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I. Title page
II. Abstract (150-250 words)
III. Keywords (3-5)
IV. Introduction
V. Literature Review
VI. Methodology
VII. Results and Discussion
VIII. Conclusion and Recommendations
IX. References (APA 7th Edition)
X. Appendices (if necessary)
XI. Author Biographies (optional)

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MODERATING EFFECT OF ICT INVESTMENT ON THE RELATIONSHIP BETWEEN FIRM CHARACTERISTICS AND FIRM VALUE OF LISTED DEPOSIT MONEY BANKS IN SUB-SAHARAN AFRICA

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ABSTRACT

This study investigates the moderating effect of ICT investment on the relationship between firm characteristics—firm size, profitability, liquidity, and leverage—and firm value among listed deposit money banks in Sub-Saharan Africa. Using a quantitative research design, secondary data were obtained from 141 banks' annual financial reports spanning 2014–2023. Descriptive, correlation, and pooled regression analyses were employed. Findings reveal that firm size positively and consistently influences firm value, while ICT investment enhances this relationship indirectly through operational efficiency. Profitability increases firm value only when paired with ICT investment, emphasizing the importance of reinvesting profits into technology. Leverage negatively affects firm value due to financial risk, and ICT investment only marginally mitigates this effect. Liquidity becomes significant when combined with ICT, though excessive liquidity can lead to inefficiencies. The study concludes that firm size and ICT investment are major determinants of firm value in the region's banking sector. Banks are advised to reinvest profits in ICT, pursue growth to benefit from economies of scale, and maintain optimal liquidity and leverage levels to maximize market value and sustain competitiveness.

Keywords: Firm value, ICT investment, firm size, profitability, leverage and liquidity.

1. INTRODUCTION

In Sub-Saharan Africa (SSA), where the banking landscape is marked by rapid technological advancements amidst evolving market dynamics, understanding the moderating effect of ICT investment on the relationship between firm characteristics and firm value is imperative. Despite the global recognition of ICT's significance in banking, empirical research tailored to the unique context of SSA's listed deposit money banks remains scarce (Ismaila and Tanko, 2023; Thakur, et al., 2023; Onuorah and Okoh, 2021). This scarcity spans methodological, population, empirical evidence, and practical domains, presenting challenges and opportunities for stakeholders navigating ICT adoption and its impact on bank performance in the region.

The integration of information and communication technology (ICT) within the banking sector has been transformative on a global scale, revolutionizing traditional banking models and ushering in a new era of efficiency, innovation, and enhanced customer experiences. Across continents, banks have leveraged ICT to streamline processes, automate tasks, and expand service offerings, thereby meeting the evolving needs and preferences of customers in an increasingly digitalized world (Ahlem, et al., 2023; Uge, 2023; Akujor, et al., 2021). However, in Sub-Saharan Africa (SSA), the landscape differs significantly due to a myriad of challenges, including infrastructure limitations, regulatory constraints, and socio-economic diversity. These factors have created a unique operating environment where the adoption and impact of ICT on listed deposit money banks remain relatively underexplored. Despite the potential benefits that ICT investment holds for enhancing firm characteristics and firm value, there is a notable dearth of comprehensive empirical evidence tailored specifically to the SSA context (Thakur, et al., 2023; Akujor, et al., 2021; Onuorah and Okoh, 2021). This gap in empirical research hinders policymakers, practitioners, and academics alike from formulating informed strategies and interventions to foster sustainable growth within the region's banking sector. Without a robust understanding of how ICT adoption influences bank performance in SSA, stakeholders are left grappling with uncertainties, thereby impeding efforts to harness the full potential of technology in driving financial inclusion, economic development,

and prosperity across the region.

The review of literature on firm size, profitability, leverage, liquidity, and ICT investments reveals critical gaps that the current study aims to address to advance understanding and inform strategic decision-making. One significant area of contention is the relationship between firm size and firm value. While some studies suggest a positive correlation, indicating that larger firms tend to have higher market valuations (Lodikero et al., 2023), others, such as Ememobong et al. (2023), Egolum and Ikebudu (2023) in their study on Nigerian conglomerate firms, find no significant relationship. These discrepancies create the need for more investigations that consider sector-specific dynamics and contextual factors such as regulatory environments and market conditions. The current study seeks to explore how variations in firm size affect valuation metrics across different industries and regions, providing insights into optimal scale strategies for firms operating in Sub-Saharan Africa's banking sector.

Moreover, while ICT investments are widely acknowledged for their potential to enhance operational efficiencies and strategic decision-making, gaps persist in understanding how specific ICT assets contribute to firm value creation. Ndhlovu and Muzira (2023) highlight challenges in the effective utilization of ICT for financial reporting in Malawi, despite widespread adoption. This suggests a disconnect between technological capabilities and their strategic integration into organizational frameworks to optimize financial transparency and market valuation. The current study seeks to address these gaps by examining the moderating effect of ICT assets on the relationship between firm characteristics, including firm size, profitability, leverage, liquidity and firm value among listed deposit money banks in Sub-Saharan Africa. By identifying key ICT assets that drive value creation and exploring their impact on financial performance metrics, the study aims to provide practical insights for enhancing competitiveness and sustainable growth in the region's banking sector.

The main objective of study is to examine the moderating effect of ICT investment on the relationship between firm characteristics and firm value of listed deposit money banks in Sub-Saharan Africa. The study specifically seeks to:

i. analyze the effect of firm size on firm value among listed deposit money banks in Sub-Saharan Africa;
ii. evaluate the effect of profitability on the firm value of listed deposit money banks in Sub-Saharan Africa;
iii. assess effect of leverage on firm value among listed deposit money banks in Sub-Saharan Africa;
iv. ascertain the effect of liquidity on firm value among listed deposit money banks in Sub-Saharan Africa;
v. explore the moderating effect of ICT investment on the relationship between firm size and firm value among listed deposit money banks in Sub-Saharan Africa; and
vi. examine the moderating effect of ICT investment on the relationship between profitability and firm value among listed deposit money banks in Sub-Saharan Africa.

