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Effect of Information and Communication Technology (ICT) Investments on Profitability of Listed Deposit Money Banks in Sub-Saharan Africa

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Abstract **Original Research Article**

This study examined the effect of ICT investments on the profitability of listed deposit money banks in Sub-Saharan Africa. A quantitative research design was employed. Data were drawn from the annual reports and financial statements of listed deposit money banks in the region. The study used purposive sampling to select 58 listed deposit money banks that met the criteria of having complete and reliable data. Secondary data were collected from reputable sources. Descriptive statistics, correlation analysis, and multiple regression were used as techniques for data analysis, supported by diagnostic procedures to ensure the robustness and validity of the findings. The results revealed that ICT assets had no statistically significant effect on profitability of listed deposit money banks in Sub-Saharan Africa. While ICT expenditure had a positive and significant effect on profitability of listed deposit money banks in Sub-Saharan Africa. The study concluded that ICT assets alone did not influence profitability of listed deposit money banks in Sub-Saharan Africa, whereas increased ICT expenditure was beneficial to the profitability of listed deposit money banks in Sub-Saharan Africa. The study recommended that deposit money banks in Sub-Saharan Africa should prioritize spending on ICT initiatives that directly enhance operational efficiency and service delivery, such as digital platforms, cybersecurity, and data management systems, as these have a proven positive effect on profitability. Additionally, banks should optimize the use of existing ICT infrastructure through better integration into core operations, regular system updates, and staff training.

Keywords: ICT Investments, Profitability, Deposit Money Banks, Sub-Saharan Africa, ICT Assets, ICT Expenditure.

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1.0 INTRODUCTION

In the global economy, Information and Communication Technology (ICT) has become integral to business operations, offering enhanced efficiency and competitiveness. ICT investments, including assets, expenditure, and software, collectively improve productivity, profitability, and market positioning (Uge, 2023). The rapid growth of ICT has significantly impacted firms' economic growth by accelerating processes and enabling fundamental business changes such as the emergence of E-commerce (Edna & Aaron, 2020). ICT reduces production costs, increases efficiency, facilitates electronic exchanges, and provides intelligent customer service, thereby increasing a company's value-added and profit (Akujor, et al., 2021). Today, a large share of economic activities involves the production, transmission, storage, and distribution of data and information, making ICT development crucial for economic activities. This impact is so profound that many countries have shifted to a knowledge-based economy approach for economic development.

ICT assets and expenditure are foundational components of a bank's technological infrastructure. ICT assets include the physical and technological infrastructure such as computers, servers, and networking equipment, while expenditure encompasses the costs associated with acquiring, maintaining, and upgrading these assets (Uge, 2023). Investments in ICT assets and expenditure enhance operational efficiency by automating processes, reducing transaction times, and enabling real-time financial monitoring. Automation reduces manual intervention, speeds up transaction processing, and minimizes errors, leading to quicker and more accurate financial operations (Reenu & Sunil, 2023). Faster processing times improve customer satisfaction and allow the bank to handle a larger volume of transactions without compromising quality.

Furthermore, advanced ICT systems facilitate real-time tracking of financial metrics, enabling banks to monitor their profitability positions continuously and respond promptly to any fluctuations.

In Sub-Saharan Africa, where banking sectors are undergoing rapid evolution amid infrastructural challenges and regulatory dynamics, the adoption and effect of ICT on profitability management present unique challenges and opportunities. The region's banking landscape is characterized by a diverse mix of financial institutions, varying levels of technological infrastructure, and regulatory frameworks that influence ICT adoption and its effectiveness in enhancing profitability. Despite global evidence highlighting the positive impact of ICT investments on financial performance, there remain significant gaps specifically focused on how ICT influences profitability management among listed deposit money banks in Sub-Saharan Africa.

These significant gaps exist across geographical, conceptual, empirical, evidence, and practical dimensions in studying Information and Communication Technology (ICT) investments and their impact on profitability within Sub-Saharan African (SSA) banking sectors. Geographically, existing studies predominantly focus on specific countries or regions like Nigeria or the Middle East, failing to provide a comprehensive view applicable to the diverse regulatory and economic environments across SSA. For instance, studies by Uge (2023) and Enomate & Audu (2021) focus exclusively on Nigeria, thus limiting the generalizability of findings and overlooking potentially unique challenges and opportunities faced by banking institutions in different SSA countries, which may have varying levels of ICT infrastructure and regulatory frameworks.

Conceptually, while studies such as those by Arvanitis and Loukis (2024) and Reenu and Sunil (2023) explore ICT's broader impacts on firm resilience and economic growth, they often neglect to delve into the specific mechanisms through which ICT assets affect profitability management in banking contexts. The conceptual gap lies in the lack of focused research that connects specific ICT investments (such as hardware (assets), and IT expenditures) to profitability metrics as short-term funding sources is crucial for bank stability in SSA. For example, while Arvanitis and Loukis (2024) examine ICT-related resource endowments during economic crises, they do not specifically address profitability in banks. The main focus of this study was to examine the effect of information and communication technology (ICT) on firm profitability within the financial sector of Sub-Saharan Africa. The specific objectives are to:

i. examine the effect of Total ICT Assets on the profitability of listed deposit money banks in Sub-Saharan Africa.

ii. analyze the effect of ICT expenditure on the profitability, as indicated by the profitability of listed deposit money banks in Sub-Saharan Africa.

The study's null hypothesis are as follows:

H_{01}: There is no significant relationship between the Total ICT Assets and the profitability of listed deposit money banks in Sub-Saharan Africa.

H_{02}: ICT expenditure does not significantly affect the profitability of listed deposit money banks in Sub-Saharan Africa.

