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- V. Literature Review
- VI. Methodology
- VII. Results and Discussion
- VIII. Conclusion and Recommendations
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EFFECT OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) COSTS ON FINANCIAL PERFORMANCE OF LISTED INDUSTRIAL GOODS COMPANIES IN NIGERIA: THE MODERATING ROLE OF FIRM SIZE

ZAINAB ABDULLAHI

ABSTRACT

This study investigated the effect of Information and Communication Technology (ICT) costs on financial performance, with firm size as a moderating variable, in Nigeria's industrial goods sector. Using secondary data from 11 listed companies, an ex post facto research design and Ordinary Least Squares (OLS) regression analysis were employed. Results show that ICT expenses negatively affect financial performance, while larger firms are better positioned to optimize these investments due to economies of scale. However, ICT infrastructure investments alone do not significantly influence financial performance. The findings highlighted the importance of firm size in determining the effectiveness of ICT expenses and suggest that smaller firms need tailored ICT strategies. The study recommends more strategic ICT management, particularly for smaller firms, and further research to explore industry-specific factors affecting ICT investments and financial outcomes.

Keywords: Financial Performance; ICT Costs; ICT Expenses; ICT Infrastructure; Firm Size.

1. INTRODUCTION

Financial performance serves as a critical indicator for organizations striving to achieve operational efficiency and strategic growth. A failure to fully harness the potential of Information and Communication Technology (ICT) has been identified as a contributing factor to declining returns, such as Return on Assets (Turner & Apelt, 2021). Over the past few years, ICT integration has significantly influenced financial performance by improving various facets of organizational operations. ICT, encompassing tools such as security systems, internet banking, and electronic payment platforms, has transformed the way businesses manage financial activities. By automating routine processes and optimizing workflows, organizations have been able to reduce operational costs and enhance service delivery, resulting in improved financial outcomes (Berger, 2018).

In the context of Africa, ICT adoption has played a pivotal role in addressing infrastructural deficiencies and promoting economic development. Despite these advancements, the impact of ICT-related costs on financial performance within African organizations, particularly in the industrial sector, remains under-researched. Although ICT investments are recognized for their potential to foster growth and operational efficiency, their influence varies widely depending on

the level of technological adoption and firm-specific characteristics (Tanniru & Lichtenstein, 2019). In Nigeria, the adoption of ICT by listed industrial goods companies has yielded promising outcomes. However, challenges such as high implementation costs and infrastructural constraints continue to hinder progress. It is therefore essential to understand the influence of ICT costs on financial performance in this context, as this knowledge is vital for both policymakers and business leaders (Tomsett, 2022).

ICT costs, often represented by ICT expenditure and ICT infrastructure, denote the financial resources required for acquiring, implementing, and maintaining technology systems. ICT expenditure includes costs associated with hardware, software, and IT services, while ICT infrastructure refers to the physical and digital assets necessary for technology operations. These costs can significantly impact an organization's financial performance. Well-managed ICT expenditures can enhance efficiency and profitability, whereas excessive or poorly allocated ICT spending can deplete financial resources and diminish performance (Melville et al., 2004; Arko, 2022).

Firm size, as a moderating variable, plays a crucial role in shaping the relationship between ICT costs and financial performance. Larger firms tend to benefit

from economies of scale, enabling more effective ICT investments that contribute to superior financial results. Conversely, smaller firms may struggle with limited resources, which can restrict their ability to fully exploit technological advancements. Understanding the moderating effect of firm size is essential for developing tailored ICT strategies that optimize financial outcomes across organizations of different sizes.

This study is motivated by the need to explore how firm size influences the effectiveness of ICT investments in improving financial performance, particularly within Nigeria's industrial goods sector. By analyzing the moderating role of firm size, the research aims to offer insights into how organizations of varying sizes can better allocate their ICT expenditures to maximize financial returns. The study seeks to address gaps in the existing literature by focusing on the interaction between ICT costs, financial performance, and firm size within the specific geographical and industrial context of Nigeria.

2. REVIEW OF RELATED LITERATURE

2.1 Conceptual Framework

2.1.1 Financial Performance

Financial performance is a measure of how effectively a firm utilizes its assets to generate revenue from its primary business activities. It also serves as an overall indicator of a firm's financial health over a specific period (Chiemeké et al., 2020). According to Geetanjali (2020), financial performance offers a comprehensive assessment of a company's standing in areas such as assets, liabilities, equity, expenses, revenue, and profitability. Various financial formulae are used to measure performance, providing detailed insights into the company's operational efficiency and effectiveness.

