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Information and Communication Sector and Return on Equity in Nigeria: A Disaggregate Approach (1986-2024)

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Abstract

Maximizing Return on Equity is a key performance goal for Nigeria's banking sector, particularly in an era where Information and Communication sector plays an increasingly central role in operational efficiency and profitability. This study examines the long-run impact of Information and Communication sector components telecommunications, print media, mass media, and multimedia on return on equity in Nigeria from 1986 to 2024. Employing the Dynamic Ordinary Least Squares (DOLS) approach, results revealed that print media significantly reduces return on equity, reflecting the declining influence of traditional media channels on banking profitability. In contrast, mass media exerted a significant positive impact, underscoring its growing importance as a profitability driver. Telecommunications and multimedia displayed negative but statistically insignificant effects, suggesting untapped potential for value creation. The model demonstrates a strong explanatory power ($R^2 = 0.94$), and diagnostic tests confirm normality and homoscedasticity, with mild serial correlation observed. The paper recommended that the Central Bank of Nigeria (CBN) and Nigerian Deposit Insurance Corporation (NDIC) should invest in broadcast and electronic media campaigns to improve financial literacy, drive inclusion, and enhance banking performance.

Keywords: *Information and Communication Technology, Return on Equity, Banking Sector, Dynamic Ordinary Least Squares, Nigeria*

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Background to the Study

Return on Equity is a fundamental indicator of financial performance and shareholder value, particularly within the banking and financial services industry. It reflects the efficiency with which a company utilizes its shareholders' equity to generate profits. In Nigeria, as in many developing economies, return on equity serves as a critical metric for assessing the health and sustainability of financial institutions, especially deposit money banks. In the context of increasing globalization, digital transformation, and regulatory pressures, the ability of Nigerian banks to maintain robust returns on equity has become more challenging. One sector that has proven instrumental in shaping the performance of banks is the information and communication sector, which encompasses telecommunications, print media, mass media, and multimedia. These elements serve as conduits for data dissemination, service delivery, branding, customer engagement, and operational efficiency. Over the past three decades, the global banking industry has undergone rapid technological transformation. Advanced economies have capitalized on innovations in communication technologies to drive higher return on equity through enhanced digital infrastructure, customer experience optimization, and cost reductions. According to the International Monetary Fund (2022), banks in countries with greater information and communication penetration have consistently recorded higher return on equity due to increased operational efficiency and customer reach. In the United States, for example, the adoption of multimedia campaigns and telecommunications platforms has allowed banks to reduce overhead costs and expand service offerings, ultimately boosting returns (Tarawneh *et al.,* 2024; World Bank, 2023). Similarly, European banks that adopted digital platforms and media technologies were reported by the European Banking Authority (2023) to outperform peers in shareholder returns.

However, in contrast to developed economies, many African countries, including Nigeria, face critical limitations in their information and communication infrastructure. While the Nigerian banking sector is one of the most developed in Sub-Saharan Africa, challenges persist in aligning its operations with information and communication-driven innovation that enhances return on equity. According to KPMG (2021), the average return on equity for African banks remains below the global average, attributed largely to inadequate investment in digital technologies and inconsistent communication strategies. Despite various reforms, such as banking consolidation and the cashless policy, Nigerian banks continue to struggle with high costs, limited rural connectivity, low financial literacy, and infrastructural gaps. Beck *et al.* (2023) emphasized that bridging this performance gap requires a deeper exploration of the nuanced impact of the communication sector on financial returns.

The Nigerian banking system comprises multiple layers of institutions, including commercial, merchant, and non-interest banks. According to the Central Bank of Nigeria (2023), as of the first quarter of 2023, there were 35 licensed deposit money banks, with their total assets reaching ₦79.7 trillion. These banks reported a collective profit before tax of ₦313.68 billion, a decrease from the ₦382.86 billion reported in the previous quarter. Significantly, the sector experienced a drop in return on equity from 20.59% to 9.38%

between Q4 2022 and Q1 2023. This stark reduction highlights the vulnerability of banks' returns to both operational inefficiencies and external shocks, including weaknesses in communication strategies and digital reach. Telecommunications have enabled banks to offer real-time mobile and internet banking services, improving transaction speed and customer satisfaction. Print media, though more traditional, remains crucial for regulatory disclosures, financial reporting, and investor communications. Mass media channels such as radio and television play vital roles in product promotion, brand building, and public trust. Multimedia, through digital advertising, social media, and customer engagement tools, has emerged as a transformative force in market expansion and brand equity. Each of these communication components holds unique implications for a bank's ability to generate equity returns, particularly in a competitive and evolving environment like Nigeria's.

While existing literature has explored the general impact of information communication and technology on bank performance, few studies have dissected the individual influence of the communication sector components telecommunications, print media, mass media, and multimedia on return on equity in the Nigerian context. This gap in the literature necessitates a more targeted analysis using a disaggregate approach, which distinguishes the unique impact of each information and communication input. This study, therefore, seeks to evaluate how these four pillars of the communication sector impact return on equity across Nigerian deposit money banks between 1986 and 2024. The outcome provides evidence-based insights for policymakers, financial institutions, and stakeholders aiming to boost shareholder value through effective communication investments and strategies. The paper is structured into five sections, which are the introduction, literature review, methodology, presentation and interpretation of results, and conclusion and recommendation.

The following hypotheses will be tested to achieve the objective of the paper:

H_{01}: Telecommunications have no significant impact on return on equity in Nigeria.
H_{02}: Print media have no significant impact on return on equity in Nigeria.
H_{03}: Mass media have no significant impact on return on equity in Nigeria.
H_{04}: Multi media have no significant impact on return on equity in Nigeria.