2.0 LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Profitability

Profitability plays a pivotal role in determining a company's strategic and operational decisions by providing a comprehensive view of its financial performance. The Profitability ratios reflect how effectively a company is utilizing its resources to generate profit and are crucial for assessing management's performance and the overall health of the business (Diriyai & Korolo, 2023). By evaluating profitability, stakeholders gain insight into how well the company is leveraging its assets, managing its profitability, and controlling its operational costs to achieve financial success. Profitability is essential for capital growth and for attracting investment. High profitability demonstrates a company's capability to enhance market share and revenue, thereby increasing its attractiveness to investors and creditors. Effective management and strategic decision-making are reflected in these ratios, making them vital for financial planning and investment decisions (Ememobong et al., 2023).

In assessing a company's profitability, the ratio of Return on Assets (ROA) is often used to measure how efficiently management is utilizing assets to produce profits. ROA indicates the overall effectiveness of asset management in generating returns. A high ROA implies that a company is effectively using its assets to maximize profit, which reflects well on management's operational efficiency. This efficiency is crucial for enhancing investor confidence, as higher profitability typically correlates with better financial performance and increased stock market valuation. Companies with strong ROA figures are perceived as better investments, which can lead to higher stock prices and more favorable investment conditions (Nangih et al. 2023; Sabiya & Joel, 2023).

2.1.2 Information and Communication Technology (ICT) Investment

According to Hatra et al. (2021), information and communication technology refers to all technologies for processing and storing information electronically. For this purpose, equipment such as computers, communication equipment, networks, fax machines and any controllable electronic package are used, Arvanitis and Loukis (2024) states that ICT is a set of technologies for manufacturing, storing, exchanging, and using information in various business forms. This includes business information, voice conversations, still and motion pictures, multimedia and other forms that have not yet been created. As this technology develops and expands in society, it affects micro and macroeconomic variables. This study focused on cost of ICT assets and ICT expenditures as the proxies for ICT investments.

2.1.2.1 Cost of Information and Commendation Technology (ICT) Asset

The cost of Information and Communication Technology (ICT) assets encompasses the total expenditure associated with acquiring, deploying, maintaining, and upgrading ICT infrastructure within an organization (Ahlem, et al. 2023; Edna & Aaron, 2020). These assets include hardware such as computers, servers, networking equipment, and peripheral devices and communication tools. Understanding the cost components of ICT assets is crucial for effective financial planning and management within businesses. The initial acquisition Total ICT Assets represent a significant investment for organizations.

In the context of listed deposit money banks in Sub-Saharan Africa, the Total ICT Assets plays a crucial role in determining profitability. Profitability, the ability of banks to meet their short-term obligations, is a critical measure of financial health and stability (Novotná, et al., 2021). The substantial initial acquisition Total ICT Assets can impact the profitability of these banks, as significant capital outlay is required upfront. This can strain financial resources, particularly for smaller banks or those with limited capital reserves (Akinboade, 2020). Deployment and implementation costs further influence profitability. Integrating ICT assets into banking operations requires additional financial resources for customization, system integration, and employee training. These costs, if not managed effectively, can lead to cash flow challenges and reduce the banks' ability to meet immediate financial obligations. However, successful deployment can enhance operational efficiency, leading to long-term profitability improvements.

2.1.2.2 Information and Commendation Technology (ICT) Expenditure

Information and Communication Technology (ICT) expenditure includes significant ongoing costs related to the maintenance and running of ICT infrastructure (Enomate & Audu 2021). These expenses are crucial for ensuring the continuous operation and efficiency of technological systems within an organization. Maintenance costs refer to the expenses incurred in keeping ICT systems operational and up-to-date, including routine servicing of hardware, software updates, troubleshooting, and repairs (Thakur, et al., 2023). Running costs encompass day-to-day expenses such as electricity, cooling systems for data centers, internet connectivity, telecommunications, and salaries for IT personnel. Efficient management of these costs is vital for listed banks in Sub-Saharan Africa to maintain high service standards and customer trust.

The impact of ICT maintenance and running costs on profitability is particularly significant for listed banks in Sub-Saharan Africa, where economic challenges and financial stability are paramount. High expenditure on these aspects can strain a bank's cash flow, reducing its ability to meet immediate financial obligations (Reenu & Sunil, 2023). However, strategic investment in ICT maintenance and operations can enhance operational efficiency, leading to long-term financial benefits. Well-maintained ICT systems minimize the risk of costly downtime, enhance customer service, and improve transaction processing speeds (Arvanitis, & Loukis, 2024). These improvements can increase customer satisfaction and loyalty, potentially boosting revenue streams and improving profitability.

