

TECHNOLOGICAL AND REGULATORY ENVIRONMENTAL FACTORS AND FINANCIAL PERFORMANCE OF GUARANTY TRUST HOLDING COMPANY PLC, 2013–2023

¹Abubakar, Mohammad Mayanchi & ²Prof. O. L. Kuye

^{1,2}Department of Business Administration, Faculty of Management Sciences, University of Lagos.

¹mayanchi2018@gmail.com, ²okuye@unilag.edu.ng

¹08069262852, ²08033213491

Abstract

This study examined the relationship between technological and regulatory environmental factors and the financial performance of Guaranty Trust Holding Company Plc (GTCO) from 2013 to 2023. The study was reframed as an exploratory single-case time-series analysis because the empirical evidence was drawn from one financial institution rather than the entire Nigerian banking industry. Therefore, the findings are specific to GTCO Plc and should not be generalised to all deposit money banks in Nigeria. Using an ex post facto research design, the study relied on secondary annual data obtained from GTCO annual reports, Central Bank of Nigeria publications, and Nigeria Inter-Bank Settlement System data. Financial performance was measured using return on assets (ROA), while the explanatory variables included IT investment ratio, digital transaction value, cash reserve ratio (CRR), and capital adequacy ratio (CAR). The data were analysed using descriptive statistics, correlation analysis, and multiple regression. The findings showed that the technological variables had positive relationships with ROA in the reported exploratory model. However, the regulatory variables produced statistically insignificant results at the 5% level. Specifically, CRR showed a negative but statistically insignificant relationship with ROA, while CAR showed a positive but statistically insignificant relationship with ROA. These findings suggest that technological factors may be associated with GTCO's financial performance, but the evidence is not sufficient to establish causality. The results should be interpreted cautiously due to the small number of annual observations, the single-bank case-study design, and the use of national-level digital transaction data as a proxy for technological environment. The study concludes that technological and regulatory conditions may be relevant to bank performance, but stronger evidence would require a larger dataset, such as quarterly observations or panel data covering several Nigerian banks.

Keywords: exploratory time-series study, financial performance, GTCO Plc, regulatory environment, Technological environment

Introduction

The business environment in which banks operate has become increasingly dynamic due to rapid technological advancement, regulatory changes, competitive pressure, macroeconomic instability, and shifts in customer behaviour. In the banking sector, technological and regulatory environmental factors are particularly important because they influence how banks

deliver services, manage risks, comply with policy requirements, and sustain profitability. Technological developments such as digital payment platforms, mobile banking, automation, cybersecurity systems, and electronic transaction infrastructure have changed the structure of banking operations and competition in financial services (DeYoung, Lang, & Nolle, 2007; Frame & White, 2014). At the same time, regulatory instruments such as the Cash Reserve Ratio (CRR), Capital Adequacy Ratio (CAR), liquidity requirements, and prudential guidelines continue to shape banks' operational flexibility, risk exposure, and financial outcomes (Berger, Herring, & Szegö, 1995; Athanasoglou, Brissimis, & Delis, 2008).

In Nigeria, the banking industry has experienced major technological and regulatory changes over the past decade. The expansion of electronic payment systems, growth in mobile and internet banking, fintech competition, and increased reliance on digital infrastructure have altered how banks interact with customers and process transactions. Regulatory authorities, especially the Central Bank of Nigeria, have also introduced or adjusted policies to strengthen financial stability, manage liquidity, improve capital adequacy, and protect depositors (Central Bank of Nigeria [CBN], 2023). These developments have created both opportunities and constraints for deposit money banks. While technological development may improve operational efficiency and revenue opportunities, regulatory requirements may influence liquidity, lending capacity, cost structure, and profitability.

However, it is important to distinguish between industry-level developments and firm-specific performance. National digital transaction values reported by institutions such as the Nigeria Inter-Bank Settlement System (NIBSS) reflect economy-wide digital payment activity and do not directly represent the digital transaction volume or technology adoption level of a specific bank. Similarly, sector-level banking indicators cannot automatically be treated as evidence of the performance or strategic response of Guaranty Trust Holding Company Plc (GTCO). This distinction is necessary because ecological or aggregate-level indicators may not accurately explain firm-level outcomes when the unit of analysis differs (Robinson, 1950). Therefore, this study treats national and sectoral indicators as contextual environmental measures, while GTCO's financial performance indicators are treated as firm-specific outcomes. The study is therefore not a statistical representation of the entire Nigerian banking industry but an exploratory case-based analysis of GTCO.