Literature Review

Conceptual Review

Information, Communication Sector

The information and communication sector comprise the technologies, services, and infrastructure that facilitate the transmission, storage, processing, and dissemination of data. It includes key components such as telecommunications, broadcasting, publishing, digital media, and data services. According to Adeleke and Ogundele (2022), the information and communication sector serves as a strategic enabler of national development, influencing productivity, governance, and economic transformation. Ndukwe *et al.* (2021) noted that the sector's role in enabling digital inclusion and financial access, especially through mobile and broadband technologies, has expanded rapidly in sub-Saharan Africa. Similarly, Olowokure and Abiodun (2023) argued that the sector has evolved from being a support system into a

driver of structural economic change, as it now forms the foundation of e-commerce, fintech, and smart governance in Nigeria. Adebayo and Adetunji (2024) emphasized that modern communication tools, such as mobile applications and digital broadcasting platforms, have redefined how services are delivered across sectors, particularly in finance, health, and education.

In Nigeria, the liberalization of the telecommunications industry and the proliferation of digital technologies have significantly enhanced the performance of public and private institutions. The Central Bank of Nigeria (CBN) and the Nigerian Communications Commission (NCC) have consistently highlighted the role of ICT in expanding access to banking and improving return on equity in deposit money banks. As a result, the information and communication sector is now viewed not just as a technical enabler, but as a transformative force for economic competitiveness and institutional performance in the digital age.

Telecommunications

Telecommunications refers to the transmission of information over significant distances using electronic means, such as telephones, satellites, and the internet. It enables real-time communication and data exchange, connecting individuals, businesses, and institutions globally (ITU, 2023). Through telecommunications infrastructure, banks can offer digital banking services, including mobile banking, online transfers, and electronic payment systems, which have become essential in modern banking (World Bank, 2022; Lottu *et al.*, 2023).

Additionally, telecommunications enable real-time communication between banks and customers, improving service delivery and fostering trust. It also supports interbank transactions and seamless integration with global financial systems, ensuring liquidity and stability in the banking sector (IMF, 2023; GSMA, 2023). Overall, telecommunications are a cornerstone of modern banking, driving financial inclusion, innovation, and efficiency in deposit money banks while addressing the evolving needs of customers in a digital economy. Worimegbe *et al.,* (2018). note, advancements in telecommunication technologies have enhanced operational capabilities, particularly in sectors like banking, where communication efficiency is vital.

Print Media

Print media refers to traditional forms of mass communication, such as newspapers, magazines, brochures, and journals, that disseminate information in printed formats. Despite the rise of digital media, print media remains a trusted and tangible medium for reaching diverse audiences, particularly in regions with limited internet access (Fotopoulos, 2023; Saragih and Harahap, 2020). Print media also serves as a platform for educating customers about financial literacy, banking policies, and new services. For example, banks publish informative articles and advertisements in newspapers to explain complex financial concepts or promote awareness campaigns (Lusardi, 2019; Shvaher *et al.*, 2021).

Multi Media

Multimedia refers to the integration of various forms of content, such as text, audio, video, graphics, and animations, to create engaging and interactive experiences. It leverages digital platforms to deliver information dynamically, catering to diverse audience preferences (Chinyere *et al.,* 2021). United Nations Educational, Scientific and Cultural Organization (Ullah *et al.,* 2024). Multimedia also plays a crucial role in financial literacy campaigns, as banks use videos, infographics, and animations to simplify complex financial concepts for customers (Rashid, 2018). Additionally, multimedia platforms like social media, mobile apps, and websites enable real-time communication, allowing banks to address customer inquiries and provide personalized services efficiently (Islam, *el al.* 2019).

Mass Media

Mass media encompasses channels of communication designed to reach large audiences, including television, radio, newspapers, and digital platforms. El-Chaarani and El-Abiad (2018) emphasized the importance of technological innovation in improving organizational communication, which is often supported by mass media campaigns. Takon *et al.* (2019) highlight how digital media platforms, a subset of mass media, facilitate the adoption of digital banking by educating customers about online transactions and services. Rashid, (2018) argued that strategic use of mass media enhances the relationship between mobile money platforms and banking institutions, particularly in developing economies like Nigeria.

Return on Equity

Return on equity is a key financial performance metric that evaluates a company's ability to generate profits from its shareholders' equity. It measures how effectively management is utilizing the capital invested by shareholders to yield net income. According to Lamothe *et al.* (2024), return on equity serves as a barometer for investor confidence, reflecting how efficiently a firm converts equity financing into earnings. It is calculated by dividing net income by shareholders' equity, and is typically expressed as a percentage. A higher return on equity indicates greater efficiency in managing equity capital, while a lower return on equity may suggest financial inefficiency or underperformance.

Olowokure and Abiodun (2023) emphasized that return on equity not only serves as a profitability metric but also acts as a strategic tool for assessing managerial decision-making, especially in capital-intensive sectors such as banking. Similarly, Yuan *et al.* (2022) argued that in the financial services industry, particularly among deposit money banks, return on equity is a more telling indicator of long-term performance than return on assets because it aligns closely with shareholder interests. Furthermore, Hossain and Gazi (2023) highlighted that return on equity has gained prominence in emerging economies as a benchmark for assessing the attractiveness of banks to potential investors, especially under volatile macroeconomic conditions. In the Nigerian context, where capital structure and financial regulation are rapidly evolving, return on equity provides insights into how well banks adapt to dynamic financial landscapes. Thus, it remains central to performance evaluations and strategic planning in the banking sector.

Empirical Review

By investigated how financial technology innovations enhance the performance of Chinese commercial banks, Ullah *et al.* (2024) conducted a study and specifically collected data from those listed on the China Stock Exchange (CSE) and also the return on assets, net profit, net income margin, ATMs, and return on equity, WeChat, and e-banking services of three selected commercial banks in China. Utilizing a descriptive research design and secondary data collection methods and employs a panel and quantitative approach from the period 2007-2023. The results indicated a statistically significant positive relationship between financial technology innovations and bank performance, suggesting that the adoption of these tools enhances the financial outcomes of banks.