2.2 Empirical Studies Review

2.2.1 Cost of Information and Commendation Technology (ICT) Asset and Profitability

Arvanitis and Loukis (2024) develop a set of research hypotheses concerning the effects of six groups of factors on firms' behavior during the 2008 global economic crisis with respect to ICT investment: three groups of internal factors (overall firm resource endowment, ICT-related resource endowment, ICT-related capabilities) and three groups of factors (competition, profitability problems, macroeconomic conditions concerning demand). These research hypotheses are tested using data from Greek firms for the economic crisis period 2009–2014. In particular, study found that the use of "organic" nonhierarchical forms of workplace organization as well as the use of Cloud Computing (as ICT-related resource) contribute to a weaker impact of crisis on ICT investment of firms, i.e. to a reduction of their ICT-related crisis vulnerability, making them more resilient to economic crises, by increasing their capacity and flexibility to react to such crises. While the findings on the resilience provided by organic workplace structures and cloud computing are insightful, the study's geographical focus on Greece limits its applicability to other regions, particularly Sub-Saharan Africa. Additionally, the time frame from 2009-2014 does not provide insights into the post-crisis period or ongoing developments in ICT investment strategies. The study also primarily addresses manufacturing and service firms, not specifically deposit money banks. Moreover, the insignificant joint effects of overall and ICT-related resources on ICT investment call for further exploration. The current study will address this gap by investigating the effect of ICT assets on the profitability of listed deposit money banks in Sub-Saharan Africa, providing insights that are region-specific and relevant to the banking sector. Reenu and Sunil (2023) investigate the joint impact of information communications technology (ICT) infrastructure, financial development (FD), and trade openness (TO) on economic growth (EG). This study includes two contrasting countries that differ from each other based on income level and consider the total sample size of 85 countries (including 27 low- and 58 high-income countries) for the period 2000–2019. The study framed various hypotheses and then applied the ordinary least square (OLS) regression, fixed effect regression (FER), and generalized method of moments (GMM) method. Our findings are fourfold: (a) the individual effects of ICT (Internet, secure Internet, broadband, and telephone) on EG are positive, excluding only telephone in LIC and excluding broadband in the HICs context; (b) in case of individual effects, the majority of ICT proxies have a positive and significant relationship with EG in LICs and HICs; (c) the joint effect of ICT infrastructure and FD in

both samples indicates that FD complements the positive impact of EG; (d) the result of the joint impact of ICT infrastructure, FD, and TO on EG in both countries is contradictory to each other. Thus, the results of joint effect conclude that in the LICs context, the joint effect of ICT infrastructure, FD, and TO positively affects EG, but the results are reversed in the HICs context. Our findings are important for the policy implications, especially in countries with highly required ICT infrastructure. The study's emphasis on economic growth rather than specific financial metrics such as profitability in the banking sector creates a conceptual gap. The use of general ICT proxies like the internet and broadband also overlooks specific ICT assets pertinent to banking operations. The current study will narrow this focus by examining how specific ICT assets affect profitability in listed deposit money banks in Sub-Saharan Africa, thereby addressing the conceptual gap in existing research.

Uge, (2023) examined the effect of Information Communication Technology (ICT) investment on performance of quoted insurance firms in Nigeria. The study was based on an ex post facto research design because relevant data are in existence on the annual reports and accounts of the firms. The population size is 23 quoted insurance firms in Nigeria. The researcher adopted a purposive sampling technique to select a sample of 10 insurance firms for this study. The period is from 2012 to 2021 implying 10 years duration. The technique used was ordinary least square (OLS) regression, and the data was analyzed using Stata/SE12.The dependent variable financial performance was proxy by net premium income and the independent variables information technology expenses, computer equipment and Computer software investment. The results revealed that information technology expenses and computer equipment investment have significant influence while computer software does not significant influence on financial performance of Insurance firms in Nigeria, while Information technology expenses and computer software has positive effect on financial performance of insurance firms, computer equipment has a negative effect. However, the study's focus on insurance firms limits its relevance to other financial sectors, such as banking. The exclusive use of Nigerian data presents a geographical limitation, and the study does not consider profitability metrics, which are critical for banks. The reliance on ex post facto design also restricts the study to historical data without addressing current ICT investment trends. The current study will extend this research to the banking sector across multiple Sub-Saharan African countries and focus specifically on profitability metrics, thus filling an empirical gap.

Novotná, et al. (2022) investigate the impact of technology investments on production efficiency in manufacturing companies and how different these relationships are for low-technology and high-technology companies. The empirical part was based on the analysis of 2,848 large, small and medium-sized Czech companies by using Bayesian networks (BNs). The results show that technological investments have the greatest positive impact on the growth of labour productivity and on a decline in labour intensity in low technology enterprises. The technological investments have a positive impact on labour productivity growth in high-technology enterprises, but at the same time, the technological investments have an impact on the increase of labour intensity. On the contrary, the influence of investment growth was insignificant on the indicators of material and services intensity. Technologically intensive investments have a different impact on small, mediumsized and on large enterprises. The reaction of large companies depends on the category of technology intensity in contrast to small and medium-size enterprises. The study's geographical focus on the Czech Republic and its concentration on manufacturing firms create limitations when considering ICT impacts on banking in Sub-Saharan Africa. Additionally, the study does not address profitability, a critical aspect of banking performance. The current study will address this gap by investigating how ICT investments specifically impact the profitability of listed deposit money banks in Sub-Saharan Africa, providing practical insights for the banking sector in this region.

Akujor, et al. (2021) investigates the effect of Information and Communication Technology (ICT) on corporate performance using Zenith Bank Nigeria Plc. and United Bank for Africa Plc. asa study. Data were obtained from annual financial statement published by the bank from 2010 -2016.Corporate performance was proxied by Return on Equity, Return on Asset and Earnings per Share. The ordinary least square regression technique with the aid of the statistical package for social sciences (SPSS) version 21were employed in the analysis. Findings revealed that ICT has a very weak (low) effect on corporate performance measured with return on equity, almost no effect at all on corporate performance measured with return on assets, and positive effect on corporate performance measured with earnings per share. The study's limited sample size and focus on two banks do not provide a comprehensive view of the banking sector. Additionally, the exclusive focus on Nigerian banks limits the geographical applicability of the findings. The study also does not directly address the profitability aspect, which is crucial for banking stability. The current study will broaden the scope to include multiple listed deposit money banks across Sub-Saharan Africa and focus on the specific impact of ICT assets on profitability, thereby addressing the evidence gap.

