respectively that "*Our customers confirm that our services are efficient and effective through our different feedback platform*" *(SA1)* while 1.6% (6), 5.7% (2) and 1.3% (5) were neutral, disagreed and strongly disagreed respectively. 59.3% (220) and 34.5 % (128) are strongly agreed and agreed respectively to the second statement "*We have a well and quality service process that yield a good output to our customer" (SA2) while* 2.4%(9) were neutral, 3.2% (12) were disagreed and 0.5% (2) were strongly disagreed. Also, 70.4 %(261) and 23.7 % (88)

are strongly agreed and agreed respectively and 0.5% (2) were neutral, 2.2% (8) were disagreed and 3.2% (12) were disagreed to the third statement "*We effectively use the capacity of the service process in achieving capacity efficiency." (SA3).* The last statement "*We utilized our available resources in achieving best service delivery to all customer"* (*SA4),* 64.4 % (239) and 29.6 %(110) were strongly agreed and agreed while 2.4 % (9) were neutral and 2.2% (8) and 1.3% (5) were strongly disagreed.

### 4.3 Test of Hypotheses

**Table 4.3.1**

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .495[a] | .245 | .234 | .51108 |

a. Predictors: (Constant), E- payment, Artificial Intelligence.

From Table 4.3, the R value is 0.495 which indicate a good level of prediction of the dependent variable (service productivity). Also, the $R^2$ which is the coefficient of determination, that is the proportion of dependent variable (Technology Trend) that can be explain by the independent variables (artificial intelligence and e-payment), The value of the $R^2$ is 0.245 that is the independent variables can explain approximately 24%of the dependent variable.

**Table 4.4 ANOVA**

**ANOVA[a]**

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 30.814 | 5 | 6.163 | 23.594 | .000[b] |
| | Residual | 95.078 | 364 | .261 | | |
| | Total | 125.892 | 369 | | | |

a. Dependent Variable: Service Productivity

b. Predictors: (Constant), E- payment, Artificial Intelligence.

Table 4.4 (the Anova table) which shows whether the overall regression model is of good fit or not. From the table the value of p is 0.000 which shows that the independent

variables are statically significantly predict the dependent variable. This shows that the regression model is a good fit of the data

**Table4. 5 Regression Analysis**

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .111 | .440 | | .252 | .001 |
| | Artificial Intelligence | .107 | .035 | .189 | 3.076 | .002 |
| | E- payment | .316 | .054 | .327 | 5.864 | .000 |

a. Dependent Variable: Service Productivity

**Artificial intelligence has no significant effect on service productivity of selected deposit money banks in Nigeria**

From Table 4.5, it can be seen that artificial intelligence had a positive and significant effect on service productivity of listed international banks in Nigeria, the p value (0.02) is less than 0.05 with a coefficient of 0.107. This shows that an increase in artificial intelligence will increase the service productivity by approximately 11%. Based on this result we can reject our null hypothesis that says artificial intelligence has no significant effect on service productivity of selected deposit money banks in Nigeria and accept our alternate hypothesis that says artificial intelligence has significant effect on service productivity of selected deposit money banks in Nigeria

**E-payment has no significant effect on service productivity of selected deposit money banks in Nigeria**

From Table 4.5, it can be seen that e-payment had a positive and significant effect on service productivity of listed international banks in Nigeria, the p value (0.00) is less than 0.05 with a coefficient of 0.316. This shows that an increase in e-payment will increase the service productivity by 32%. This implies that an increase in e-payment will resulted in an increase on the level of service productivity by 32%. Based on this result we can reject our null hypothesis that says e-payment has no significant effect on service productivity of

selected deposit money banks in Nigeria and accept our alternate hypothesis that says e-payment has significant effect on service productivity of selected deposit money banks in Nigeria.

## 5. Discussion of Findings

The empirical analysis shows that artificial intelligence and e-payment had positive and significant effect on service productivity of international banks in Nigeria. The study discovered that artificial intelligence had positive and significant effect on service productivity of selected deposit money banks in Nigeria. This result is in line with the study of Smith (2024); Marcello, et al (2023) who posited that positive customer interaction with mechanical artificial intelligence (AI) positively and significantly influences overall customer satisfaction. It is also in tandem with the study of Edu et al (2022) who observed technology changes significantly affects customer satisfaction. Also, E-payment had positive and significant effect on service productivity of international banks in Nigeria, which is in line with the findings of Nteegah and Oladosu (2022) who asserted that e-payment has a positive and significant effect on deposit penetration. Also, in line with the study of Kilay et al. (2022) reveals positive and significant influence of e-payment and e-commerce on performance of small SMEs in Indonesia.

## 6. Conclusion and Recommendation

Based on the empirical results of the study, the study concludes that despite the peculiar challenges associated with technology trend in developing countries, technology through the use of artificial intelligence has influenced service productivity of international banks in Nigeria. Also, with the numerous complaints of failed transactions; e-payment has enhanced quality customer services and customers' satisfaction. The paper therefore recommends proper maintenance of technology devices for greater capacity utilization, also further investment in technology infrastructure is needed to further improved on service productivity.

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