Rasheed *et al.* (2024) investigated how financial technology influenced the financial performance of the deposit money banks in the southwest, Nigeria. The research design applied to the study was Ex-Post Facto research design in order to have functional relationship between customers and employees of the DMBs branches in the South West geopolitical zone in Nigeria. The descriptive statistics which were conducted using the current levels of financial performance on deposit money banks indicated that there had been an improvement in the return on assets because the financial technology had been deployed with the weighted average of 216 or 35.94 percent and 97.13 percent of the respondents see the level of improvement in equities of banks in Nigeria as moderate followed by the rate of improvement in net income margin of banks with weighted mean of 192 or 31.9 percent. The empirical evidence illustrated that the implementation of automated teller machine, the mobile banking, internet banking and point of sales to the banks financial performance has notably and highly enhanced the bank return on asset, the bank return on equity and the net income of the banks. This means that the financial position of the banks in Nigeria is quite sensitive to expansion of the other medium because an increment of 1% in increase of automated teller machine is sensitive in terms of increase in the return of assets by 0.18%. Similarly, the level of asset return rose by 0.29 percent with mobile banking increase by 1 percent. The study hence concluded that the implementation of mobile banking and internet bank spearhead pretty much all the pointers of bank financial performance in Nigeria. The paper however responds that, the adoption of the mobile banking was more intense, and more so at the aspect of the bank returns on equity although, all the alternative banking channels helps to improve the bank financial performance in Nigeria.

By applying correlation coefficients and regression models on the sample of Nepalese commercial banks in Nepalese between the periods of 2015 to 2021, Worimegbe *et al.*, (2018). successively discussed the financial technology as the fundament of financial inclusion and its relation on profitability. This meant that the high number of ATMs of the bank drags the increase in the return on assets and return on equity. Similarly, the number of branches of a bank positively influences the return on assets and the return on equity which meant that as number of the branches of the bank increases, the return on assets and the return on the equity increases respectively. Next, debt to asset ratio too indicated positive influence on the return on asset and return on equity. This meant that the greater the debt to assets ratio

the greater would be the return on assets and the return on equity. Similarly, credit to deposit ratio affects the returns on assets and returns on equity negatively. This, as well, pointed towards the fact that low the credit to deposit ratio, the lower would be the returns on assets and on equity. Likewise, credit to asset ratio affects the return on assets and the return on equity adversely which led to a higher credit to asset ratio corresponding to a lower return on assets and the return on equity. Moreover, the lending of deprived sectors influences the negative effect on the return on assets and return on equity implying that the greater the percentage of deprived sector lending of a bank, the less was likely to be the return on asset and that on equity.

The profitability and efficiency of commercial banks in Jordan is compared to the investment on information technology (IT) by Al-Amarneh *et al.* (2023). Profitability of banks is measured as a net interest margin (NIM), and return on equity (ROE), and return on assets (ROA) when adjusting by size and financial leverage of banks. The cost efficiency ratio is the way of measuring the cost efficiency. I used a sample size of 13 commercial banks that were listed in Amman Stock Exchange between 2010 and 2021. The descriptive statistics, correlation analysis, panel least squares method, and fixed effects multiple regression models are analyzed to establish such a relationship between the variables. The results revealed that the expenditure of banks on information technology (including hardware and software) is 0.61 percent of the total amount of assets. Also, banking institutions which invest in IT are expected to do better in the long run, as can be attested by the fact that they are more profitable and efficient. The lower and middle size banks invest more in IT relative to asset turnover compared to the bigger banks. Compared to highly leveraged banks, the IT investment to asset ratio of the less leveraged banks is usually higher (0.69 per cent). This result indicated that profitable banks (those with high ROE) spent more than 1.1 per cent of the total assets base on IT. In the meantime, the more efficient the banks are, the more they invest in the IT (0.65 %).

Chinyere *et al.* (2021) conducted a study on the influence of Information and Communication Technology (ICT) on the performance of companies and they used the Zenith Bank Nigeria Plc. and United Bank for Africa Plc. to conduct the study. I used the annual financial statement which is released by the bank since 2010- 2016. Corporate performance was represented by Return on Equity, Return on Asset and Earnings per Share. The regression method of ordinary least square and the assistance of statistical package of social sciences (SPSS) version 21were used during the analysis. The results indicated that the impact of ICT on corporate performance in terms of return on equity is very weak (low), practically no impact at all on corporate performance in terms of return on assets, and a positive impact when comparing corporate performance in terms of the earnings per share. Thus, the study advised that; the management team at the bank ought to be keen on the ICT requirement of the bank; to ensure that the bank does not waste money on unnecessary ICT gadgets in order to save cost incurred on ICT operation at the bank. Staff training and development also comes first as a way of facilitating the effective and efficient use of the ICT resources. Moreover, government ought to step forward in her responsibility to ensure the existence of enabling environment to boost businesses.

In another research, Chukwuekwu (2021) examined the audited financial statements of 10 deposit money banks listed on the Nigerian Stock Exchange in 2011–2020 to extract secondary data. The findings revealed that e-banking had a positive and significant effect on the performance of listed Deposit Money Banks in Nigeria, as measured by Automated Teller Machines (ATMs), Point of Sales (POS), Internet Banking (IB), and Mobile Banking (MB), as measured by return on equity (ROE) and return on assets (ROA). On the other hand, e-banking does not significantly affect Earnings per Share (EPS). The study recommended that for effectiveness in electronic banking, there should be rigorous campaigns and awareness for clients to patronize e-facilities. Banks should further invest in Information technology given the disruptive trend of emerging financial solutions in Fintech.