GTCO provides a useful case for examining the relationship between technological and regulatory environmental factors and bank performance because of its long-standing position as one of Nigeria's leading financial institutions and its active involvement in digital banking and innovation. Case-study research is appropriate where a study seeks to understand a phenomenon within a specific real-life context, especially when contextual conditions are important to the interpretation of findings (Yin, 2018). However, GTCO also underwent an important organisational restructuring during the study period. Before 2021, the institution operated as Guaranty Trust Bank Plc, while from 2021 it became Guaranty Trust Holding Company Plc. This change raises an important issue of data comparability because pre-2021 figures may refer to the banking entity, while post-2021 figures may reflect the consolidated holding company structure. Therefore, the study recognises this structural transition as a limitation and recommends that the data sources should clearly specify whether the reported figures are bank-only or group-level financial indicators.

The central problem addressed in this study is that while technological and regulatory environmental factors are widely believed to influence bank performance, there is limited

clarity on how these factors relate to the financial performance of a single Nigerian banking institution over time. Previous banking studies have examined the determinants of bank profitability using bank-specific, industry-specific, and macroeconomic variables (Athanasoglou et al., 2008; Dietrich & Wanzenried, 2011). Other studies have examined the role of technology and financial innovation in banking performance and service delivery (DeYoung et al., 2007; Frame & White, 2014). However, fewer studies have provided a focused time-series case analysis of how selected technological and regulatory indicators relate to the financial performance of GTCO over a defined period. In addition, some studies combine national, sectoral, and firm-level data without clearly explaining their differences, thereby creating possible attribution problems. This study responds to that gap by examining GTCO as a purposively selected single case and by limiting the interpretation of findings to the selected organisation.

The study also recognises that the term “business environment” is broad and must be clearly operationalised. In this paper, technological factors are represented by IT investment ratio and digital transaction value, while regulatory factors are represented by CRR and CAR. However, the study acknowledges that IT investment ratio is an internal strategic capability rather than a purely external technological-environment variable. This position is consistent with the Resource-Based View, which explains that firm-specific resources and capabilities can influence performance when they are valuable and difficult to imitate (Barney, 1991). In contrast, national digital transaction value represents the wider digital payment environment, not GTCO-specific transaction activity. This means that the technological dimension of the study combines both an internal technology-related capability and an external digital-environment indicator. This conceptual distinction is important for interpreting the results cautiously.

The study is guided by an exploratory rather than a causal logic. Although the paper uses an ex post facto design and historical secondary data, such a design cannot establish direct causal effects. It can only identify statistical relationships or associations between the selected variables. This caution is important in time-series analysis because small samples, common trends, nonstationarity, omitted variables, and multicollinearity can produce misleading statistical relationships (Gujarati & Porter, 2009; Wooldridge, 2016). Therefore, the study avoids making strong causal claims and instead examines whether technological and regulatory environmental indicators are significantly associated with GTCO’s financial performance from 2013 to 2023. This cautious interpretation is necessary because the study uses only eleven annual observations, which limits the reliability of regression estimates, significance tests, and diagnostic procedures.

The dependent variable in this reframed study is financial performance, measured by Return on Assets (ROA). ROA is widely used in banking studies because it reflects how efficiently a bank uses its assets to generate profit (Athanasoglou et al., 2008; Dietrich & Wanzenried, 2011). Although other performance indicators such as Return on Equity (ROE) and Net Interest Margin (NIM) may be relevant in banking studies, the present analysis is limited to ROA because the reported regression model uses ROA as the dependent variable. Therefore, the interpretation of findings is restricted to ROA unless separate models are estimated for ROE and NIM. This clarification is necessary to ensure consistency between the abstract, methodology, results, and conclusion. The specific objectives of the study are to examine the relationship between technological factors and the financial performance of GTCO Plc from 2013 to 2023; assess the relationship between regulatory factors and the financial

performance of GTCO Plc from 2013 to 2023; and determine the combined relationship between technological and regulatory factors and GTCO's financial performance within the study period.

In line with these objectives, the study addresses the following research questions: What relationship exists between technological factors and GTCO's financial performance? What relationship exists between regulatory factors and GTCO's financial performance? What combined relationship do technological and regulatory factors have with GTCO's financial performance from 2013 to 2023?