Hatra, et al. (2021) in a study on the Effect of Information and Communication Technology on Firms Performance in Iran stated that during the last decades, the technological revolution forces industries and enterprises to use technology-based processes and equipment to overgrow. Production chain management with the use of information and communication technology equips production tools with new technologies. The usage of information and communication technology in industries and manufacturing enterprises in developed countries and countries whose industries have grown significantly, since, the 1990s have caused significant changes in improving product quality, increasing productivity and reducing time in the manufacturing sector. At the same time, they could overcome their weaknesses with the benefits of ICT and stand in the right place in the economy. This study tries to study the impact of Information and Communication Technology (ICT) on the Iranian manufacturing sector. In this research, the effect of ICT on firm performance

(manufacturing units with ten employees and more) has been investigated. By considering data of 22 sectors during 2008-2016 and employing the GMM method, the impact of ICT application's usage on the income growth has been assessed. The results showed that hardware and software usage, communication technology has a positive and significant effect on income growth. While fixed capital formation, employment, exchange rate and R&D have a positive and significant impact, the producer price index has a negative and significant effect on income growth. While the study highlights the positive effects of ICT on productivity and income growth, its emphasis on the manufacturing sector does not address the nuances of the financial sector, particularly banking. The geographical focus on Iran and the time period considered (2008-2016) may not provide relevant insights for Sub-Saharan Africa's banking sector. Furthermore, the study does not specifically explore the impact of ICT on profitability. The current study will address this gap by examining the effect of ICT assets on the profitability of listed deposit money banks in Sub-Saharan Africa, providing region-specific insights relevant to the banking sector.

2.2.2 Information and Commendation Technology (ICT) Expenditure and Profitability

Reenu and Sunil (2023) investigate the joint impact of information communications technology (ICT) infrastructure, financial development (FD), and trade openness (TO) on economic growth (EG). This study includes two contrasting countries that differ from each other based on income level and consider the total sample size of 85 countries (including 27 low- and 58 high-income countries) for the period 2000–2019. We framed various hypotheses and then applied the ordinary least square (OLS) regression, fixed effect regression (FER), and generalized method of moments (GMM) method. Our findings are fourfold: (a) the individual effects of ICT (Internet, secure Internet, broadband, and telephone) on EG are positive, excluding only telephone in LIC and excluding broadband in the HICs context; (b) in case of individual effects, the majority of ICT proxies have a positive and significant relationship with EG in LICs and HICs; (c) the joint effect of ICT infrastructure and FD in both samples indicates that FD complements the positive impact of EG; (d) the result of the joint impact of ICT infrastructure, FD, and TO on EG in both countries is contradictory to each other. Thus, the results of joint effect conclude that in the LICs context, the joint effect of ICT infrastructure, FD, and TO positively affects EG, but the results are reversed in the HICs context. The findings are important for the policy implications, especially in countries with highly required ICT infrastructure. The study's primary focus on economic growth across various countries with different income levels does not address the specific impact of ICT expenditure on the profitability of deposit money banks in Sub-Saharan Africa. Additionally, the broad timeframe and diverse economic contexts dilute the relevance of findings for the banking sector. The methodologies employed do not specifically investigate profitability aspects critical to banking performance. The current study will address this gap by focusing on the specific impact of ICT expenditure on the profitability of listed deposit money banks in Sub-Saharan Africa, providing region-specific insights.

Ahlem, et al., (2023) examines the dynamic relationship between fintech investments and financial performance, and it explores whether the bank size could influence the performance in the context of the digital transformation (digitization). The fully modified ordinary least squares (FMOLS) model is estimated for 23 European banks throughout the whole period ranging from 2010 to 2019 and for the two sub-periods spanning from 2010 to 2014 and from 2015 to 2019. The econometric results evince that fintech are positively and significantly related to the bank profitability, inferring that the greater the digital engagement of banks is, the higher the profitability is. Our findings provide evidence that the bank size is a moderator factor in affecting the relationship between digital investments and the profitability. Hence, larger banks benefit more from investments in the financial technology so as to improve their performance. While the study offers valuable insights into how digital investments affect profitability in European contexts, it does not explore profitability, which is a critical aspect for banks. The focus on European banks limits the applicability of findings to Sub-Saharan African banks, which may face different challenges and opportunities. The study's concentration on profitability metrics neglects the vital profitability perspective needed for banking sector stability. The current study will fill this gap by examining the impact of ICT expenditure specifically on the profitability of listed deposit money banks in Sub-Saharan Africa, addressing the need for a profitability-focused analysis in this region.

Novotná, et al. (2022) investigate the impact of technology investments on production efficiency in manufacturing companies and how different these relationships are for low-technology and high-technology companies. The empirical part was based on the analysis of 2,848 large, small and medium-sized Czech companies by using Bayesian networks (BNs). The results show that technological investments have the greatest positive impact on the growth of labour productivity and on a decline in labour intensity in low technology enterprises. The technological investments have a positive impact on labour productivity growth in high-technology enterprises, but at the same time, the technological investments have an impact on the increase of labour intensity. On the contrary, the influence of investment growth was insignificant on the indicators of material and services intensity. Technologically intensive investments have a different impact on small, mediumsized and on large enterprises. The reaction of large companies depends on the category of technology intensity in contrast to small and medium-size enterprises. The study's focus on manufacturing and production efficiency does not translate to insights for the financial sector, particularly banking. The geographical and sectoral scope limits the relevance to Sub-Saharan African banks. The study also overlooks the critical aspect of profitability, which is essential for banking operations. The current study will address this gap by focusing on the effect of ICT expenditure on the profitability of listed deposit money banks in Sub-Saharan

Africa, providing empirical evidence specific to the banking sector in this region.