Financial statements, prepared periodically, are designed to present reliable information regarding a company's financial position and performance to stakeholders. Although measuring financial performance is generally considered straightforward, it can be subject to complexities. Researchers have employed diverse approaches, using either market-based or accounting-based measures, or a combination of both. Broadly, financial performance is assessed using financial and non-financial metrics. These two categories represent distinct perspectives on performance evaluation, with each approach carrying unique theoretical implications and potential biases (Connolly et al., 2022).

One widely used measure of financial performance is Return on Assets (ROA), a financial ratio that gauges a firm's profitability relative to its total assets. ROA helps corporate managers, analysts, and investors assess how efficiently a company utilizes its assets to generate profits (Tomsett, 2022). Expressed as a

percentage, ROA is calculated by dividing a company's net income by its average assets. A higher ROA indicates more efficient asset use, while a lower ROA suggests room for improvement (Stren, 2020). ROA serves as a critical metric in assessing corporate efficiency, as it compares earnings to the resources a company invests in generating them (Silvani et al., 2021).

2.1.2 Information and Communication Technology (ICT) Investment

Information and Communication Technology (ICT) is a broad term encompassing technologies that integrate telecommunications, computers, and related services to enable access, transmission, and manipulation of information (Decman et al., 2021). ICT includes various devices such as telephones, computers, network hardware, audiovisual systems, and satellites. It also covers services like video conferencing and distance learning, and even extends to analog technologies like paper-based communication. The convergence of audiovisual, telecommunication, and computer networks into unified systems has created significant economic incentives, enabling organizations to streamline their communication and information management processes (Doyle, 2020). Any cost incurred by a company in order to own ICT infrastructure is termed ICT Costs. These costs can be divided into ICT expenses (revenue costs of ICT incurred in operations) and ICT infrastructure costs (capital costs of ICT).

2.1.2.1 ICT Expenses

ICT expenses refer to the financial resources allocated to personnel and overhead costs related to the Information and Communication Technology sector. ICT personnel include managers, professionals, technicians, and craft workers responsible for managing an organization's technological infrastructure (Ndou, 2021; Okoye et al., 2021). According to Pant and Fisher (2021), ICT personnel work in partnership with organizational goals, ensuring efficient and secure technology operations. Their responsibilities include designing ICT systems, overseeing service delivery, maintaining information security, and contributing to the development of IT standards and policies. ICT officers play a critical role in implementing an organization's ICT strategy by focusing on key areas such as operational efficiency, risk management, data analytics, and knowledge management (Price, 2021).

In addition, ICT personnel manage the overall technology infrastructure, including software applications, hardware, and network infrastructure. They also collaborate with external service providers to ensure seamless operations, propose improvements to the ICT architecture, and support IT-related projects (Samuel & Tyokoso, 2021; Prud-homme, 2021).

2.1.2.2 ICT Infrastructure

ICT infrastructure refers to the collection of hardware, software, networks, and related technologies used to develop, deliver, and manage ICT services. According to Bird et al. (2022), ICT infrastructure includes components such as network switches, routers, firewalls, servers, and physical wiring. Each element plays a critical role in facilitating communication and information management within an organization.

A network switch enables connectivity between devices in a local area network (LAN), while routers allow communication between different LANs by directing data packets to their destinations. Firewalls, positioned at the network's edge, regulate incoming and outgoing traffic based on predefined security rules. Servers store and manage data, providing users with access to shared resources. The physical network infrastructure, including wiring and server rooms, is often overlooked but is critical to ensuring the proper functioning of IT systems. Network wiring, such as CAT 5/6/7 and fiber optic cables, ensures reliable data transmission, while data centers serve as the core hub for network operations.

In a broader context, ICT infrastructure encompasses all technological assets, including hardware, software, networks, and systems, that support an organization's day-to-day activities. These systems facilitate the flow of information and enable effective communication across various levels of the organization. Additionally, ICT infrastructure supports a wide range of functions, from sensor networks and geographic information systems (GIS) to electronic data management and IT services. Proper management and maintenance of ICT infrastructure are essential to sustaining organizational efficiency and driving long-term growth.