The study is guided by the following hypotheses;

H_{01}: Firm size does not significantly influence the firm value of listed deposit money banks in Sub-Saharan Africa.
H_{02}: Profitability does not significantly influence the firm value of listed deposit money banks in Sub-Saharan Africa.
H_{03}: Leverage does not significantly influence the firm value of listed deposit money banks in Sub-Saharan Africa.
H_{04}: Liquidity does not significantly influence the firm value of listed deposit money banks in Sub-Saharan Africa.
H_{05}: ICT investment does not moderate the relationship between firm size and firm value among listed deposit money banks in Sub-Saharan Africa.
H_{06}: ICT investment does not moderate the relationship between profitability and firm value among listed deposit money banks in Sub-Saharan Africa.

2. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Firm Value

Firm value encapsulates the total economic worth of a company, representing a fundamental concept in finance that plays a pivotal role in how businesses are evaluated by investors and stakeholders alike. It serves as a comprehensive indicator of a company's current financial health and its potential for future growth and profitability. According to Lodikero et al. (2023), firm value is typically assessed through various financial metrics such as market capitalization, enterprise value, and stock price. These metrics collectively provide a snapshot of the market's perception of a company's performance, prospects, and overall attractiveness as an investment opportunity. Market capitalization, one of the primary components of firm value, measures the total value of a company's outstanding shares traded in the stock market. This metric reflects not only the company's size but also its influence and perceived worth in the market (Kaku et al., 2022).

2.1.2 Firm Characteristics

2.1.2.1 Firm Size

Firm size plays a pivotal role in determining a company's strategic capabilities and market position. Larger firms often benefit from economies of scale, which can lead to lower production costs and enhanced market influence. These advantages enable larger companies to leverage their size for competitive pricing, extensive research and development, and broader market reach. According to Jerry and Okenwa (2023), larger firms in the energy sector face complexities in environmental reporting due to their extensive operations and established reporting practices. This complexity can impact their ability to effectively communicate environmental initiatives and comply with regulatory standards, influencing their perceived value in the market. For example, managing the vast amounts of data required for comprehensive environmental reporting can be challenging for larger firms, leading to potential gaps in disclosure and transparency.

2.1.2.2 Firm Profitability

Firm profitability is a key indicator of financial health and performance, typically measured by metrics such as net income margin, return on assets (ROA), and return on equity (ROE). High profitability indicates that a company effectively generates earnings relative to its expenses and other costs, which is essential for sustaining growth and attracting investors. Ememobong et al. (2023) found that profitability positively influences earnings predictability among quoted manufacturing companies in Nigeria, underscoring the importance of profitability in enhancing investor confidence and supporting firm valuation. This relationship suggests that profitable companies are better positioned to forecast future earnings, providing a more stable outlook for investors.

2.1.2.3 Firm Leverage

The leverage ratio, according to Nindi and Triyono, (2022), measures the extent to which a company is financed with debt and assesses the possibility of defaulting on its debt obligations. Markonah, et al. (2020) describe leverage as the risk and return associated with using fixed costs, such as debt and preferred stock. The more fixed-cost debt a company uses, the greater the risk and expected return. Jihadi, et al. (2021) defines the leverage ratio as a metric used to measure the extent to which a company's assets are financed by debt, indicating the debt burden compared to its assets. Broadly speaking, the leverage ratio evaluates a company's ability to meet all its obligations, both short-term and long-term, if the company were to be liquidated. This study uses the Debt-to-Equity Ratio (DER) as the leverage ratio. Alawiyah, et al. (2023) notes that long-term creditors primarily focus on earnings outlooks and cash flow forecasts when measuring risk, but they also consider the balance between assets funded by creditors and those funded by the company's owners.

2.1.2.4 Firm Liquidity

The liquidity ratio measures a company's ability to meet its short-term obligations using its most liquid assets (Farij & Wardani 2024). The calculation of the liquidity ratio provides significant benefits to various interested parties. Primarily, the company's owners and management use it to assess their financial capabilities. In practice, the liquidity ratio analysis serves multiple purposes for both the company's owners and external parties like creditors and suppliers. The liquidity ratio used in this study is the Current Ratio. According to Olivia, et al. (2021), the Current Ratio measures a company's ability to pay short-term liabilities or debts that are due. A higher Current Ratio indicates a greater ability of the company to meet its obligations promptly. The Current Ratio compares all current assets to all current liabilities. If the ratio is low, it suggests the company may lack sufficient capital to pay its debts (Serlindawati & Chairunisa, 2024). However, a high ratio does not necessarily indicate a favorable condition, as it could mean that cash is not being utilized efficiently. In practice, a Current Ratio of 200% (2:1) is often considered a satisfactory benchmark for a company's financial health.

2.1.3 ICT Investment

Investment in Information and Communication Technology (ICT) involves the acquisition and utilization of technological resources to improve operational efficiency, decision-making processes, and competitive advantage. According to Orajekwe and Ogbodo (2023), ICT assets encompass hardware, software, and digital infrastructure that facilitate data management and communication within firms. These assets are critical for enhancing productivity and innovation, thereby contributing to overall firm performance and value. ICT assets represent the tangible and intangible technological resources owned and utilized by a company, encompassing a wide range of tools such as computer systems, software applications, networks, and digital platforms (Hatra et al., 2021; Jane et al., 2021). These assets are crucial for streamlining operations, improving efficiency, and facilitating effective communication both internally and externally. In today's digital age, the deployment of ICT assets has become fundamental to a company's competitive advantage and operational effectiveness.

2.2 Empirical Review

2.2.1 Firm Size and Firm Value

Efut et al. (2023) examined the effect of firm size on the financial reporting quality of listed universal banks in Nigeria during the pre- and post-IFRS periods, using an ex-post facto design and multiple regression analysis. Based on data from five purposively selected banks, the study found a significant negative relationship between firm size and financial reporting quality, suggesting that larger

banks may face difficulties maintaining reporting standards. However, it did not explore how firm size affects overall firm value—an aspect the current study addresses by assessing firm size in relation to financial performance, market valuation, and investor perception among Sub-Saharan African banks.