Akujor, et al. (2021) investigates the effect of Information and Communication Technology (ICT) on corporate performance using Zenith Bank Nigeria Plc. and United Bank for Africa Plc. asa study. Data were obtained from annual financial statement published by the bank from 2010 -2016.Corporate performance was proxied by Return on Equity, Return on Asset and Earnings per Share. The ordinary least square regression technique with the aid of the statistical package for social sciences (SPSS) version 21were employed in the analysis. Findings revealed that ICT has a very weak (low) effect on corporate performance measured with return on equity, almost no effect at all on corporate performance measured with return on assets, and positive effect on corporate performance measured with earnings per share. The study's limited scope, focusing on only two banks, restricts the generalizability of the findings. Additionally, it does not specifically address profitability, which is crucial for banking stability. The geographical focus on Nigeria does not capture the broader Sub-Saharan African context. The current study will expand the scope to include multiple listed deposit money banks across Sub-Saharan Africa and focus specifically on the effect of ICT expenditure on profitability, thus addressing the evidence gap.

Hatra, et al. (2021) in a study on the Effect of Information and Communication Technology on Firms Performance in Iran stated that during the last decades, the technological revolution forces industries and enterprises to use technology-based processes and equipment to overgrow. Production chain management with the use of information and communication technology equips production tools with new technologies. The usage of information and communication technology in industries and manufacturing enterprises in developed countries and countries whose industries have grown significantly, since, the 1990s have caused significant changes in improving product quality, increasing productivity and reducing time in the manufacturing sector. At the same time, they could overcome their weaknesses with the benefits of ICT and stand in the right place in the economy. This study tries to study the impact of Information and Communication Technology (ICT) on the Iranian manufacturing sector. In this research, the effect of ICT on firm performance (manufacturing units with ten employees and more) has been investigated. By considering data of 22 sectors during 2008-2016 and employing the GMM method, the impact of ICT application's usage on the income growth has been assessed. The results showed that hardware and software usage, communication technology has a positive and significant effect on income growth. The study highlights the positive effects of ICT on productivity and income growth but does not address the financial sector, particularly banking. The geographical focus on Iran and the time period considered limit the relevance for Sub-Saharan Africa's banking sector. Moreover, the study does not investigate the impact of ICT on profitability. The current study will focus on the banking sector in Sub-Saharan Africa and examine the specific impact of ICT expenditure on the profitability of listed deposit money banks, providing practical insights relevant to the region.

Jane et al (2021) evaluate Effect of Information and Communication Technology (ICT) on Corporate Performance: A Study of Selected Quoted Banks. The study investigated the effect of Information and Communication Technology (ICT) on corporate performance using Zenith Bank Nigeria Plc. and United Bank for Africa Plc. as a study. Data were obtained from annual financial statement published by the bank from 2010 -2016.Corporate performance was proxied by Return on Equity, Return on Asset and Earnings per Share. The ordinary least square regression technique with the aid of the statistical package for social sciences (SPSS) version 21were employed in the analysis. Findings revealed that ICT has a very weak (low) effect on corporate performance measured with return on equity, almost no effect at all on corporate performance measured with return on assets, and positive effect on corporate performance measured with earnings per share. Therefore, the study recommends that; there is need for the bank management team to prioritize the ICT need of the bank to avoid unnecessary investment on ICT gadgets to reduce the cost associated to ICT operations of the bank. Also, staff training, and development are paramount to enable the effective and efficient utilization of the ICT resources. Furthermore, government should rise to her duty to provide enabling environment for the thriving of businesses. The limited sample size and focus on Nigerian banks restrict the generalizability of the findings to the broader Sub-Saharan African context. Additionally, the study does not specifically address profitability, an essential aspect of banking performance. The findings on corporate performance are not directly translatable to profitability analysis. The current study will address this gap by examining the impact of ICT expenditure on the profitability of listed deposit money banks across Sub-Saharan Africa, providing more comprehensive and region-specific evidence.

2.3 Theoretical Review

2.3.1 Resource Based View Theory (RBV)

The Resource-Based View (RBV) theory, developed by scholars such as Birger Wernerfelt in 1984, C.K. Prahalad and Gary Hamel in 1990, and Jay Barney in 1991, posits that sustainable competitive advantage derives primarily from a firm's internal resources rather than external competitive forces. This theoretical framework encourages organizations to identify and leverage their unique resources (both tangible assets like physical infrastructure and intangible assets such as knowledge and capabilities) to achieve superior performance and market positioning. According to RBV, firms can achieve greater success by focusing on exploiting their internal strengths and distinctive competencies rather than solely reacting to external market conditions (Uge, 2023; Enomate & Audu, 2021; Akinboade, 2020).

The Resource-Based View (RBV) theory provides a valuable framework for understanding how investments in Information and Communication Technology (ICT) can contribute to the profitability management of listed deposit money banks in Sub-Saharan Africa. Originating in the

1980s and 1990s through seminal works by scholars like Wernerfelt, Prahalad, Hamel, and Barney, RBV posits that sustainable competitive advantage derives primarily from a firm's internal resources rather than external factors in the competitive environment. This perspective encourages organizations to leverage their unique resources, both tangible (such as physical assets) and intangible (such as knowledge and capabilities), to achieve superior performance and competitive positioning.

In the context of listed deposit money banks in Sub-Saharan Africa, ICT investments represent crucial internal resources that can significantly enhance profitability management capabilities. By strategically allocating resources to ICT infrastructure, banks can automate processes, improve transaction efficiency, and enhance real-time monitoring of financial activities. These technological advancements not only streamline operational workflows but also provide banks with enhanced analytical tools for profitability risk management. Advanced ICT systems enable banks to assess profitability positions more accurately, anticipate cash flow needs, and respond swiftly to market fluctuations or regulatory changes, thereby strengthening their ability to maintain optimal profitability levels.