2.1.3 Firm Size

Firm size refers to the scale or magnitude of an organization, typically measured by indicators such as the number of employees, total assets, sales revenue, or market capitalization. It plays a critical role in influencing various organizational outcomes, including financial performance, resource allocation, and operational efficiency. Larger firms often benefit from economies of scale, allowing them to allocate resources more efficiently and invest in technology, innovation, and human capital. In contrast, smaller firms may face resource constraints that limit their capacity for growth and technological adoption (Penrose, 1959; Lee, 2009).

Firm size can also affect the organization's ability to compete in the market, access financing, and manage risks. Larger firms, for example, are generally more diversified and resilient to market fluctuations, while smaller firms tend to be more agile and responsive to changes in their environment (Teece, 1996).

2.2 Empirical Study Review

ICT Expenses and Financial Performance of Firms

Empirical studies investigating the impact of Information and Communication Technology (ICT) expenses on financial performance present mixed results and reveal several research gaps. For instance, Simmons (2022) and Thomas and Carvalho (2022) reported positive effects of ICT investments on profitability and corporate performance in niche sectors such as sachet water and cement manufacturing in Nigeria. However, these studies are often limited by the absence of a comprehensive analysis of firm size as a moderating factor. Consequently, their findings may lack generalizability across different industries and geographical regions. Other research, such as that conducted by Sam and Hoshino (2022) and Tomsett (2022), highlighted broad benefits of ICT, including increased market share and reduced operational costs. Yet, these studies failed to address the specific influence of ICT costs or the moderating role of firm size in detail.

Further studies, including those by Udo et al. (2022) and Vasudevan (2022), also confirm a positive correlation between ICT use and financial performance. However, these studies do not sufficiently explore the moderating effects of firm size or provide detailed analyses of ICT expenditure and infrastructure. Insights from other regions, such as Aguolu (2021) and Amit and Zott (2021), similarly emphasize the beneficial impact of ICT on performance but do not focus on the interplay between ICT costs and firm size. This underscores an empirical gap in the literature: the need for a detailed investigation into the effect of ICT expenditure and infrastructure on financial performance, moderated by firm size. Particularly within the context of Nigerian consumer goods firms, this remains an underexplored area, offering a crucial opportunity for future research to inform strategic ICT investment decisions across diverse business environments.

ICT Infrastructure and Financial Performance of Firms

The existing literature on the relationship between ICT infrastructure and financial performance generally indicates positive effects but reveals significant limitations when applied to the Nigerian consumer goods sector. Yu (2021) examined the influence of ICT infrastructure on net operating profit in Indonesia, identifying positive impacts from factors such as cellular ownership, internet accessibility, and base transceiver stations (BTS). However, these findings are specific to Indonesia and do not account for the contextual and sectoral differences in Nigeria's consumer goods industry. Moreover, Yu's study



focused on broader economic outcomes, such as economic growth and income inequality, rather than firm-specific financial performance, and did not consider the moderating role of firm size.

Similarly, Benk and Budka (2020) explored the impact of ICT infrastructure on financial performance in Nigerian non-financial service companies, finding positive effects but an insignificant role for ICT personnel. While informative, this study's relevance to the consumer goods sector is limited by its focus on non-financial firms and its methodological shortcomings, such as reliance on basic statistical analyses. In another study, Bonner (2020) conducted a global analysis of ICT infrastructure's determinants but did not address sector-specific impacts or consider firm size as a factor. These gaps underscore the need for targeted research examining the influence of ICT infrastructure on financial performance within Nigeria's consumer goods sector, with particular attention to firm size and industry-specific dynamics. Such research would provide critical insights for both scholars and practitioners seeking to optimize ICT investments in this context.

3. METHODOLOGY

This study employed quantitative research methods, utilizing secondary data to achieve its objectives. An ex post facto research design was adopted to investigate the relationships under study. The population comprised all 13 industrial goods

companies listed on the Nigerian Exchange Group as of December 31, 2022. A purposive sampling technique was used to select the sample from the population, with BUA Cement Plc and Notore Chemical Industries Plc being excluded, resulting in a final sample of 11 companies. The study applied Ordinary Least Squares (OLS) regression analysis to examine the moderating effect of firm size on the relationship between ICT costs and financial performance among the sampled industrial goods companies in Nigeria.