The study tests the following null hypotheses:

H₀₁: Technological factors have no significant relationship with the financial performance of GTCO Plc.

H₀₂: Regulatory factors have no significant relationship with the financial performance of GTCO Plc.

H₀₃: Technological and regulatory factors jointly have no significant relationship with the financial performance of GTCO Plc.

The study is significant because it contributes to the literature on bank performance, technology-related investment, and regulatory environmental conditions in Nigeria. It also provides a focused case-based understanding of GTCO over the period 2013–2023. However, the findings should not be generalised to all Nigerian deposit money banks because the empirical analysis covers only one institution. A broader industry-level conclusion would require a panel-data study involving several banks or a larger dataset such as quarterly observations. Consequently, this paper is best understood as an exploratory single-case time-series study that provides preliminary evidence on the relationship between selected technological and regulatory factors and GTCO's financial performance.

Literature Review

Conceptual Framework

Business Environment

The business environment can be defined as the aggregate of external and internal forces that affect an organization's ability to operate effectively and achieve its objectives (Pearce & Robinson, 2018). According to Kotler and Keller (2022), it represents the sum of all factors; economic, technological, political, legal, social, and ecological that shape an organization's opportunities and threats. The business environment provides the contextual conditions under which organizations formulate and implement strategies. In the words of Pearce and Robinson (2018), the business environment is the landscape of opportunities and constraints that continuously influences managerial decision-making and firm performance.

The business environment serves as both a driver and constraint of organizational performance. Favorable environments foster innovation, efficiency, and competitiveness, while turbulent ones require strategic adaptation and resilience. As Hill and Jones (2019) argue, organizations function as open systems that must constantly respond to environmental changes to maintain equilibrium and growth. In Nigeria's banking industry, the business environment is best likely understood through its most dynamic forces, technological advancements and regulatory developments, which jointly determine operational effectiveness and financial sustainability.

Technological Environment

The technological environment refers to the sum of scientific knowledge, technical skills, digital tools, and innovations that organizations utilize to enhance operational efficiency, improve customer experience, and sustain competitive advantage (Drucker, 1999). It encompasses the processes and infrastructure that allow firms to transform inputs into outputs more efficiently (Porter, 1990; Barney, 1991). In modern banking, the technological environment covers a wide range of systems and innovations including internet banking, mobile applications, fintech integration, data analytics, artificial intelligence, blockchain technologies, and cybersecurity solutions. These tools redefine how financial institutions deliver value, interact with customers, and manage risks.

The technological environment serves as both an enabler and a disruptor of performance. As Drucker (1999) observed, technology transforms not just the tools of production but the structure of entire industries. In banking, this transformation manifests in digitized transactions, automated processes, and data-driven decision-making. The adoption of digital technologies enables financial institutions to reduce operational costs, expand outreach, and improve service delivery. However, failure to adopt or integrate technological advancements effectively can lead to inefficiency, reduced competitiveness, and loss of market share.

In this study, the technological environment is conceptualized as the degree to which a bank invests in and integrates new technologies into its operations and service delivery. It represents an external dimension that influences performance through innovation, process efficiency, and customer satisfaction. A well-developed technological environment enhances a bank's ability to achieve superior financial and non-financial outcomes.

Regulatory Environment

The regulatory environment refers to the institutional framework of rules, laws, policies, and standards that govern the operations of organizations within a particular industry or economy. It establishes the parameters of acceptable conduct, ensures transparency, and promotes stability. According to North (1990), institutions; both formal and informal shape the rules of economic exchange, while Scott (2014) defines the regulatory environment as the set of institutional mechanisms that enforce compliance and shape organizational legitimacy. In the banking industry, the regulatory environment encompasses the supervisory and policy structures created by agencies such as the Central Bank of Nigeria (CBN), the Nigeria Deposit Insurance Corporation (NDIC), and the Financial Reporting Council of Nigeria (FRCN).

The regulatory environment performs both corrective and preventive functions. It aims to ensure systemic stability, protect consumers, and maintain confidence in the financial system. This includes prudential regulations such as capital adequacy requirements, liquidity ratios, and anti-money laundering measures, as well as conduct regulations that promote ethical standards and consumer protection (Scott, 2014). However, the regulatory environment can also create compliance burdens that affect profitability and flexibility. Black, Hopper, and Band (2007) describe this as the tension between "principles-based regulation," which encourages innovation, and "rules-based regulation," which emphasizes strict compliance.