Egolum and Ikebudu (2023) investigated the impact of firm size on earnings management among five listed conglomerates in Nigeria (2012–2021) using an ex-post facto design and OLS regression. The results showed that firm size had an insignificant effect on earnings management. Yet, the study did not extend its analysis to firm value, particularly within the banking sector, which operates under distinct financial and regulatory conditions. The current study therefore focuses on listed deposit money banks in Sub-Saharan Africa, applying panel regression techniques to offer sector-specific insights into the firm size–firm value nexus.

Lodikero et al. (2023) explored the relationship between foreign ownership and CSR disclosure among listed industrial goods firms in Nigeria (2013–2022) using panel least squares regression. They found an insignificant positive relationship between the variables. Although insightful for CSR disclosure, the study did not consider how firm size influences firm value in the banking sector, a gap the present research seeks to fill by investigating the effect of firm size on financial performance, market valuation, and investor perception among Sub-Saharan African banks.

Jerry and Okenwa (2023) analyzed the link between firm size and environmental disclosure among nine listed Nigerian energy corporations (2013–2022) using multiple regression. Their findings indicated that larger firms often face challenges in providing detailed environmental disclosures due to operational complexities. However, the study did not address firm size and value in the banking sector. The present research bridges this gap by examining how firm size affects firm value among listed deposit money banks in Sub-Saharan Africa through an ex-post facto design and panel regression approach.

Nangih (2023) studied the effect of firm characteristics on financial performance among 16 listed consumer goods firms in Nigeria (2013–2022) using an ex-post facto design and panel regression. The findings showed a significant positive effect of firm size on earnings per share (EPS). However, the study did not consider broader firm value indicators or the banking sector's unique dynamics. The current study extends this analysis by examining how firm size affects firm value—capturing financial performance, market valuation, and investor perception—among listed deposit money banks in Sub-Saharan Africa.

2.2.2 Profitability and Firm Value

Orajekwe and Ogbodo (2023) examined how profitability influences the Environmental Disclosure Index (EDI) of listed energy firms in Nigeria, South Africa, and Kenya, using secondary data and regression analysis based on GRI 306 guidelines. The study found a positive relationship between profitability and EDI, indicating that more profitable firms disclose more environmental information. However, it did not assess how profitability affects firm value, especially in the banking sector. The current study addresses this gap by examining how profitability influences firm value in listed deposit money banks across Sub-Saharan Africa through an ex-post facto design and panel regression, providing insights into how profitability shapes financial performance, market valuation, and investor perception.

Ememobong et al. (2023) explored the relationship between firm leverage and earnings predictability among 12 listed manufacturing companies in Nigeria (2017–2021) using an ex-post facto design and panel regression with OLS estimates. Findings revealed a weak effect of leverage on earnings predictability, suggesting that leverage is not a strong determinant in that sector. However, the study did not examine profitability's role in determining firm value within the banking sector. To bridge this gap, the current study analyzes how profitability affects firm value among listed deposit money banks in Sub-Saharan Africa using multiple regression and panel data analysis for broader sectoral insights.

Okoba and Chukwu (2023) investigated the effect of leverage on social sustainability performance disclosures among 30 Nigerian manufacturing firms (2010–2020), applying legitimacy theory and regression with Newey-West robust errors. Results showed a positive relationship between leverage and social sustainability disclosure, implying that leveraged firms enhance disclosure to build legitimacy. Yet, the study ignored the influence of profitability on firm value in the banking industry. The present study therefore focuses on how profitability affects firm value in listed deposit money banks across Sub-Saharan Africa, using ex-post facto design and panel analysis to provide sector-specific insights for financial institutions and policymakers.

Efut et al. (2023) assessed the impact of profitability on the financial reporting quality of listed universal banks in Nigeria before and after IFRS adoption, using an ex-post facto design and multiple regression. The findings revealed a significant negative relationship between profitability and financial reporting quality. However, the study did not explore the broader link between profitability and firm value. The current research extends this scope by evaluating how profitability affects financial performance and

market valuation of deposit money banks across Sub-Saharan Africa.

Jerry and Okenwa (2023) analyzed the relationship between firm leverage and environmental disclosure among nine listed Nigerian energy corporations (2013–2022) using multiple regression under a causal-comparative design. Their results indicated no significant relationship between leverage and disclosure. Nevertheless, the study overlooked how profitability influences firm value in the banking sector. The current study fills this gap by investigating the effect of profitability—measured by ROA, ROE, and net profit margin—on firm value in Sub-Saharan African banks. By linking profitability to market valuation and investor confidence, it provides actionable insights for policymakers, regulators, and bank executives in enhancing financial stability and performance.

2.2.3 Leverage and Firm Value

Farij and Wardani (2024) investigated the effect of leverage on firm value among coal mining companies listed on the Indonesia Stock Exchange (2018–2022), using Tobin's Q as a proxy for firm value and Debt-to-Equity Ratio (DER) as the main leverage indicator. Employing multiple regression analysis, their findings revealed that leverage had a positive and significant effect on firm value, implying that higher debt levels may enhance firm value through the tax-shield effect. However, the study's limitation lies in its narrow sectoral focus on coal mining and its omission of profitability and liquidity interactions in the model specification, thereby restricting the generalizability of its conclusions to other industries such as banking.

Rafli, Irham, and Imron (2023) examined the effect of leverage on firm value among manufacturing companies listed on the Indonesia Stock Exchange (2017–2021), adopting a quantitative design and multiple regression analysis. The results indicated that leverage exerted a positive and significant impact on firm value, suggesting that moderate use of debt supports firm expansion and investor confidence. Nonetheless, the study's methodology lacked panel-based estimation, which limits its ability to account for firm-specific heterogeneity and time dynamics—factors particularly critical in the financial sector where leverage structures differ markedly.

Ripaluddin et al. (2023) analyzed the influence of leverage on firm value through profitability using Structural Equation Modeling–Partial Least Squares (SEM-PLS) based on quarterly data of PT Indofood Sukses Makmur Tbk (2019–2021). The results demonstrated that leverage positively and significantly affected firm value. While this single-firm case offers insight into internal financial dynamics, its limited scope and absence of sectoral comparison reduce external validity and restrict the applicability of findings to complex, multi-firm environments like the banking industry.