Model Specification and Estimation

The model specification for this study is given in functional form as:

$$ROA_{it} = \beta_0 + \beta_1 ICTEXP_{it} + \beta_2 ICTINF_{it} + \beta_3 ICTEXP*FSIZE_{it} + \beta_4 ICTINF*FSIZE_{it} + \beta_5 LEVG_{it} + \beta_6 LIQD_{it} + \epsilon_{it}$$

Where: ROA_{it} represents the financial performance of company i in year t ; $ICTEXP_{it}$, $ICTINF_{it}$, $ICTEXP*FSIZE_{it}$, and $ICTINF*FSIZE_{it}$ denote the ICT Expenses, ICT infrastructure cost, interaction between ICT Expenses and Firm Size, and interaction between ICT Infrastructure Costs and Firm Size, respectively, for company i in year t ; $LEVG_{it}$ represents the leverage of the company i in year t ; $LIQD_{it}$ represents the liquidity of the company i in year t ; β_0 to β_6 are the coefficients to be estimated, representing the relationship between the independent variables and corporate failure and ϵ_{it} is the error term.

Table 1: Variables Definition and their Measurements

Variable	Code	Measurement	Sources
Dependent Variable:			
Return on Assets	ROA	ROA = (Profit after tax/ Total Tax) X 100	AL-Qudah, (2021)
Independent Variables:			
ICT Expenses Ratio	ICTEXP	ICTEXP = (ICT Expenses/Revenue) X 100	Adekunle and Rafiu (2020); Kozak (2018)
ICT Infrastructure	ICTINF	ICTINF = (Property, plant and equipment on ICT/ Total) X 100	Adekunle and Rafiu (2020);
Moderating Variable:			
Firm Size		Natural logarithm of Total Assets	Kozak (2018)
Control variables:			
Leverage	LEVG	% of Total Debt to Total Equity	AL-Qudah, (2021)
Liquidity	LIQD	Current Assets less Inventory/Current Liabilities	AL-Qudah, (2021)

Source: Author’s Compilation, (2024)

4. RESULTS AND DISCUSSION

4.1 Descriptive Analysis

Table 2 presents the descriptive statistics of the variables used in this study. The mean value of Return on Assets (ROA), a measure of financial performance,

is 0.077, with a median (p50) of 0.064 and a standard deviation (SD) of 0.14, indicating variability in firm profitability. The maximum value of ROA is 0.54, while the minimum is -0.26, showing a range of profitability across the sampled firms.



Table 2: Descriptive Analysis

variable	Mean	p50	Max	Min	SD	N
ROA	0.077	0.064	0.54	-0.26	0.14	97
ICTEXP	0.52	0.43	1.2	0.055	0.35	41
ICTINF	0.1	0	1.2	0	0.24	97
ICTEXP_FSIZE	4.5	3.6	12	0	2.9	41
ICTINF_FSIZE	0.96	0	11	0	2.2	97
LEVG	31	22	2987	-10710	1180	97
LIQD	2.8	1.6	36	0.024	4.9	97

Source: STATA 14.0 Output, (2024)

ICT expenses (ICTEXP) have a mean of 0.52, with a median of 0.43 and a standard deviation of 0.35. This suggests a moderate level of investment in ICT across firms, with values ranging from 0.055 to 1.2. Similarly, ICT infrastructure (ICTINF) shows a mean of 0.1, indicating relatively lower infrastructure investments, with a standard deviation of 0.24 and a range from 0 to 1.2.

The interaction terms, ICT expenses moderated by firm size (ICTEXP_FSIZE) and ICT infrastructure moderated by firm size (ICTINF_FSIZE), have means of 4.5 and 0.96, respectively. This indicates that firm size plays a role in how ICT costs are distributed, particularly with ICT expenses. Leverage (LEVG) has a high standard deviation (1,180), suggesting significant variability in debt levels among firms, while liquidity (LIQD) shows an average value of 2.8,

suggesting most firms maintain moderate liquidity

4.2 Correlation Analysis

Table 3 presents the correlation matrix, which shows the relationships between ROA, ICT variables, leverage, and liquidity. ROA is negatively correlated with ICT expenses ($r = -0.1503$) and ICT infrastructure ($r = -0.0958$), suggesting that higher ICT costs may not directly translate into higher financial performance. This aligns with the results for the interaction terms, ICTEXP_FSIZE and ICTINF_FSIZE, which also show negative correlations with ROA (-0.0034 and -0.0966 , respectively), indicating that firm size does not entirely mitigate the impact of ICT expenses or infrastructure on financial performance.