Onuoha *et al.* (2020) also considered voluntary intellectual capital disclosure (ICD) quality as well as the level of voluntary intellectual capital disclosure (ICD) by deposit money banks (DMBs) in Nigeria. The information sample of 271 informants and the content analysis done on the annual reports of 12 DMBs in Nigeria came up with data. The analysis of the data collected used factor analysis, t-test, Friedman test on related sample and Wilcoxon signed-rank test. The results showed that the level of the ICD is huge and greater than the quality of ICD which is not important, whereas the level of disclosure is the greatest in the relational element of intellectual capital. It also indicates that there is a major difference between the extent of human capital, structural capital and relational capital disclosures of which the major difference has been raced back to the difference between the extent of disclosures of relational capital and that of the human capital. The findings are interpretable in the target sample in which the duration of the study is 5 years and 12 DMBs in Nigeria. Nevertheless, the study offers a strong empirical ground to the policymakers and regulators to formulate the future ICD regulations on banks and incite better quality of ICD by DMBs. On its part, in another studies, Akani and Tony (2020) explored the impact of financial innovations on the profitability of Nigerian deposit money banks using Ordinary Least Square (OLS) and concluded that ATM and electronic transfer of funds have a negative correlation to return on equity whereas internet banking, mobile banking and investments in information communication technology have a positive correlation on return on equity.

The study was carried out by Islam *et al.* (2019) to determine whether the performance of banks which has implemented internet banking differs with banks which is yet to adopt internet banking. In addition, whether there is a considerable change of performance of banks prior to the implementation of the internet banking and after the implementation will be seen. The metric of performance was determined based on Return on Asset (ROA) and Return (ROE). The information was taken as a secondary data in the annual report of all the 30 listed banks of Bangladesh. The findings demonstrated that ROA and ROE of the banks with online banking is high in contrast to the position of banks without online bank. The findings were not significant though. Moreover, it has been determined that ROA and ROE are lower due to the introduction of internet banking and it has been determined to be statistically significant. This may be as a result of the cost incurred in the initial phase of the infrastructure development and may not by any means endear customer to use internet banking in large numbers.

Therefore, with such investment made, the gain could not come in the first stages of adoption of internet banking. By using the ordinary least squares estimation technique.

In this study by Takon *et al.* (2019), the researcher focused on looking at how digital payment system makes the banking sector efficient in Nigeria. Data of 2009-2018 were obtained by creating quarterly statistical data using Central Bank of Nigeria (CBN) Statistical Bulletin and World Bank database. They utilized the Ordinary Least Square (OLS) regression following the tests on the conditions of time series using Augmented Dickey-Fuller (ADF) and Philip-Peron (PP) test of stationarity. They used Engle and Granger test to test co-integration in order to establish whether there is long run relationship. It was the error correction model (ECM) that was used to determine the speed of adjustment. The outcome of the study indicated that the proxy variable: digital payments consisting of Automated Teller Machine (ATM) transactions, Point of Sales (POS) transactions; Mobile Payment (MP) transactions and Web Payment (WP) Transactions impacts negatively and significantly on bank efficiency which is proxied by bank overhead cost in the long and the short run. The impact that digital payment has on the total cost as a proportion of income differs with the variables used to approximate digital payment. It was also identified in the finding that digital payment is a beneficial factor towards noninterest income, return on equity, and return on assets of banks in Nigeria. The finding implied that an advanced digital payment system in Nigeria will enhance the performance of the banking sector and consequently performance of the economy. They thus advised that Nigerian Banks must come up with policies that would help improve the accessibility of the existing digital payment systems of usage among all users of financial services in Nigeria so as to increase the number of transactions as well as the value of transactions they make and also make efforts to pursue other emerging digital systems of payment.

Rashid (2018) also examined the linkage between the Investment in Information Technology (IT) and the performance of banks. The research carried out on the listed banks in the Dhaka Stock exchange (DSE) and five of the commercial banks are being targeted in particular. Based on secondary data, this study consists of a quantitative longitudinal study. The relationship between the Information Technology (IT) investment and performance of banks has been quantified using the correlation model and also the regression model. The metrics used to measure performance of Bank are Return on Investment (ROI), Net Profit Margin (NPM), Return on Equity (ROE) and Return on Asset (ROA). The conclusion made in this research showed that IT Investment and performance of banks had a positive correlation. It is therefore indicated that there is need to think more seriously about investing and utilizing Information and Communication Technology in the banking industry.

Nwakoby *et al.* (2018) looked into the effect of information and communication technology on the performance of the deposit money banks in Nigeria during 2006 to 2015 with the Return on Equity (ROE) as the dependent variable where the independent variable is the Automated Teller Machine (ATM), Point of Sale (POS), Mobile Money (MM), Web Payment (WP), Interbank Transfer (IBT). The influence of different forms of information

and communication technology on the banks return on equity (ROE) was tested using the log-linear regression model and the result so computed was carried out using the econometric computer software package, e-view version 8.0. The outcome's result revealed that the use of different types of information and the communication technology has immensely affected the quality of the banking operations, performance and specifically the increase in the return on equity of the banks. The long-run returns on equity of the deposit money banks can be maintained by use of information and communication technology. The research suggested that investment in information and Communication Technology should constitute a valuable part of the general plan of the banking operation since these will cause the Nigerian banks to become more effective, profitable and competitive.

Yang *et al.* (2018) investigated the performance of Chinese banks following the full adoption of e-banking system, particularly in profitability and cost efficiency performance. The report and data of five banks in China were used for sample analysis. The bank performance was measured in terms of return on assets (ROA), return on equity (ROE), operating margin (OM), net interest margin (NIM) and efficiency ratio. With the data collected, the different performance means between development stage and developed stage of e-banking in China were compared. The study revealed that e-banking could improve the Chinese bank performance in terms of ROA, ROE, and OM. On the contrary, e-banking has a slight impact on Chinese bank performance with respect to NIM and efficiency ratio. The findings suggested for e-banking adoption for banking operations.

El-Chaarani and El-Abiad (2018) analyze how technological innovation factors affect the performance of Lebanese banks in eight years (2010 2017). In the study, use of return on assets (ROA) and return on equity (ROE) were adopted as proxies of the level of performance. Such technological innovation factors are internet banking, mobile banking, automated teller machines and investment of computer software. The investment in technological innovation of the automated teller machines (ATM) and internet banking has a favorable influence on the performance of the Lebanese banks. The findings also portrayed insignificant effect of mobile banking and investment in computer software on the Lebanese bank performance.