Alawiyah et al. (2023) assessed leverage effects on firm value among pharmaceutical companies (2017–2021) using panel regression. They concluded that, although ROA had a positive and significant effect on firm value, leverage (DER) and liquidity (CR) exerted negative but significant effects. This mixed evidence highlights the contextual sensitivity of leverage–value relationships, suggesting that excessive debt may harm firm value in industries with high R&D costs. However, the study's short time frame and absence of moderating or control variables (e.g., firm size or market risk) limit its explanatory depth.

Nindi and Triyono (2022) analyzed leverage and firm value among consumer goods firms (2018–2020), incorporating dividend policy as a moderating variable. Using multiple regression, they found that leverage significantly influenced firm value. Despite its inclusion of a moderating variable, the study's short observation period and exclusive focus on consumer goods limit its relevance for capital-intensive and highly regulated sectors such as banking, where profitability plays a dominant role in determining value.

2.2.4 Liquidity and Firm Value

Serlindawati and Chairunisa (2024) analyzed the influence of liquidity on firm value among manufacturing companies in the consumer goods sector listed on the Indonesia Stock Exchange (2017–2021). Using causal quantitative methods and multiple regression analysis, the study found that liquidity had no significant positive effect on firm value. This suggests that short-term solvency alone may not enhance investors' valuation of firms in the consumer goods sector. However, the study was limited to one sub-sector and did not account for profitability or leverage interactions, which may moderate the liquidity–value relationship in other industries such as banking.

Farij and Wardani (2024) examined the effect of liquidity, leverage, and profitability on firm value among coal mining firms in Indonesia (2018–2022), using Tobin's Q as the proxy for firm value. Employing multiple regression analysis, their results showed that liquidity had a positive but insignificant effect on firm value. This implies that liquidity, though important for operational stability, may not significantly influence investors' valuation in capital-intensive sectors. The study's limitation lies in its sectoral scope and the absence of dynamic analysis across time, which constrains its relevance for financial institutions with distinct liquidity management structures.

Rafli, Irham, and Imron (2023) analyzed the effect of liquidity on firm value among manufacturing firms in

Indonesia (2017–2021) using multiple regression analysis. Their findings revealed that liquidity had a positive and significant effect on firm value, suggesting that firms maintaining optimal liquidity levels are perceived as financially stable by investors. Nevertheless, the study's reliance on cross-sectional regression without panel adjustments may overstate short-term relationships, limiting its robustness for sectors like banking, where liquidity management is more complex and regulated.

Alawiyah et al. (2023) investigated liquidity's effect on firm value in the pharmaceutical sector (2017–2021) through panel regression analysis. The results indicated that liquidity (Current Ratio) had a positive and significant impact on firm value. Although this finding supports the notion that liquidity enhances investor confidence, the study's focus on one sector and limited control for macroeconomic variations reduce its generalizability to other industries with different capital and risk structures.

Ripaluddin et al. (2023) examined the relationship between liquidity, leverage, and profitability using Structural Equation Modeling–Partial Least Squares (SEM-PLS) based on quarterly data from PT Indofood Sukses Makmur Tbk (2019–2021). The results showed that liquidity and leverage both had significant positive effects on profitability, which in turn influenced firm value. While this highlights the indirect role of liquidity through profitability, the single-firm case study design limits broader inference across industries and financial systems.

2.2.5 ICT Assets and Firm Value

Ismaila and Tanko (2023) examined the impact of board diversity on the relationship between ownership structure and financial performance among fifty listed manufacturing firms in Nigeria (2013–2022). Using multiple regression analysis, the study found that concentrated ownership positively and significantly affected firm performance, while board diversity strengthened the relationship between ownership structure and performance. This suggests that diverse boards enhance governance efficiency and financial outcomes. However, the study focused solely on manufacturing firms, limiting its applicability to the banking sector where ownership dispersion and regulatory oversight differ markedly. Moreover, the study did not incorporate technological or firm-specific operational factors such as ICT adoption that may influence performance in modern financial systems.

Thakur et al. (2023) analyzed the impact of ICT on the profitability of 33 Indian banks over a ten-year period (2010–2019), employing panel data analysis. The study revealed that ICT investment had a negative linear but positive quadratic relationship with bank profitability, suggesting a U-shaped effect—ICT initially depresses profits before enhancing them as digital efficiency improves. While the study provides robust empirical evidence on ICT's dynamic impact, it does not account for contextual differences in banking structures between emerging and developing economies. Furthermore, it focuses on profitability alone, neglecting broader dimensions of firm value such as market valuation and investor perception.

Uge (2023) investigated the effect of ICT investment on the performance of quoted insurance firms in Nigeria (2012–2021) using an ex-post facto design and OLS regression. The study found that IT expenses and computer equipment significantly influenced financial performance, while software investments were insignificant. Although the study highlights the role of ICT cost components in performance, its focus on the insurance sector limits generalizability to banks where digital infrastructure plays a more strategic role in service delivery and profitability. Additionally, its reliance on traditional regression may not fully capture the dynamic and moderating effects of ICT across time.

Ahlem et al. (2023) explored the dynamic relationship between fintech investments and financial performance among 23 European banks (2010–2019) using the Fully Modified Ordinary Least Squares (FMOLS) model. Results revealed that fintech investment had a positive and significant effect on profitability and that bank size moderated this relationship positively, indicating that larger banks benefit more from digital transformation. While the study provides valuable insight into how digitalization enhances bank performance, it is limited to European economies with advanced fintech ecosystems. Its relevance to Sub-Saharan African banks—where technological adoption and infrastructure differ—remains uncertain.

Akujor et al. (2021) examined ICT's effect on corporate performance using Zenith Bank and United Bank for Africa (2010–2016). Employing OLS regression, the study found ICT had a weak influence on return on equity and almost no effect on return on assets, but a positive impact on earnings per share. The limited sample size and focus on two banks restrict the generalizability of findings, while the use of basic financial metrics overlooks broader firm value indicators. Moreover, the study's time frame predates significant fintech advancements, making its conclusions less reflective of current digital banking realities.