Table 3: Correlation Matrix

	ROA	ICTEXP	ICTINF	ICTEXP* FSIZE	ICTINF* FSIZE	LEVG	LIQD
ROA	1.0000						
ICTEXP	-0.1503	1.0000					
ICTINF	-0.0958	-0.417	1.0000				
ICTEXP*FSIZE	-0.0034	0.9551	-0.4358	1.0000			
ICTINF*FSIZE	-0.0966	-0.4201	0.9997	-0.4389	1.0000		
LEVG	-0.0437	-0.2263	0.023	-0.1796	0.0232	1.0000	
LIQD	-0.1751	-0.1207	-0.074	-0.0847	-0.0748	0.2404	1.0000

Source: STATA 14.0 Output, (2024)

Interestingly, ICT expenses are positively correlated with the interaction term ICTEXP_FSIZE ($r = 0.9551$), signifying that larger firms are able to leverage ICT investments more effectively. ICT infrastructure (ICTINF) and its interaction with firm size (ICTINF_FSIZE) exhibit near-perfect positive correlation ($r = 0.9997$), which reflects the high association between infrastructure investments and firm size. Leverage (LEVG) and liquidity (LIQD) show weak negative correlations with ROA, indicating that higher debt levels and lower liquidity may also negatively impact firm profitability.

4.3 Regression Analysis

Table 4 presents the results of the pooled Ordinary Least Squares (OLS) regression, examining the moderating effect of firm size on the relationship between ICT costs and financial performance (ROA). The model has an R-squared of 0.3396, indicating that approximately 34% of the variability in ROA can be explained by the independent variables in the model. The F-statistic is significant ($F = 2.91, p = 0.0211$), suggesting that the model is a good fit for the data.

Table 4: Pooled OLS Regression

Source	SS	Df	MS	Number of obs	=	41
				F (6, 509)	=	2.91
Model	0.517101	6	0.086184	Prob > F	=	0.0211
Residual	1.005749	34	0.029581	R-Squared	=	0.3396
				Adj R-squared	=	0.223
Total	1.52285	40	6.552689	Root MSE	=	0.17199
CORFAIL	Coef.	Std. Err	T	P> t 	[95% Conf. Interval]	
ICTEXP	-1.03656	0.268902	-3.85	0.000	-1.58304	-0.49009
ICTINF	4.381717	10.42214	0.42	0.677	-16.7986	25.56206
ICTEXP_FSIZE	0.111288	0.032386	3.44	0.002	0.045471	0.177104
ICTINF_FSIZE	-0.54771	1.221437	-0.45	0.657	-3.02996	1.934553
LEVG	-1.1E-05	1.58E-05	-0.70	0.489	-4.3E-05	2.11E-05
LIQD	-0.0069	0.00403	-1.71	0.096	-0.01509	0.001291
cons	0.152126	0.064358	2.36	0.024	0.021335	0.282917

Source: STATA 14.0 Output, (2024)

The coefficient for ICT expenses (ICTEXP) is negative and significant (-1.03656, $p = 0.000$), indicating that higher ICT expenses are associated with a decline in financial performance. This suggests that, for the sample of industrial goods companies in Nigeria, excessive ICT spending may not lead to improved profitability, potentially due to misallocation of resources or inefficiencies in ICT utilization.

The coefficient for ICT infrastructure (ICTINF) is positive but not statistically significant (4.381717, $p = 0.677$), suggesting that ICT infrastructure investments, on their own, do not have a significant direct effect on financial performance in this context. The interaction term for ICT expenses and firm size (ICTEXP_FSIZE) is positive and significant (0.111288, $p = 0.002$), indicating that larger firms are better able to leverage their ICT expenditures to improve financial performance. This supports the hypothesis that firm size moderates the relationship between ICT costs and financial outcomes, with larger firms benefiting more from ICT investments.

However, the interaction term for ICT infrastructure and firm size (ICTINF_FSIZE) is negative and not significant (-0.54771, $p = 0.657$), implying that firm size does not significantly influence the relationship between ICT infrastructure and financial performance.