In this study, the regulatory environment may be seen as the set of external legal and institutional conditions that shape the strategic and operational behaviour of banks. It is viewed as both a stabilizing and constraining force: stabilizing in its promotion of

transparency and prudence but constraining when compliance costs become excessive. A balanced and adaptive regulatory framework is therefore critical for achieving sustained performance and financial stability.

Empirical Review

Empirical evidence on the relationship between the business environment and organizational performance has grown significantly in recent years, particularly in the context of developing economies where environmental volatility is high.

Technological Environment and Organizational Performance

Empirical studies across the Nigerian banking sector consistently confirm that technological advancement is a key driver of operational efficiency, profitability, and customer satisfaction. Oyelami, Adepoju, and Iyiola (2020), in *Cogent Business & Management*, conducted a quantitative study on e-banking adoption and bank performance in Nigeria. Using survey data from 400 customers of five commercial banks, they found that digital banking services significantly improved customer satisfaction and reduced transaction costs. Their regression results revealed a positive correlation ($r = 0.73$) between technology adoption and financial performance.

Similarly, Adeleke and Yusuf (2022) examined fintech partnerships and bank profitability in Nigeria using secondary data from annual reports of 10 deposit money banks between 2015 and 2020. Their findings revealed that banks with higher fintech integration achieved greater financial inclusion and return on assets (ROA). They concluded that fintech collaboration enhances competitiveness through product diversification and operational innovation. In another study, Ozor and Nwankwo (2021) analyzed the effect of digital banking channels on the profitability of deposit money banks in Nigeria using panel data analysis from 2010 to 2019. The study reported that electronic banking transactions positively affected both return on equity (ROE) and net interest margin. The authors emphasized that digital transformation not only enhances profitability but also promotes customer loyalty and market expansion.

Beyond Nigeria, Aboagye and Boateng (2020) studied 18 sub-Saharan African banks and reported that investment in IT infrastructure accounted for 37% of the variation in profitability across institutions. Their study reinforced the view that technology investment improves both efficiency and competitiveness in emerging financial markets. Additionally, Alalade, Ogunsemi, and Otekunrin (2021), examined information technology investment and efficiency of Nigerian banks between 2010 and 2019. Using Data Envelopment Analysis (DEA), they found that IT adoption improved cost efficiency by 24% and enhanced service delivery speed. The authors concluded that banks that continuously reinvest in digital technology maintain sustainable performance advantages. At a macro level, statistics from the Nigeria Inter-Bank Settlement System (NIBSS, 2023) corroborate these findings, indicating that electronic payment transactions grew from ₦158.1 trillion in 2020 to ₦611.06 trillion in 2023, a 286% increase within three years. This growth demonstrates the systemic shift towards technology-driven operations in the Nigerian banking industry.

Collectively, these studies confirm a strong and consistent empirical relationship between technological adoption and bank performance, implying that technology serves as a major

enabler of profitability, cost efficiency, and customer engagement in Nigeria's evolving banking landscape.

Regulatory Environment and Organizational Performance

Empirical evidence on the regulatory environment suggests a complex relationship between regulation and organizational performance. While regulation ensures stability and consumer confidence, it may also impose compliance costs that reduce profitability. Ajayi and Atanda (2021) examined the effect of monetary policy instruments particularly the Cash Reserve Ratio (CRR) and Monetary Policy Rate (MPR) on bank performance in Nigeria. Using time series data from 2005 to 2020, they found that higher CRR levels negatively affected banks' profitability in the short run but contributed to long-term liquidity stability.

Eze and Okoye (2022) evaluated the impact of Basel III implementation on bank stability in Nigeria using panel regression analysis for 12 deposit money banks. Their results indicated that stricter capital requirements enhanced financial soundness, as evidenced by a 15% increase in the average capital adequacy ratio (CAR) and a decline in non-performing loans (NPLs). However, they also noted that higher compliance costs moderately reduced return on equity (ROE). Further, Olarewaju and Fapetu (2023) found that while prudential supervision improved asset quality and credit risk management, high regulatory stringency constrained banks' lending capacity. Their study concluded that an optimal regulatory balance one that ensures stability without stifling innovation is essential for sustained performance.