Ezema *et al.* (2018) examined the impact of information management systems on the performance of commercial banks in Nigeria by using ordinary least square approach econometric techniques, Fixed and Random Effects Models. They found that the use of ICT in Nigerian banking industry increased return on equity. The regression and factor analysis showed that an insignificant size of profit exists without the introduction of ICT implying that ICT has a positive effect on profitability. Furthermore, the findings indicated strong relationship between sustained investment in ICT and efficiency.

In another study, Sujud and Hashem (2017) examined effect of bank innovations on profitability and return on assets (ROA) of commercial banks in Lebanon by using descriptive analysis. They found that there is a significant positive impact of bank innovations

on profitability and return on assets of Lebanese commercial banks. While Gadagbui and Amoah (2016) examined Bank Capital and Profitability: A Study of Selected Banks in Ghana by using panel data purposive sampling technique, The random-effects Generalised Least Square (GLS) regression methodology. The study revealed that equity capital is significantly and positively related to Net Interest Margin (NIM), and Return-on-Equity (ROE) in Ghana.

Okonkwo *et al.* (2015) used the years data of banks available in the annual data and Central Bank of Nigeria to find the relationship between the variables (dependent and independent). Okonkwo et al. (2015) determined the Impact of Information and Communication Technology and financial innovation on the performance of commercial banks in Nigeria and the help of OLS analysis determined how E-Banking services and ATM influenced the performance of commercial banks in Nigeria. According to the research results, when higher profitability performance is gained on the part of the banks, the Return on Equity (ROE) of the commercial banks was increased. Spending money in e banking services and ATMs, do not in fact enhance the performance of the banks. The research suggested among other things that there should be more focus on corporate governance and policies that will enhance the use of financial innovation gadgets properly and efficiently as opposed to seeking more investments.

Theoretical Framework

This paper adopted the Media Richness Theory which was developed by Richard L. Daft and Robert H. Lengel in 1986. The theory explores the effectiveness of communication media based on their ability to convey information and reduce uncertainty and ambiguity. It categorizes media along a spectrum of "richness," where richer media are better suited for complex, ambiguous tasks, while leaner media are appropriate for straightforward communication.

The effectiveness of communication (EC) in reducing ambiguity can be expressed as:

$$EC = f(RM, TC) \quad (1)$$

Where:
EC: Communication Effectiveness
RM: Richness of the Medium (e.g., face-to-face, phone, email),
TC: Task Complexity (e.g., high ambiguity or low ambiguity tasks).

The equation (1) illustrates that the suitability of a medium depends on its richness relative to the complexity of the task being communicated. Media Richness Theory is highly relevant to the study of *Information, Communication sector and* return *on equity in Nigeria.* The theory provides insights into how different information and communication tools and media types can enhance communication, decision-making, and overall performance, thereby influencing the return on equity of deposit money banks.

Methodology

Sources and Nature of Data

This paper employs an ex post facto research design, analysing secondary annual time series data from 1990 to 2023. Data used is secondary type and is obtained by using the Central Bank of Nigeria Statistical Bulletin (CBN, 2025) and comprises Telecommunications, print media, multimedia, mass media, return on equity in the period of 1986-2024.

Model Specification

The study adopted and used Dynamic Ordinary Least Squares (DOLS). The foundation of the model was based on the theoretical framework of the study. Also, the initial model was adapted from the work of and the study adapted Uzor *et al.* (2022) model in analyzing the effect of information, communication, and technology and deposit money bank profitability in Nigeria the model's implicit form is:

$$ER = f(ATM, MBNK, IBNK, POS) \quad (2)$$

Where ER –efficiency ratio of deposit money banks in Nigeria; ATM –volume of transactions on automated teller machines; MBNK volume of transactions on mobile banking platform; IBNK volume of transactions on internet banking platform; POS –volume of transactions on point-of-sale terminals. Equations 2 was modified based on the research objectives and to establish the functional relationship of information, communication, and technology sectors and return on asset in Nigeria. Thus, the functional form of the model incorporated is implicitly expressed in equation 3

$$ROE = f(TLC, PMA, MMA, MDA) \quad (3)$$

Where;
TLC = Telecommunications,
PMA = Print media,
MMA = Mass media,
MDA = Multimedia,
ROE = Return on Equity.

Specifying equation (3) for in a stochastic (linear regression) form:

$$ROE_t = \beta_0 + \beta_1 TLC_t + \beta_2 PMA_t + \beta_3 MMA_t + \beta_4 MDA_t + \mu_t \quad (4)$$

Where;

μ_t = denotes the white noise error term for equation 4,

β_0 = is a constant parameter while,

β_1 to β_4 are parameter to be estimated

However, to establish the relationship information, communication sectors and return on equity in Nigeria using Dynamic Ordinary Least Squares (DOLS), equation (4) was formulated as:

$$ROE_t = \beta_0 + \beta_1 TLC + \beta_2 PMA + \beta_3 MMA + \beta_4 MDA + \sum_{i=1}^{m} \beta_6^i \Delta TLC_t + \sum_{i=1}^{n} \beta_7^i \Delta TLC_{t+i} + \sum_{i=1}^{o} \beta_8^i \Delta TLC_{t-i} + \sum_{i=1}^{p} \beta_9^i \Delta_t PMA + \sum_{i=1}^{q} \beta_{10}^i \Delta PMA_{t+i} + \sum_{i=1}^{r} \beta_{11}^i \Delta PMA_{t-i} + \sum_{i=1}^{s} \beta_{12}^i \Delta MMA_t + \sum_{i=1}^{t} \beta_{13}^i \Delta MMA_{t+i} + \sum_{i=1}^{u} \beta_{14}^i \Delta MMA_{t-i} + \sum_{i=1}^{v} \beta_{15}^i \Delta MDA_t + \sum_{i=1}^{w} \beta_{16}^i \Delta MDA_{t+i} + \sum_{i=1}^{x} \beta_{17}^i \Delta MDA_{t-i} + \mu_t \quad (5)$$