3.0 METHODOLOGY

This study employs a quantitative and experimental research approach with an ex post facto research design to explore the effect of Information and Communication Technology (ICT) investments on the profitability of listed deposit money banks in Sub-Saharan Africa. A quantitative approach allows for systematic measurement and analysis of data, providing a robust framework to investigate the relationships between different variables. The research philosophy guiding this study is deeply rooted in a quantitative and experimental approach that aligns with the positivist paradigm. The population for this study includes 193 listed deposit money banks in Sub-Saharan Africa. The study sampled 58 listed deposit money banks in Sub-Saharan Africa which is summarized in table 1. The study covered the period between 2012 to 2023. Purposive sampling is chosen for this study (Damayanti, et al., 2022). Descriptive statistics, correlation analysis, and multiple regression were used as techniques for data analysis, supported by diagnostic procedures to ensure the robustness and validity of the findings.

Table 1: Population and Sample Selection Summary

Number of listed Deposit Money Banks in SSA	193
Less: Number of Deposit Money Banks listed within the last 10 years (2012-2022)	(53)
Less: Number of listed Deposit Money Banks with incomplete and inaccurate data for assessing the study's variables	(82)
Company Sample Size	**58**

Source: Author's compilation from the Stock Exchange, 2025

3.1 Model specification

The model specification for this study was adapted from Mantik et al. (2022) to align with the objectives of this research. The model is presented below:

$PROF_{it} = \beta_0 + \beta_1 ICTASS_{it} + \beta_2 ICTEXP_{it} + \beta_3 FSIZE_{it} + \varepsilon_{it}$

Where: PROF = Profitability, ICTASS = Costs of ICT Assets; ICTEXP = ICT Expenditure; FSIZE = Firm Size; β_0 = intercept; = β_1, β_2, and β_3, = the coefficients of the independent variables; ε = error term; i = firms for the study; and t = time period for the study.

Table 2: Variables Measurement

Variable	Code	Measurement	Source
Dependent			
Profitability	**PROF**	Return on Assets = (Net Profit After Tax/Total Assets)	Mantik, et al. (2022)
Independent			
ICT Assets	**ICTASS**	Natural log of firm's Total ICT Assets	Nwala, et al. (2022)
ICT Expenditure	**ICTEXP**	Natural log of firm's ICT Expenditure	Uge, (2023)
Control			
Firm Size	**FSIZE**	Natural log of firm's Total Assets	Efut, et al. (2023)

Source: Author's Compilation, 2025

4.0 RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Table 3: Descriptive Analysis

Variable	OBS	Mean	Std. Dev.	Min	Max
PRO	871	0.023583	0.031897	-0.2322645	0.239457
ICTASS	871	0.151704	0.274359	0	3.699359
ICTEXP	447	12.76574	2.765845	4.077538	18.14174
FSIZE	871	18.36226	2.673305	9.930325	23.42947

Source: STATA 17.0 Output, (2025)

Table 3 provides a descriptive analysis of the variables used in the study, summarizing their central tendency and dispersion. Here is a detailed interpretation of each variable based on the provided statistics:

Profitability (PRO) has an average value of 0.023583. This indicates that, on average, the firms in the sample exhibit a slight positive profitability. The standard deviation of 0.031897 suggests a moderate degree of variability around this average profitability. Specifically, this variability reflects differences in how well firms perform financially. The minimum value of -0.2322645 indicates that some firms experienced negative profitability, meaning they incurred losses. Conversely, the maximum value of 0.239457 represents the highest level of profitability observed, showing that some firms achieved substantial profits. This range of values highlights the diverse financial performance of firms within the sample.

ICT Assets (ICTASS) has a mean value of 0.151704, which suggests that, on average, firms allocate about 15.17% of their total assets to ICT investments. The standard deviation of 0.274359 shows a high level of dispersion in this allocation, indicating significant variation in how much firms invest in ICT relative to their total assets. The minimum value of 0 indicates that some firms do not invest in ICT assets at all, while the maximum value of 3.699359 shows that a few firms allocate a substantial portion of their assets to ICT, reflecting a broad spectrum of ICT asset investments.

ICT Expenditure (ICTEXP) has an average of 12.76574, representing the typical amount spent by firms on ICT. The standard deviation of 2.765845 indicates that there is considerable variation in ICT spending across firms. The minimum expenditure recorded is 4.077538, suggesting that the lowest spenders allocate this amount to ICT. The maximum expenditure of 18.14174 indicates that some firms invest significantly more in ICT, reflecting a wide range of spending behaviors within the sample.

Firm Size (FSIZE) has an average value of 18.36226, which reflects the typical size of the firms in the sample, measured by metrics such as total assets or revenue. The standard deviation of 2.673305 indicates variation in firm size, with some firms being considerably larger or smaller than the average. The minimum value of 9.930325 represents the smallest firm size observed, while the maximum value of 23.42947 highlights the largest firm size, showing a diverse range of firm sizes within the sample.

Table 4: Correlation Matrix

	PRO	ICTASS	ICTEXP	FSIZE
PRO	1.0000			
ICTASS	0.0067	1.0000		
ICTEXP	-0.0431	0.0023	1.0000	
FSIZE	-0.0835	-0.0427	0.8775	1.00000

Source: STATA 17.0 Output, (2025)

An in-depth analysis of how each variable relates to profitability (PRO), as indicated by the correlation matrix in Table 4, is as follows:

ICT Assets (ICTASS) has a correlation coefficient of 0.0067 with profitability (PRO), indicating an extremely weak positive relationship. This suggests that the amount of ICT assets a firm holds has almost no impact on its profitability. The correlation is so close to zero that it implies no meaningful connection between the firm's ICT asset levels and its financial performance.