2.3 Theoretical Review

2.3.1 Resource-Based View (RBV) Theory

The Resource-Based View (RBV) theory, proposed by Wernerfelt (1984), posits that a firm's sustainable competitive advantage and superior performance

derive from its ability to acquire, manage, and deploy valuable, rare, inimitable, and non-substitutable (VRIN) resources. According to Barney (1991), firms are bundles of heterogeneous resources and capabilities, and those that effectively utilize them outperform competitors. In this context, Information and Communication Technology (ICT) assets—such as digital infrastructure, software systems, and data analytics—constitute strategic resources that can enhance operational efficiency, decision-making, and financial reporting. Peteraf (1993) emphasizes that sustained advantage arises from resource heterogeneity and immobility, while Grant (1991) highlights the importance of integrating these resources into strategic operations. Building on this, Teece, Pisano, and Shuen (1997) introduced the concept of dynamic capabilities, asserting that firms must continuously reconfigure their resource base to adapt to changing environments, a principle directly applicable to ICT-driven firms in the digital economy.
Empirical evidence supports the RBV's relevance to ICT utilization. Ndhlovu and Muzira (2023) found that ICT assets enhance the timeliness and quality of corporate internet financial reporting by facilitating real-time data processing, improving communication, and supporting transparency. Their findings demonstrate that effective ICT management strengthens stakeholder confidence and regulatory compliance. In line with this, the current study adopts the RBV as its theoretical foundation to explain how ICT investments contribute to firm value. By strategically leveraging ICT assets, firms can improve performance, market valuation, and investor perception—thereby aligning technological capabilities with long-term competitive advantage.

3. METHODOLOGY

This study employs a quantitative research design to explore the effect of firm size and profitability on firm value among listed deposit money banks in Sub-Saharan Africa. The research philosophy guiding this study is deeply rooted in a positivist paradigm. Positivism, as defined by Saunders (2009), emphasizes rationality, objectivity, prediction, and control. The population for this study includes all 229 listed deposit money banks in Sub-Saharan Africa, 141 banks were selected using a purposive sampling. The secondary data was used in this study. Descriptive statistics, Correlation analysis and Multiple regression analysis were employed as techniques for data analysis.

This model specification is designed in three models to analyze how ICT Assets moderate the relationship between firm characteristics (Firm Size, Profitability, Liquidity, and Leverage) and Firm Value in listed deposit money banks in Sub-Saharan Africa.
The regression equation for this model is as follows:

$$FVL_{it} = \alpha + \beta_1 FSZ_{it} + \beta_2 PRO_{it} + \beta_3 LQD_{it} + \beta_4 LVG_{it} + \varepsilon_{it}$$

Where:
FVL_{it} = Firm Value for firm i at time t; FSZ_{it} = Firm Size for firm i at time t; PRO_{it} = Profitability for firm i at time t; LQD_{it} = Liquidity for firm i at time t; LVG_{it} = Leverage for firm i at time t; α = Constant term; β_1, β_2, β_3, β_4 = Coefficients of the independent variables; and ε_{it} = Error term

$$FVL_{it} = \alpha + \beta_1 FSZ_{it} + \beta_2 PRO_{it} + \beta_3 LQD_{it} + \beta_4 LVG_{it} + \gamma 1 ICT_{it} + \varepsilon_{it}$$

Where:
ICT_{it} = ICT Assets for firm i at time t
$1\gamma 1$ = Coefficient of the moderator ICT_{it}

$$FVLit = \alpha + \beta_1 FSZ_{it} + \beta_2 PRO_{it} + \beta_3 LQD_{it} + \beta_4 LVG_{it} + \gamma 1 ICT_{it} + \delta_1 (FSZ_{it} \times ICT_{it}) + \delta_2 (PRO_{it} \times ICT_{it}) + \delta_3 (LQD_{it} \times ICT_{it}) + \delta_4 (LVG_{it} \times ICT_{it}) + \varepsilon_{it}$$

Where:
δ_1, δ_2, δ_3, δ_4 = Coefficients of the interaction terms between the independent variables and the moderator ICT_{it}
Thess models' specification lays the groundwork for investigating how ICT assets affect the relationship between firm characteristics and firm value, both directly and through interaction effects.

Table 3.2: Variable Measurement

VARIABLE	PROXIES	CODE	MEASUREMENT	SOURCE
Dependent	Firm Value	FVL	Tobin's Q	Alawiyah, et al. (2023)
Independent	Firm size	FSZ	Nat. log of cost of firm's total assets for the year	Jibril et al. (2021)
	Profitability	PRO	Net Profit after Tax/total assets	Thakur, et al. (2023)
	Liquidity	LQD	Current Assets/ Current Liabilities	Elga, (2021)
	Leverage	LVG	Debt to Equity Ratio	Ripaluddin, et al., (2023)
Moderating	ICT Assets	ICT	Nat. log of cost of firm's ICT Assets for the year	Hatra et al., (2021)

Source: Author's compilation, 2024

4. DATA PRESENTATION AND ANALYSIS

The descriptive statistics in Table 4.1 provide key insights into the characteristics of listed deposit money banks in Sub-Saharan Africa, which are central to this study. These statistics offer a snapshot of the data by summarizing variables that play a crucial role in exploring the moderating effect of ICT investment on the relationship between firm characteristics and firm value. The variables analyzed include Firm Value (FVL), Firm Size (FSZ), Profitability (PRO), Leverage (LEVG), Liquidity (LIQUID), and Information and Communication Technology Investment (ICT).

Table 4.1: Descriptive Analysis

Variable	OBS	Mean	Std. Dev.	Min	Max
FVL	850	16.59	2.62	7.67	21.28
FSZ	871	18.36	2.67	9.93	23.43
PRO	871	0.02	0.03	-0.23	0.24
LEVG	871	0.83	0.17	0.06	2.55
LIQUID	841	2.20	18.76	0.09	541.01
ICT	456	12.66	2.81	9.02	17.62

Source: STATA 14.0 (2024)

The descriptive statistics indicate notable heterogeneity among listed deposit money banks in Sub-Saharan Africa. Firm value (FVL), measured as the natural logarithm of market capitalization, has a mean of 16.59 and a standard deviation of 2.62, with values ranging from 7.67 to 21.28. This wide spread suggests that the sample includes both small and large banks, differing significantly in market capitalization due to variations in strategic capabilities, investor confidence, and operational efficiency. Similarly, firm size (FSZ), proxied by the natural logarithm of total assets, records a mean of 18.36 and a standard deviation of 2.67, with minimum and maximum values of 9.93 and 23.43, respectively. The large dispersion underscores the diversity in asset base and operational scale among banks, reinforcing the importance of firm size as a determinant of firm value, given its influence on economies of scale and market power.