Other control variables, such as leverage (LEVG) and liquidity (LIQD), do not show significant effects on financial performance. The coefficient for leverage is negative (-1.1E-05, $p = 0.489$), while liquidity is marginally significant at the 10% level (-0.0069, $p = 0.096$), indicating a possible negative impact of

liquidity on profitability, though the effect is weak.

4.4 Discussion

The results of this study offer valuable insights into the relationship between ICT costs, firm size, and financial performance in the Nigerian industrial goods sector. The findings suggest that ICT expenses, when not managed effectively, can detract from financial performance. This is consistent with previous research, which highlights the importance of efficient ICT resource allocation (Simmons, 2022; Thomas & Carvalho, 2022). However, the significant positive interaction between ICT expenses and firm size indicates that larger firms are better positioned to optimize these investments, benefiting more from their ICT expenditures than smaller firms. This supports the argument that economies of scale play a crucial role in determining the impact of ICT on financial outcomes (Penrose, 1959).

Conversely, ICT infrastructure investments do not show a direct significant effect on financial performance, nor does firm size appear to significantly moderate this relationship. This could suggest that infrastructure alone, without effective integration into business processes, may not yield immediate financial benefits. This finding aligns with literature suggesting that the mere acquisition of ICT infrastructure is insufficient to drive financial performance unless supported by complementary capabilities and processes (Amit & Zott, 2021).

In conclusion, the study highlights the critical role of firm size in moderating the relationship between ICT costs and financial performance. Larger firms are more capable of realizing the potential benefits of ICT investments, particularly in terms of expenses, while

smaller firms may face challenges in maximizing the value of such investments. This underscores the importance of strategic ICT management, especially for smaller firms seeking to enhance their financial outcomes.

5. CONCLUSION AND RECOMMENDATIONS

This study examined the relationship between ICT costs, firm size, and financial performance in the Nigerian industrial goods sector, with a particular focus on how firm size moderates the effects of ICT expenses and ICT infrastructure on financial outcomes. The results indicate that ICT expenses have a significant negative impact on financial performance when not managed efficiently. However, the interaction between ICT expenses and firm size reveals that larger firms are better able to capitalize on these investments, leading to improved financial outcomes. This suggests that economies of scale play an important role in the effective utilization of ICT resources.

On the other hand, ICT infrastructure investments do not show a significant direct effect on financial performance, nor does firm size significantly influence this relationship. This indicates that infrastructure investments alone may not translate into improved profitability without complementary strategies and resources. Additionally, the control variables, leverage and liquidity, were not found to have a significant effect on financial performance, except for a weak negative association between liquidity and profitability.

Overall, this study highlights the importance of firm size as a moderating factor in the relationship between ICT costs and financial performance, suggesting that larger firms are more adept at leveraging ICT investments for better financial outcomes. For smaller firms, optimizing the use of ICT resources remains a challenge.

Based on the findings of this study, the following recommendations are proposed:

1. Strategic ICT Investment: Firms, particularly smaller ones, should adopt more strategic approaches to ICT spending. While ICT investments are essential for modern business operations, firms must ensure that these expenditures are aligned with operational needs and effectively managed to avoid negative impacts on financial performance.

2. Tailored ICT Strategies for Firm Size: Policymakers and business leaders should recognize the varying capacities of firms based on their size to leverage ICT investments. Larger firms benefit from economies of scale, but smaller firms may need customized ICT strategies, including targeted support and resource optimization, to maximize returns on

ICT investments.

3. Efficient Management of ICT Infrastructure: While ICT infrastructure alone does not guarantee improved financial performance, firms should focus on integrating infrastructure investments with other business processes and ensuring that infrastructure is optimally utilized. This may include training, process improvements, and fostering an innovation-driven culture.

4. Continuous Monitoring of ICT Costs: Firms should implement robust monitoring mechanisms to track ICT expenses and their impact on financial performance. This will help identify areas where ICT costs can be better managed or reallocated to improve profitability.

5. Further Research: Future research should explore the role of other moderating variables, such as industry-specific factors, governance structures, and market dynamics, in shaping the relationship between ICT investments and financial performance. Additionally, studies could investigate the long-term effects of ICT investments on firm performance across different sectors and regions.

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