ICT Expenditure (ICTEXP) shows a correlation of -0.0431 with profitability. This small negative correlation indicates that there is a minimal inverse relationship between ICT spending and profitability. In other words, firms that spend more on ICT do not experience significantly different profitability compared to those that spend less. The weak magnitude of this correlation suggests that ICT expenditure has a negligible effect on profitability.

Firm Size (FSIZE) has a correlation of -0.0835 with profitability, reflecting a weak negative relationship. This indicates that larger firms might experience slightly lower profitability on average. The correlation is not very strong, suggesting that while firm size has some impact on profitability, it is not a significant factor on its own.

4.2 Analyses and Results

Table 5: Heteroskedasticity Test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity			
chi2(1)		=	12.91
Prob > chi^2		=	0.0003

Source: STATA 17.0 Output, (2025)

Table 5 presents the results of the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity. The test statistic is chi2(1) = 12.91, with a p-value of 0.0003. This low p-value indicates a significant presence of heteroskedasticity in the model, meaning that the variability of the residuals is not constant across observations and the assumption of homoskedasticity has been violated. Consequently, the model's standard errors may be unreliable. To address this issue, the study conducts robust standard errors, which provide more reliable estimates in the presence of heteroskedasticity, ensuring that the results remain valid and robust despite the detected variability.

Table 6: Multicollinearity Test

Variable	**VIF**	**1/VIF**
FSIZE	6.19	0.161441
ICTEXP	4.70	0.212816
ICTASS	1.14	0.873713
Mean VIF	**4.01**	

Source: STATA 17.0 Output, (2025)

Table 6 displays the results of the multicollinearity test, showing the Variance Inflation Factor (VIF) and its reciprocal (1/VIF) for each variable.

Firm Size (FSIZE) has a VIF of 6.19, which is relatively high compared to other variables. This suggests that there is a moderate level of multicollinearity associated with FSIZE. The reciprocal value of 0.161441 further indicates that FSIZE is contributing to the inflation of the variance of the estimated regression coefficients. High VIF values generally signal that FSIZE is correlated with other predictors, which could impact the stability and interpretability of the regression coefficients.

ICT Expenditure (ICTEXP) shows a VIF of 4.70, indicating a moderate degree of multicollinearity. The reciprocal value of 0.212816 reflects a notable degree of variance inflation due to ICTEXP. This suggests that ICTEXP is somewhat correlated with other variables in the model, which could affect the precision of the coefficient estimates for ICTEXP.

ICT Assets (ICTASS) has a VIF of 1.14, also indicating very low multicollinearity. The reciprocal value of 0.873713 confirms that ICTASS contributes minimally to the inflation of the variance of regression coefficients, suggesting that it is not highly correlated with other variables.

The Mean VIF of 4.01 falls within a range that suggests some degree of multicollinearity in the model, though not excessively high. This average value indicates that while multicollinearity is present, it is not at a level that would typically cause severe issues in most regression analyses.

Table 7: Pooled Regression Model

PRO	**Coef.**	**Robust Std. Err**	**T**	**P>|t|**
ICTASS	-0.00198	0.00852	-0.23	0.816
ICTEXP	0.00329	0.00114	2.88	0.004
FSIZE	0.00339	0.00157	2.15	0.032
Cons	0.01516	0.02238	0.68	0.499
F (6, 351)				8.97
Prob > F				0.0000
R-squared				0.2364

Source: STATA 17.0 Output, (2025)

4.3 Test of Hypotheses

The overall model, as indicated by the F-statistic of 8.97 and a p-value of 0.0000, shows that the model is statistically significant. The R-squared value of 0.2364 suggests that approximately 23.64% of the variability in profitability of listed deposit money banks in Sub-Saharan Africa is explained by the included variables. This indicates a reasonable level of explanatory power, although there is still a substantial amount of variation in profitability not captured by the model

4.3.1 ICT Assets (ICTASS)

The coefficient for ICT Assets (ICTASS) is -0.00198, with a robust standard error of 0.00852. The t-value is -0.23, and the p-value is 0.816. The negative coefficient indicates that an increase in ICT assets is associated with a slight decrease in profitability of listed deposit money banks in Sub-Saharan Africa. However, the high p-value exceeds the conventional significance level (0.05), meaning the study fail to reject the null hypothesis that the coefficient is zero. Thus, there is no statistically significant evidence to support that ICT assets have a meaningful effect on profitability of listed deposit money banks in Sub-Saharan Africa. Therefore, ICTASS does not have a significant effect on profitability, and the effect is not significantly negative.

4.3.2 ICT Expenditure (ICTEXP)

The coefficient for ICT Expenditure (ICTEXP) is 0.00329, with a robust standard error of 0.00114. The t-value is 2.88, and the p-value is 0.004. This positive coefficient suggests that higher ICT expenditures are associated with increased profitability of listed deposit money banks in Sub-Saharan Africa. Since the p-value is less than 0.05, the study rejects the null hypothesis that the coefficient is zero. This finding indicates that ICT Expenditure (ICTEXP) has a statistically significant positive effect on profitability, showing that increased investment in ICT expenditures is beneficial for profitability of listed deposit money banks in Sub-Saharan Africa.

4.4 Discussion of Findings

4.4.1 Cost of Information and Commendation Technology (ICT) Asset and Profitability

The finding that ICT assets do not have a statistically significant effect on profitability of listed deposit money banks in Sub-Saharan Africa aligns with several studies that underscore the role of ICT investments in financial performance. Studies such as, Arvanitis and Loukis (2024) found that while ICT investments, particularly through non-hierarchical structures and Cloud Computing, could mitigate vulnerabilities during crises, they did not directly address profitability metrics in their Greek context. This limitation suggests that while ICT can offer strategic benefits, its direct impact on profitability may not always be evident. Similarly, Reenu and Sunil (2023) explored the impact of ICT on economic growth across various countries and found that the effects varied significantly, with no specific focus on profitability. This broad approach highlights that while ICT can influence growth, its direct effect on financial metrics like profitability remains inconclusive in their study.