Where TLC is telecommunications in Nigeria, PMA is print media in Nigeria, MMA is mass media in Nigeria, MDA is multimedia in Nigeria, ROE is Return on Equity in Nigeria. Also, β_1 to β_4 represent the long-run coefficients for each independent variable, indicating their impact on ROA in the long term. (Σ) represent the summation terms capture the short-run dynamics: ΔTLCt-j to ΔMDAt-j represent lagged differences of the independent variables (j = 1 to n). ΔPCIt-j represents lagged differences of the dependent variable (j = 1 to m). while μ represent the error term remains the same, representing unexplained factors affecting ROE. Equation 5 presents the Dynamic Ordinary Least Square (DOLS) which shows the current and lagged relationship between information, communication, and technology and return on asset in Nigeria.

Variable Description, Measurements and Apriori Expectation

Table 1: Description of the Variables Used for the Model

Variable	Description/Measure	Type	Source	Apriori Expectation
ROA	Return on Equity	Dependent	CBN, 2024	
TLC	Telecommunications	Independent	CBN, 2024	$\beta_1 > 0$
PMA	Print media	Independent	CBN, 2024	$\beta_2 > 0$
MMA	Mass media	Independent	CBN, 2024	$\beta_3 > 0$
MDA	Multi media	Independent	CBN, 2024	$\beta_4 > 0$

Source: Author Compilation, 2025

The a priori expectation is that $\beta_1, \beta_2, \beta_3, and\ \beta_4 > 0$ indicating a positive relationship between the dependent and independent variables, that is, increase in information, communication sector variables like telecommunications, print media, mass media, multimedia will lead to increase in return on equity in Nigeria.

Method of Analysis

The study utilised the Dynamic OLS (DOLS) model, introduced by Stock and Watson (1993), which mitigates feedback in the co-integrating system by enhancing the co-

integrating regression with lags and leads of the differenced explanatory variables, ensuring that the resultant co-integrating equation's error term is orthogonal to the complete history of stochastic regressor innovations (or trends) (Masih *et al.* 1996). DOLS is an effective method for examining time series data and estimating the long-term associations among variables, considering their dynamic characteristics and possible endogeneity.

Presentation and Interpretation of Results
Descriptive Analysis
Table 2: Descriptive Analysis

	ROE	TLC	PMA	MMA	MDA
Mean	20.17846	3089.271	13.01884	371.8884	544.8043
Median	21.10000	1112.659	12.10613	295.1353	354.4333
Maximum	162.9800	11027.87	20.77686	805.0054	1444.341
Minimum	-64.72000	18.32974	7.001627	55.08113	128.8189
Std. Dev.	29.74999	3562.490	4.654984	280.9203	447.8823
Skewness	2.336658	0.771328	0.370824	0.332821	0.805112
Kurtosis	16.24009	2.245794	1.528843	1.523191	2.120079
Jarque-Bera	320.3523	4.791496	4.410814	4.264073	5.471511
Probability	0.000000	0.091105	0.110206	0.118595	0.064845
Sum	786.9600	120481.6	507.7346	14503.65	21247.37
Sum Sq. Dev.	33632.35	4.82E+08	823.4172	2998817.	7622746.
Observations	39	39	39	39	39

Source: Researcher's Computation Using EViews-12 (2025)

The descriptive statistics presented in Table 2 provide insights into the statistical characteristics of the variables under study, with Return on Equity (ROE) as the dependent variable. ROE exhibits an average value of approximately 20.18, with a maximum of 162.98 and a minimum of -64.72, indicating significant variation in equity profitability among the observations. The standard deviation of 29.75 confirms this high variability, while the skewness of 2.34 indicates a strong positive skew, suggesting that most ROE values are clustered toward the lower end, with a few very high values pulling the distribution rightward. Additionally, the kurtosis value of 16.24 reveals a leptokurtic distribution, characterized by heavy tails and the presence of extreme values, which is statistically confirmed by a Jarque-Bera probability of 0.0000, implying non-normality in the distribution.

Telecommunications (TLC), one of the key independent variables, has a high mean value of 3089.27, which is notably higher than its median of 1112.66, confirming positive skewness (0.77). The large standard deviation (3562.49) and high maximum value (11027.87) indicate considerable dispersion. Print Media Activities (PMA) display a mean of 13.02 and a median of 12.11, with relatively low standard deviation (4.65), suggesting mild variability and a near-symmetric distribution (skewness = 0.37). Mass Media Activities (MMA) show a mean of 371.89, exceeding the median of 295.14, and present moderate skewness (0.33) with

a large standard deviation of 280.92, indicating widespread data dispersion. Similarly, Multimedia Activities (MDA) have a mean of 544.80, higher than the median of 354.43, a skewness of 0.81, and a high standard deviation of 447.88, reflecting considerable variability.

Kurtosis values for TLC, PMA, MMA, and MDA are all below 3, confirming platykurtic distributions, meaning they are relatively flatter and have lighter tails than a normal distribution. In contrast, ROE exhibits a sharply peaked, heavy-tailed distribution. This indicates that the distribution is leptokurtic These results suggest that while most independent variables have relatively mild skewness and dispersion, ROE stands out with significant outliers and high variability, which should be carefully addressed in subsequent regression analyses.