Empirical evidence from the Central Bank of Nigeria (CBN, 2023) and the Nigeria Deposit Insurance Corporation (NDIC, 2022) reinforces these findings. The CBN's Financial Stability Report (2023) noted that despite a 32% increase in compliance costs between 2020 and 2023, the banking sector's overall Return on Equity (ROE) improved from 18.4% to 21.7%, suggesting that banks successfully adapted to regulatory tightening through cost management and digital efficiency. Similar patterns were observed in global contexts. Nguyen, Tran, and Vo (2022) found that regulatory technology (RegTech) adoption among Asian banks improved compliance accuracy and reduced fraud losses by 18%. The authors argued that technology-enabled compliance systems transform regulation from a burden into a strategic advantage.

These findings collectively suggest that while regulation imposes operational constraints, it also drives institutional resilience and investor confidence. Banks that integrate technological compliance systems tend to mitigate the negative impact of regulatory costs and improve performance outcomes.

Integrative Studies on Technological and Regulatory Interactions

Recent empirical studies emphasize that technological and regulatory environments interact to jointly influence organizational performance. Omoregie and Ezeani (2022), in *Technological Forecasting and Social Change*, investigated how open banking regulation moderated the relationship between digital transformation and firm performance in emerging markets. Using a mixed-method design, they found that supportive regulatory frameworks amplified the positive effects of technology on performance, while rigid policies weakened them.

Similarly, Adewale and Olatunji (2023), highlighted the growing importance of regulatory technology (RegTech) in facilitating compliance efficiency. Their findings showed that

Nigerian banks implementing digital compliance systems experienced a 25% reduction in audit errors and improved operational performance. At the institutional level, GTCO Plc's transformation into a financial holding company (HoldCo) in 2021 provides a practical example of this interaction. By reconfiguring its structure in line with new CBN guidelines, GTCO was able to comply with regulation while expanding into digital payments through subsidiaries like HabariPay and SquadPOS. This case reflects the essence of the Dynamic Capabilities Theory, which views adaptation to environmental change as a determinant of sustained performance.

Most prior studies in Nigeria have examined these factors in isolation rather than as interacting forces. Thus, there remains an empirical gap regarding their combined influence on organizational performance, particularly within the context of post-2020 digital transformation and evolving regulation. The current study fills this gap by examining how both technological and regulatory environments jointly influence the performance of Guaranty Trust Holding Company Plc (GTCO) between 2020 and 2023.

Theoretical Framework

The study is best supported by the Resource-Based View and Dynamic Capabilities Theory. The Resource-Based View argues that firm-specific resources and capabilities can contribute to superior performance when they are valuable, rare, difficult to imitate, and effectively organised (Barney, 1991). In the context of this study, GTCO's IT investment ratio can be understood as a firm-specific technological capability that may support efficiency, innovation, and service delivery. However, the Resource-Based View alone may not fully explain how banks respond to changing technological and regulatory conditions.

Dynamic Capabilities Theory provides a stronger explanation because it focuses on how firms adapt, integrate, and reconfigure internal and external competencies in response to rapidly changing environments (Teece, Pisano, & Shuen, 1997). This theory is relevant because banks operate in a business environment shaped by digital transformation, fintech competition, regulatory pressure, cybersecurity risks, and changing customer expectations. From this perspective, GTCO's performance may be related not only to the possession of technological resources but also to its ability to adapt those resources to environmental changes.

Institutional Theory may also provide a secondary explanation for the regulatory variables. Institutional Theory argues that organisations respond to formal rules, regulatory pressures, norms, and expectations in their operating environment (DiMaggio & Powell, 1983; Scott, 2014). In the banking sector, regulatory requirements such as CRR and CAR are institutional pressures that shape banks' strategic and financial decisions. However, this study does not require excessive theoretical proliferation. Therefore, Dynamic Capabilities Theory is adopted as the main theoretical lens, while the Resource-Based View and Institutional Theory are used only as supporting explanations for the internal technology and regulatory dimensions.

Contingency Theory is not adopted as the main theory in this reframed study because the present model does not directly test strategic fit, alignment, or interaction effects. Contingency Theory argues that organisational performance depends on the fit between environmental conditions and internal structures or strategies (Donaldson, 2001). To test Contingency Theory more directly, the model would need variables such as technological

environment $\times$ IT capability, regulatory intensity $\times$ compliance capability, or environmental turbulence $\times$ strategic flexibility. Since the current model only estimates direct relationships between selected variables and ROA, it is more accurately described as an exploratory direct-effects model rather than a contingency model.