Further supporting this finding, Novotná et al. (2022) investigated the impact of technology investments on production efficiency in Czech manufacturing firms. Their study indicated that technology intensity influenced efficiency but did not address profitability or banking-specific metrics. This focus on manufacturing and the Czech context underscores the difficulty in generalizing the effects of ICT on profitability in different sectors or geographical areas. Hatra et al. (2021) also found positive effects of ICT on income growth in Iranian manufacturing firms but did not directly link these effects to banking profitability. These studies reinforce the idea that ICT's influence on profitability can be limited or sector-specific. Contrastingly, several studies suggest that ICT investments can positively affect profitability of listed deposit money banks in Sub-Saharan Africa, challenging the finding of no significant effect. Uge (2023) discovered significant impacts of ICT expenses and computer equipment on performance in Nigerian insurance firms, although this focus on insurance limits broader applicability. Akujor et al. (2021) and Jane et al. (2021) found weak effects on performance metrics but positive impacts on earnings per share in Nigerian banks, suggesting potential profitability benefits from ICT investments under certain conditions. Onuorah and Okoh (2021) reported positive effects of ICT on the deposit base and profitability of Nigerian banks, indicating that ICT can enhance financial performance. These studies suggest that ICT might influence profitability differently depending on the sector and context.

From a theoretical perspective, the Resource-Based View (RBV) theory supports the notion that ICT assets could enhance profitability if they are considered valuable and strategic. Studies showing positive effects of ICT on financial performance align with RBV, suggesting that ICT can provide competitive advantages. However, studies indicating no significant effect may challenge RBV if ICT assets fail to deliver the expected strategic benefits in specific contexts. This contradiction could result from ineffective ICT utilization or its lack of strategic value in certain environments, highlighting the complex relationship between ICT investments and profitability of listed deposit money banks in Sub-Saharan Africa.

4.4.2 Information and Commendation Technology (ICT) Expenditure and Profitability

The finding that ICT Expenditure (ICTEXP) has a statistically significant positive effect on profitability of listed deposit money banks in Sub-Saharan Africa, this underscores the value of investing in information and communication technology to enhance financial performance. Studies such as Ahlem et al. (2023) support this view by demonstrating that digital investments in fintech significantly improve profitability, particularly in larger banks where such investments can be leveraged more effectively. Similarly, Hatra et al. (2021) highlights positive effects of ICT on income growth, which aligns with the notion that increased ICT expenditure can lead to better financial outcomes. Akinboade (2020) and Mohammed et al. (2019) also find that ICT investments positively impact financial performance and productivity, reinforcing the idea that strategic ICT investments can drive profitability improvements. This alignment across various studies indicates a general consensus that ICT expenditures can be a profitable investment.

Despite this general agreement, some studies offer

contrasting results. Reenu and Sunil (2023) find that the impact of ICT on economic growth varies by income level, suggesting that the benefits of ICT investments might not be uniformly positive across different economic contexts. Their study reveals that while ICT infrastructure positively influences economic growth in low-income countries, the effect can be reversed in high-income contexts. This variability implies that the relationship between ICT expenditure and profitability might be context-dependent. Novotná et al. (2022) and Akujor et al. (2021) also present mixed results, with positive impacts on certain performance metrics but weaker or inconsistent effects on overall profitability. Similarly, Jane et al. (2021) finds weak impacts on some profitability measures, indicating that ICT expenditure might not always translate into substantial profitability improvements.

From the perspective of Resource-Based View (RBV) theory, the positive impact of ICT expenditure on profitability is consistent with RBV's emphasis on the strategic value of valuable and rare resources. RBV posits that firms can achieve competitive advantage and enhanced performance through the effective utilization of unique resources like advanced ICT. By investing in ICT, firms can enhance operational efficiency, improve decision-making, and gain a strategic edge, leading to increased profitability. However, the variability in outcomes observed across different studies highlights that while ICT can be a valuable resource, its benefits are contingent upon proper implementation and alignment with the firm's strategic goals. This means that the effectiveness of ICT investments in improving profitability is not guaranteed and can vary based on how well the technology is integrated into the firm's operations and strategy.

5.0 CONCLUSION AND RECOMMENDATIONS

In conclusion, the study emphasizes that the value of ICT investments of listed deposit money banks in Sub-Saharan Africa lies in how they are utilized rather than the volume of assets acquired. It is also concluded that simply increasing ICT Assets does not automatically enhance profitability of listed deposit money banks in Sub-Saharan Africa. On the other hand, the study concludes that strategic spending on ICT contribute meaningfully to financial performance of listed deposit money banks in Sub-Saharan Africa. This underscores the importance of aligning ICT investment decisions with broader operational goals to achieve tangible business outcomes within the Sub-Saharan Africa.

The study recommends that:

i. Deposit money banks within Sub-Saharan Africa should prioritize spending on ICT initiatives that directly enhance operational efficiency and service delivery, such as digital platforms, cybersecurity, and data management systems, as this has a proven positive effect on profitability.

ii. Since ICT assets alone do not significantly impact profitability, deposit money banks within Sub-Saharan Africa should optimize the use of current infrastructure through better integration into core operations, regular system updates, and employee training.

Deposit money banks within Sub-Saharan Africa should evaluate the financial effect of ICT investments regularly and align future expenditures with areas that demonstrate measurable contributions to profitability, ensuring efficient resource allocation.

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