Profitability (PRO), measured by return on assets (ROA), shows an average of 2% with a standard deviation of 0.03, spanning from -0.23 to 0.24. The presence of negative returns indicates that some banks incurred losses, while others achieved relatively strong performance, reflecting operational and market challenges within the region. Leverage (LEVG), represented by the debt-to-equity ratio, has a mean of 0.83 and a range from 0.06 to 2.55, implying varying degrees of financial risk exposure across banks. Liquidity (LIQUID), measured by the current ratio, has a mean of 2.20 but an unusually high standard deviation of 18.76, ranging from 0.09 to 541.01—suggesting significant outliers or disparities in short-term asset management. ICT investment (ICT), captured as the logarithm of ICT expenditure, averages 12.66 with a standard deviation of 2.81 (ranging from 9.02 to 17.62), revealing substantial differences in digital investment priorities and capacity.

Table 4.2: Correlation Matrix

	FVL	FSZ	PRO	LEVG	LIQUID	ICT
FVL	1.0000					
FSZ	0.9118	1.0000				
PRO	0.0245	-0.0662	1.0000			
LEVG	0.2743	0.4119	-0.1563	1.0000		
LIQUID	-0.1571	-0.2241	0.2861	-0.4069	1.00000	
ICT	0.8936	0.9358	-0.0188	0.3430	-0.20840	1.00000

Source: STATA 14.0 (2024)

The correlation analysis reveals significant relationships among firm characteristics, ICT investment, and firm value for listed deposit money banks in Sub-Saharan Africa. Firm size (r = 0.9118) and ICT investment (r = 0.8936) show the strongest positive correlations with firm value, suggesting that larger banks and those investing more heavily in technology tend to achieve higher market valuations. These findings imply that scale and digital capability are crucial drivers of competitiveness and market performance in the region's banking sector. Profitability (r = 0.0245) and leverage (r = 0.2743) exhibit weaker positive correlations, indicating that while profitable and moderately leveraged banks may

experience some value gains, their effects are less pronounced than those of firm size and ICT. Liquidity, however, shows a weak negative correlation (r = -0.1571), implying that excess liquid assets may constrain value creation by limiting productive investment.

Table 4.3: Multicollinearity Test

Variable	VIF	1/VIF
FSZ	8.81	0.113522
ICT	8.33	0.120007
LEVG	1.41	0.711285
LIQUID	1.29	0.775457
PRO	1.11	0.902507
Mean VIF	**4.19**	

Source: STATA 14.0 (2024)

The multicollinearity diagnostics presented in Table 4.3 assess the degree of interdependence among the independent variables in the regression model using the Variance Inflation Factor (VIF) and its reciprocal (1/VIF). The results indicate that Firm Size (FSZ) and ICT Investment (ICT) exhibit relatively high VIF values of 8.81 and 8.33, respectively—approaching the conventional threshold of 10. This suggests a moderate level of multicollinearity between these two variables, which may be due to the tendency of larger banks to invest more heavily in ICT infrastructure. In contrast, Leverage (LEVG), Liquidity (LIQUID), and Profitability (PRO) record low VIFs of 1.41, 1.29, and 1.11, respectively, signifying minimal collinearity and strong independence among these variables. Correspondingly, the 1/VIF values of FSZ (0.1135) and ICT (0.1200) confirm their relatively higher intercorrelation, while the higher 1/VIF values for LEVG (0.7113), LIQUID (0.7755), and PRO (0.9025) reinforce their statistical independence.

The mean VIF value of 4.19, which is below the benchmark of 10, indicates that multicollinearity is not a serious threat to the overall reliability of the regression estimates.

Table 4.4: Heteroskedasticity Test

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity	
Ho: Constant variance	
chi2(1) =	7.02
Prob > chi2 =	0.0081

Source: STATA 14.0 (2024)

Table 4.4 presents the Breusch-Pagan/Cook-Weisberg test results for heteroskedasticity, which examine whether the variance of the regression residuals remains constant across observations. The test produced a chi-squared statistic of 7.02 with a corresponding probability value (Prob > chi^2) of 0.0081. Since this p-value is below the 0.05 significance threshold, the null hypothesis of homoskedasticity is rejected, indicating the presence of heteroskedasticity in the model. This result implies that the variability of the error terms differs across levels of the independent variables, potentially affecting the reliability of standard error estimates. To mitigate this issue and preserve the validity of statistical inference, the study employs robust standard errors in subsequent regression analyses, thereby correcting for the unequal variance and ensuring more reliable coefficient estimates.

Table 4.5: Summary of Robust Regression Results

	Model 1: Basic		**Model 2: With Moderator**		**Model 3: Interaction**	
FVL	**Coef.**	**P>t**	**Coef.**	**P>t**	**Coef.**	**P>t**
FSZ	0.8836159	0.000	0.6363691	0.000	0.6443318	0.000
PRO	5.086699	0.001	4.534795	0.001	-31.41445	0.003
LEVG	-1.292145	0.000	-1.634969	0.000	-2.480024	0.395
LIQUID	0.006515	0.639	-0.0007116	0.966	0.3643423	0.009
ICT			0.2270409	0.000	0.2179166	0.308
FSZ_ICT					-0.0029138	0.692
PRO_ICT					3.207717	0.002
LEVG_ICT					0.0798101	0.738
LIQD_ICT					-0.0357435	0.010
_con	1.312153	0.0000	3.349846	0.0000	3.880781	0.158
Number of OBS		826		452		452
Prob > F		0.0000		0.0000		0.0000
R-Square		0.8054		0.8575		0.8661

Source: STATA 14.0 (2024)

4.3 Test of Hypotheses and Discussion of Findings

Across the three models, the R-squared values increase, indicating improved explanatory power as the models account for ICT investment and interaction effects. Model 1 has an R-squared of 0.8054, meaning the model explains 80.54% of the variance in firm value. Model 2, with ICT as a moderator, improves the R-squared to 0.8575, explaining 85.75% of the variance. Model 3, which includes interaction effects, further increases the R-squared to 0.8661, explaining 86.61% of the variance. This progression highlights that incorporating ICT investment and its interactions with firm characteristics provides a better understanding of how these factors jointly influence firm value in listed deposit money banks in Sub-Saharan Africa.