Correlation Matrix Results

Table 3: Correlation Matrix Results

Correlation Probability	ROE	TLC	PMA	MMA	MDA
ROE	1.000000				

TLC	0.108342	1.000000			
	0.5115	-----			
PMA	-0.128813	0.876662	1.000000		
	0.4345	0.0000	-----		
MMA	0.130359	0.952885	0.914161	1.000000	
	0.4290	0.0000	0.0000	-----	
MDA	0.084683	0.977615	0.912103	0.964295	1.000000
	0.6083	0.0000	0.0000	0.0000	-----

Source: Author's Computation, using E-Views 12, (2025)

The correlation in table 3 presents the strength and direction of linear relationships between Return on Equity (ROE) and the independent variables: Telecommunications (TLC), Print Media (PMA), Mass Media (MMA), and Multimedia (MDA). From the first column, ROE shows a weak positive correlation with TLC (0.1083), though the probability value (p = 0.5115) indicates that this relationship is not statistically significant at the 5% level. This implies that variations in telecommunications spending or activity are not meaningfully associated with changes in ROE during the study period. ROE also exhibits a weak negative correlation with PMA (−0.1288), with a p-value of 0.4345, which again suggests no significant relationship between print media investment and return on equity. Similarly, the correlation between ROE and MMA is slightly positive (0.1304), but statistically insignificant (p = 0.4290). This suggests that changes in mass media engagement have not had a strong or significant linear relationship with ROE.

Lastly, the correlation between ROE and MDA is positive but very weak (0.0847), and the p-value (0.6083) indicates that this relationship is also not statistically significant. Overall, the

interpretation of the first column suggests that none of the independent variables (TLC, PMA, MMA, and MDA) demonstrate a statistically significant linear relationship with Return on Equity within the observed dataset, though they may still contribute in nonlinear or lagged ways that are not captured by simple pairwise correlation.

Stationary Tests (Unit Root Tests)
This section shows the unit root of the variables using the Augmented Dickey-Fuller (ADF) Test to check the stationary at a 5 per cent level of significance.

Table 4: Unit Root Test Result

Variable	Augmented Dickey-Fuller (ADF) Test		
	ADF	@ 5%	Status
ROE	-6.775132	-2.948404	1(1)
TLC	-2.485828	-1.950117	1(1)
PMA	-7.319186	-3.536601	1(1)
MMA	-4.935957	-3.540328	1(1)
MDA	-4.110409	-3.536601	1(1)

Source: Author's Computation Using EViews-12 (2025)

All of the variables used in this investigation were found to be integrated at order one (1), as shown in Table 4, which displays the findings of the stationary test. They are all stationary at the order 1(1).

Co-integration Test Results
The Engle-Granger residual-based co-integration test is a bifurcated methodology employed to ascertain the existence of a long-term equilibrium relationship among two or more non-stationary variables. The concept of co-integration posits that if two or more series are independently non-stationary. If a linear combination of the series is stationary, the series is considered co-integrated. This indicates that, despite temporary fluctuations, the variables often coalesce over time, implying a consistent long-term link.

Table 5: Results of engle and granger (residual based) co-integration test

Variable	ADF Test Statistic	95% Critical ADF Value	Remarks
Residual	-6.168190	-1.950687	Co-integrated
Note: significant at 5%			

Source: Author's Computation Using EViews-12 (2025)

The result of the Engle–Granger residual-based cointegration test presented in Table 5 indicates that the ADF test statistic of -6.168190 is more negative than the 5% critical value of -1.950687, leading to the rejection of the null hypothesis of no cointegration. This confirms the existence of a long-run equilibrium relationship between Return on Equity (ROE) and

the selected ICT subsector indicators, namely telecommunications (TLC), print media (PMA), mass media (MMA), and multimedia (MDA), over the study period 1986–2024. The implication of this finding is that changes in the ICT subsectors have a significant and lasting impact on the ROE of Nigerian banks, suggesting that growth and investment in telecommunications, print media, mass media, and multimedia play a strategic role in shaping bank profitability. Consequently, the use of cointegration-based estimation techniques such as Dynamic Ordinary Least Squares (DOLS) is justified for modeling these relationships.

Dynamic OLS (DOLS) Regression Results

This section presented the long-run DOLS regression analysis where telecommunications, print media, mass media, multimedia.

Table 6: Dynamic OLS (DOLS) Model Results

Dependent Variable: ROE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TLC	-0.005167	0.004450	-1.160921	0.2601
PMA	-9.981240	2.197865	-4.541334	0.0002
MMA	0.267648	0.059566	4.493278	0.0002
MDA	-0.010179	0.039066	-0.260556	0.7972
C	81.79827	19.55344	4.183318	0.0005
R-squared	0.940448			
Adjusted R-squared	0.890300			
F-statistics	26.79881			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	2.017295			

Source: Author's Computation, using E-views 12, (2025)

The results of the Dynamic Ordinary Least Squares (DOLS) estimation in Table 6 show that the model explains a substantial portion of the variation in Return on equity (ROE), with an R-squared value of 0.94, indicating that approximately 94% of the changes in ROE are explained by telecommunications (TLC), print media (PMA), mass media (MMA), and multimedia (MDA). The adjusted R-squared of 0.89 confirms the robustness of the model. The F-statistic of 26.80 and its probability of 0.0000 indicate the overall model is statistically significant.

Examining individual coefficients, telecommunications (TLC) has a negative but statistically insignificant effect on ROE (coefficient = -0.005167, p = 0.2601), while print media (PMA) exerts a significant negative effect (coefficient = -9.981240, p = 0.0002), suggesting that higher investment or activity in print media reduces banks' ROE. Conversely, mass media (MMA) has a positive and significant effect on ROE (coefficient = 0.267648, p = 0.0002), implying that growth in mass media contributes positively to profitability. Multimedia (MDA) has a negative but insignificant impact on ROE (coefficient = -0.010179, p = 0.7972), indicating limited influence on performance. The Durbin–Watson statistic of 2.02 shows no

evidence of autocorrelation, validating the model's reliability. These results imply that among ICT subsectors, mass media is a key driver of ROE, while print media negatively influences profitability, guiding policymakers and bank managers to prioritize ICT channels with stronger positive impacts.

Post-Estimation Checks (DOLS Diagnostic Test)

The results from the DOLS diagnostic checks captured in Table 7 are crucial for validating the robustness and reliability of the regression model that investigates the impact of information, communication, and technology determinants on return on equity in Nigeria. These post-estimation tests assess various assumptions underlying the DOLS regression analysis, ensuring that the model's inferences are statistically sound.