4.3.1 Firm Size and Firm Value

The current finding that firm size (FSZ) has a strong positive and significant effect on firm value (FVL) aligns with previous studies such as Nangih (2023) and Kaku et al. (2022), which established that larger firms tend to achieve higher financial performance and market valuation. These studies emphasized that larger banks benefit from economies of scale, broader customer bases, and superior access to capital—factors that enhance profitability and investor confidence. Similarly, Lodikero et al. (2023) confirmed that firm size positively influences market capitalization and investor perception, consistent with the present study's evidence that scale provides a structural advantage in the Sub-Saharan African banking sector.

However, the findings of Efut et al. (2023) contradict this positive association, reporting a significant negative relationship between firm size and financial reporting quality among Nigerian universal banks. This inconsistency may stem from the operational complexity and governance challenges that accompany firm growth. As firms expand, internal monitoring and transparency often weaken, creating inefficiencies and potential agency problems. In addition, Egolum and Ikebudu (2023) found no significant relationship between firm size and earnings management in conglomerate firms, suggesting that the effect of size on performance may vary across sectors depending on regulatory environments, capital intensity, and managerial structures.

The Resource-Based View (RBV) theory provides a strong theoretical explanation for the current finding. According to Wernerfelt (1984) and Barney (1991), firm size represents a bundle of valuable, rare, inimitable, and non-substitutable resources that can be strategically deployed to achieve superior performance. Larger banks possess extensive financial resources, advanced technological capabilities, and human capital, which enable them to leverage internal efficiencies and sustain market competitiveness. From the RBV perspective, firm size strengthens a bank's capacity to acquire and integrate ICT investments, expand market reach, and build long-term value—explaining why firm size remains a key determinant of firm value in Sub-Saharan Africa's banking industry.

4.3.2 Profitability and Firm Value

The relationship between profitability (PRO) and firm value (FVL) among listed deposit money banks in Sub-Saharan Africa is complex, showing that profitability enhances firm value only when supported by ICT investment. The current finding aligns with studies such as Orajekwe and Ogbodo (2023), who reported that profitability improves transparency and investor confidence, thereby raising firm value. Similarly, Ahlem et al. (2023) found that profitability becomes a stronger determinant of value when combined with ICT or fintech investments, which enhance efficiency and innovation. These studies affirm that while profitability signals financial strength, its true impact on firm value depends on the firm's ability to channel profits into value-enhancing technologies and digital capabilities.

Conversely, some studies present contradictory evidence. Ndhlovu and Muzira (2023) found that profitability alone does not guarantee improved financial reporting quality, implying that without ICT systems, profits may not translate into greater market trust or value. Likewise, Kaku et al. (2022) observed a negative link between profitability and IFRS compliance in Nigerian financial institutions, suggesting that profitable firms might deprioritize transparency and regulatory discipline when ICT integration is weak. Efut et al. (2023) also reported that profitability negatively affected financial reporting quality in Nigerian banks, supporting the view that profits without digital reinforcement or governance systems can reduce credibility and, consequently, firm value.

The Resource-Based View (RBV) provides a compelling explanation for these findings. RBV posits that competitive advantage stems from a firm's ability to effectively deploy valuable and rare resources. Profitability alone is a valuable outcome, but ICT serves as a complementary strategic resource that enables firms to convert profitability into sustainable value through operational efficiency, innovation, and improved stakeholder communication. In the context of Sub-Saharan Africa's evolving banking landscape, ICT investment enhances the utilization of profitability as a strategic asset, reinforcing its positive impact on firm value and ensuring that financial gains translate into long-term competitive advantage.

4.3.3 Leverage and Firm Value

The consistent negative relationship between leverage

(LEVG) and firm value (FVL) found in this study aligns with prior empirical evidence emphasizing the detrimental impact of high debt levels on financial performance and market valuation. Kaku et al. (2022) reported that leverage adversely affected financial performance and compliance with IFRS among Nigerian financial institutions, as excessive debt constrained investment capacity and increased financial strain. Similarly, Ememobong et al. (2023) found that higher leverage weakened earnings predictability in Nigerian manufacturing firms, reinforcing the notion that heavy reliance on debt heightens uncertainty and investor risk perception. These findings corroborate the present study's results, suggesting that for banks in Sub-Saharan Africa, excessive leverage erodes firm value due to increased interest obligations, reduced flexibility, and heightened insolvency risk.

Contradictory findings, such as those by Jerry and Okenwa (2023), who observed an insignificant effect of leverage on environmental disclosure in Nigerian energy firms, highlight that the impact of leverage may vary across sectors depending on financial structure and risk exposure. In less debt-sensitive industries, leverage may not directly translate into value loss. However, in the banking sector, where leverage fundamentally determines financial stability and investor confidence, its effect on firm value is more pronounced. Additionally, studies such as Uge (2023) and Thakur et al. (2023) show that while ICT investments improve efficiency and profitability over time, they do not significantly mitigate the risks arising from high leverage. This supports the conclusion that ICT enhances operational capacity but cannot neutralize structural financial risks tied to debt financing.

The Resource-Based View (RBV) and Agency Theory together offer a theoretical explanation for these outcomes. From the RBV perspective, ICT constitutes a valuable and strategic resource that can enhance efficiency and competitiveness but cannot substitute for prudent financial management—debt remains a liability that directly influences a firm's risk profile. Meanwhile, Agency Theory explains that high leverage intensifies conflicts between managers and shareholders, as managers may undertake risky debt-financed projects to pursue personal or short-term gains. Although ICT can improve transparency and monitoring, it cannot fully resolve these agency conflicts or offset the inherent risks of excessive debt. Thus, while ICT investment may bolster operational performance, it does not eliminate the adverse effect of leverage on firm value, reaffirming that maintaining balanced capital structures remains critical for sustaining firm value among Sub-Saharan African banks.

4.3.4 Liquidity and Firm Value

Liquidity (LIQD) demonstrates a nuanced relationship with firm value (FVL), showing that while liquidity alone does not significantly affect firm value, its interaction with ICT investment enhances value creation. This finding aligns with studies such as Thakur et al. (2023) and Onuorah and Okoh (2021), who found that ICT investments improve liquidity management and profitability in banks by optimizing cash utilization, improving loan-deposit ratios, and facilitating efficient asset allocation. Similarly, Lambe et al. (2023) emphasized that ICT enhances operational efficiency, but its contribution to value depends on alignment with strategic financial management. These findings collectively support the conclusion that when liquidity is complemented by ICT investment, it becomes more strategically useful, transforming from a passive resource into an active driver of firm value through improved decision-making, cost efficiency, and profitability.

Conversely, several studies report that liquidity alone has little or no direct effect on firm value. Diriyai and Korolo (2023) and Ndhlovu and Muzira (2023) found that liquidity, though essential for short-term stability, does not inherently increase firm value unless it is productively deployed alongside other strategic assets such as ICT. Moreover, excessive liquidity may even reduce firm value when poorly managed. Jerry and Okenwa (2023) observed that firms with high liquidity often fail to utilize cash reserves effectively, leading to idle capital and reduced returns. When paired with excessive ICT spending, this inefficiency may worsen, as resources are diverted to non-productive investments or redundant technologies, undermining overall profitability and market valuation.

The Resource-Based View (RBV) and Agency Theory jointly explain this mixed outcome. RBV posits that liquidity becomes a source of competitive advantage only when integrated with other valuable and inimitable resources like ICT, which enhance its strategic deployment and financial productivity. ICT enables banks to convert liquidity into high-value investments, thereby strengthening firm value. In contrast, Agency Theory cautions that excessive liquidity can amplify managerial opportunism and inefficiency—especially when paired with large ICT budgets lacking strategic oversight. Thus, while ICT can transform liquidity into a more dynamic and value-creating resource, both must be optimally balanced and strategically managed to avoid diminishing returns. This balance is critical for sustaining firm value among listed deposit money banks in Sub-Saharan Africa.

4.3.5 ICT Investment and Firm Value

ICT investment (ICT) has emerged as a critical determinant of firm value (FVL) in listed deposit money banks across Sub-Saharan Africa. The findings reveal a strong positive and significant relationship

between ICT investment and firm value, confirming that banks allocating greater resources to technology experience higher market valuations. This result aligns with Thakur et al. (2023), who found that ICT enhances profitability and competitiveness in the long run by improving efficiency, customer experience, and innovation. Similarly, Onuorah and Okoh (2021) and Lambe et al. (2023) observed that ICT adoption improves liquidity management, operational efficiency, and strategic decision-making, thereby driving sustained growth and shareholder value.

Conversely, some studies, including Akujor et al. (2021) and Jane et al. (2021), reported weak or insignificant short-term effects of ICT on profitability, as returns on ICT investments often take time to materialize. These differences may arise from sectoral variations, the scale of ICT deployment, or differences in performance metrics. While ICT may not immediately enhance profitability, its long-term influence on firm value through process optimization, enhanced transparency, and digital innovation remains profound. In this study, the diminishing direct effect of ICT in Model 3 suggests that its impact becomes more pronounced through interactions with other firm characteristics such as profitability and liquidity rather than as an isolated driver.

Theoretically, the Resource-Based View (RBV) and Agency Theory explain these findings. Under RBV, ICT represents a valuable, rare, and inimitable resource that enables banks to build sustainable competitive advantages through efficiency and innovation. By integrating ICT into core operations, banks enhance their capacity to deliver superior performance and market value. Agency Theory complements this by highlighting how ICT reduces information asymmetry and aligns managerial actions with shareholder interests through greater transparency and accountability. Thus, ICT serves as both a strategic resource and a governance mechanism that strengthens firm performance and enhances value creation in Sub-Saharan Africa's digital banking environment.

5. CONCLUSION AND RECOMMENDATIONS

In conclusion, the study established that firm characteristics and ICT investment jointly determine the firm value of listed deposit money banks in Sub-Saharan Africa. Firm size and ICT investment emerge as the most significant drivers of market value, reflecting the importance of scale and technological capability in enhancing competitiveness. Profitability contributes positively to firm value only when complemented by ICT investment, while excessive leverage undermines market performance due to heightened financial risks. Liquidity influences firm value when optimally managed alongside ICT, but excess liquidity can lead to inefficiencies. Overall, the findings underscore that sustainable firm value in Sub-Saharan Africa's banking sector depends on a holistic management approach that integrates financial performance with strategic ICT investment, prudent leverage control, and efficient resource utilization.

Based on the findings of this study regarding the effect of firm characteristics and ICT investment on the firm value of listed deposit money banks in Sub-Saharan Africa, several specific recommendations are proposed.

i. Banks should adopt growth-oriented strategies such as mergers and acquisitions to achieve economies of scale and strengthen market presence. The Central Bank of Nigeria (CBN) and the Securities and Exchange Commission (SEC) should provide regulatory support and guidelines to facilitate these consolidations.
ii. A portion of profits should be strategically reinvested into ICT-driven initiatives, including digital transformation projects and employee ICT training. The National Information Technology Development Agency (NITDA) should offer grants and capacity-building programs to support these investments.
iii. Banks should implement prudent debt management frameworks by setting target debt-to-equity ratios and continuously monitoring financial risks. The Financial Stability Oversight Council (FSOC) should provide oversight and guidance to ensure sustainable leverage and financial stability.
iv. Effective liquidity management should be aligned with ICT investment strategies to enhance operational efficiency. Banks should perform regular liquidity assessments and stress testing, while the CBN should develop liquidity management guidelines and offer training programs for treasury professionals.
v. Continuous investment in ICT should be prioritized through dedicated budgets and partnerships with technology firms. The Nigerian Communications Commission (NCC) should promote collaboration between banks and technology providers to drive innovation, enhance service delivery, and strengthen competitiveness.

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