Table 7: Results of DOLS Diagnostic Checks

Tests		Outcomes	
		Coefficient	Probability
Breusch-Godfrey-Serial-Correlation Test	F-stat.	4.6798730	0.0180000
Heteroscedasticity-Breusch-Pagan-Godfrey Test	F-stat.	1.1860340	0.3402000
Normality Test	Jarque-Bera	0.143196	0.930905

Source: Author's Computation Using EViews-12 (2025)

The results of the DOLS diagnostic checks in Table 7 indicated that the model meets most of the necessary assumptions for reliability. The Breusch–Godfrey serial correlation test shows an F-statistic of 4.68 with a probability value of 0.0180, which is below the 5% significance level. This suggests the presence of serial correlation in the residuals, meaning the model may need adjustment or correction for autocorrelation. The Breusch–Pagan–Godfrey heteroscedasticity test yields an F-statistic of 1.19 with a probability of 0.3402, which is greater than 0.05, indicating that the residuals are homoscedastic and there is no evidence of heteroscedasticity. Finally, the Jarque–Bera normality test returns a statistic of 0.14 with a probability of 0.9309, which is well above 0.05, confirming that the residuals are normally distributed.

Discussion of Findings

The results of the Dynamic Ordinary Least Squares (DOLS) estimation revealed a nuanced relationship between the independent variables which are Telecommunications (TLC), Print Media (PMA), Mass Media (MMA), and Multimedia (MDA) while the independent variable is Return on Equity (ROE) in Nigeria from 1986 to 2024. The coefficient of telecommunications (TLC) is negative but statistically insignificant, suggesting that growth in telecommunications infrastructure has not translated into measurable returns for Nigerian banks over the study period. This aligns with Fotopoulos (2023), who noted that technological infrastructure often requires time and efficient policies to enhance profitability outcomes. Similarly, Al-Amarneh *et al.* (2023) highlight that IT investments may fail to yield immediate financial gains if not complemented by strategic adoption. Conversely, Lottu *et al.*

(2023) argue that Nigeria's digital transformation has improved financial inclusion and connectivity, which should eventually boost performance, indicating that the insignificant relationship may be transitional.

Print media (PMA) shows a significant negative impact on return on equity, reflecting the declining influence and profitability of print media in an era dominated by digital platforms. This agrees with Saragih and Harahap (2020), who emphasize that print media has struggled to remain viable in the digital age, and with Fotopoulos (2023), who asserts that traditional media's declining trust and audience base has reduced its economic contribution.

Mass media (MMA) has a significant positive effect on return on equity, indicating that broadcast and electronic media continue to play a crucial role in shaping consumer awareness and driving financial performance. This finding aligns with Shvaher *et al.* (2021), who emphasize social media's role in improving financial literacy and engagement, which in turn influences financial institutions' profitability. Similarly, Yang *et al.* (2018) confirm that electronic banking and media campaigns significantly improve bank performance through greater reach and customer interaction.

Multimedia (MDA) exhibited a negative but insignificant coefficient, suggesting that while multimedia platforms are emerging tools for engagement, they have not yet significantly contributed to profitability. This finding supports GSMA (2023), which noted that although mobile and multimedia platforms have grown rapidly, their profitability impact is still constrained by infrastructural and regulatory challenges.

Overall, the model's high R-squared and significant F-statistic confirm that the selected variables collectively explain a substantial proportion of changes in ROE. The results also reinforce the argument by Chinyere *et al.* (2021) and Uzor *et al.* (2022) that ICT adoption alone is not sufficient to boost financial performance; its effectiveness depends on integration with innovative strategies and consumer engagement. Furthermore, the contrasting effects of traditional media (negative) and mass media (positive) underscore the digital shift emphasized by Okonkwo *et al.* (2015) and Takon *et al.* (2019), who argue that modern communication platforms are key drivers of profitability in the banking sector. These findings collectively highlight the evolving role of ICT and communication channels in Nigeria's financial system, demonstrating that while digital transformation offers immense opportunities for profitability growth, legacy systems such as print media contribute less value.

Conclusion and Recommendations

This study investigated the impact of telecommunications, print media, mass media, and multimedia on the profitability of Deposit Money Banks in Nigeria, proxied by Return on Equity (ROE), from 1986 to 2024. The Dynamic Ordinary Least Squares (DOLS) results revealed that print media had a significant negative effect on ROE, while mass media positively and significantly influenced profitability. Telecommunications and multimedia

showed negative but statistically insignificant effects, suggesting that their full potential to drive profitability has not yet been realized. The diagnostic checks confirmed the reliability of the model, as there was no evidence of heteroscedasticity or non-normality, though serial correlation was detected, indicating a need for further robustness adjustments. Overall, the findings underscore a digital transformation trend, where electronic and broadcast media remain critical for financial performance, while traditional media's influence continues to decline.

Therefore, the study recommended the following:

i. The insignificant impact of telecommunications highlighted the need for improved infrastructure. The Ministry of Communications, Innovation and Digital Economy should collaborate with the Nigerian Communications Commission (NCC) to expand broadband access and 5G networks, ensuring banks can fully leverage telecom services for profitability.
ii. Given the negative influenced of print media, the Federal Ministry of Information and National Orientation should support print media organizations in adopting hybrid digital models to remain relevant and cost-effective, which can help banks use them strategically for brand communication.
iii. The positive impact of mass media suggested its continued importance. The Central Bank of Nigeria (CBN) and Nigerian Deposit Insurance Corporation (NDIC) should invest in broadcast and electronic media campaigns to improve financial literacy, drive inclusion, and enhance banking performance.
iv. The insignificant role of multimedia indicated untapped potential. Banks should partner with tech startups to develop AI-driven, interactive multimedia content that enhances customer experience, while the Ministry of Science, Technology and Innovation creates policies that incentivize innovation in the banking sector.

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