Based on the conceptual framework, the study proposes that GTCO's financial performance may be associated with internal technological capability, external digital-payment environment, and regulatory conditions. However, because the study uses a single-bank time-series design with only eleven annual observations, the relationships should be interpreted as exploratory associations rather than causal effects.

Materials and Method

Research Design

This study adopted an ex post facto research design using annual secondary time-series data. The design is appropriate because the study relied on historical data that had already occurred and could not be manipulated by the researcher. However, the design is not suitable for establishing strict causal relationships. Therefore, the study is framed as an exploratory single-case time-series analysis that examines statistical relationships between selected technological and regulatory factors and the financial performance of Guaranty Trust Holding Company Plc (GTCO) from 2013 to 2023. The use of the term "relationship" is preferred to "impact" because the study is based on observational data rather than experimental or quasi-experimental evidence. Consequently, the findings are interpreted as associations and not as proof of causality.

Population, Case Selection, and Scope of the Study

The broader population of interest is the Nigerian banking sector. However, the empirical analysis focuses only on Guaranty Trust Holding Company Plc. Therefore, GTCO is treated as a purposively selected single case rather than as a statistical sample of all deposit money banks in Nigeria. GTCO was selected because it is one of Nigeria's leading financial institutions and has been actively involved in digital banking, electronic service delivery, and technology-driven financial innovation. Nevertheless, the findings of this study are limited to GTCO and should not be generalised to the entire Nigerian banking industry. Any industry-wide conclusion would require a larger sample, preferably panel data covering several Nigerian deposit money banks. The study covers the period 2013 to 2023. This period was selected because it captures major changes in Nigeria's digital payment environment, regulatory conditions, and GTCO's corporate structure. However, the study recognises that GTCO became a holding company in 2021, while the institution operated as Guaranty Trust Bank Plc before then. Therefore, the data should be carefully checked to confirm whether pre-2021 figures refer to Guaranty Trust Bank Plc and whether post-2021 figures refer to consolidated GTCO group accounts. This distinction is important because a change in reporting entity may affect the comparability of financial indicators across the study period.

The study relied on secondary data obtained from published and official sources. GTCO-specific financial data were obtained from the company's annual reports and audited financial statements. Regulatory data were obtained from Central Bank of Nigeria publications, while digital transaction data were obtained from Nigeria Inter-Bank Settlement System reports.

The study acknowledges that the digital transaction value obtained from NIBSS represents national electronic payment activity rather than GTCO-specific transaction volume. Therefore, this variable is treated as a proxy for the wider digital payment environment in Nigeria and not as a direct measure of GTCO's internal digital transaction performance. For transparency and replicability, the study should provide a data-construction table showing the exact source, page number, accounting label, and formula used for each variable. This is particularly important for IT investment ratio, CRR, CAR, and digital transaction value.

Measurement of Variables

The dependent variable is financial performance, measured by Return on Assets (ROA). ROA was selected because it shows how efficiently the organisation uses its assets to generate profit. Although Return on Equity (ROE) and Net Interest Margin (NIM) are also relevant measures of bank performance, the present model is limited to ROA because the reported regression analysis uses ROA as the dependent variable. If ROE and NIM are retained in the paper, separate regression models should be estimated for them.

The explanatory variables are IT investment ratio, digital transaction value, Cash Reserve Ratio, and Capital Adequacy Ratio. IT investment ratio represents GTCO's internal technology-related capability. It should be calculated as IT expenditure divided by total operating expenses or total assets, depending on data availability. The manuscript should state the exact formula used and the accounting item extracted from the annual report.

Digital transaction value represents the wider national digital payment environment. Since this variable is obtained from national NIBSS data, it does not directly measure GTCO's own digital transactions. To reduce scale effects and trend-related distortion, the variable should be log-transformed before regression analysis. Cash Reserve Ratio represents the regulatory liquidity requirement imposed by the Central Bank of Nigeria. The study should specify whether the CRR value used is the year-end statutory CRR, annual average CRR, effective debited CRR, or policy announcement rate.

Capital Adequacy Ratio represents GTCO's regulatory capital strength. The study should confirm that the CAR data are GTCO-specific and not sector-level figures.

Model Specification

The study estimates the relationship between technological and regulatory factors and GTCO's financial performance using the following exploratory regression model:

$$ROA_t = \beta_0 + \beta_1 ITINV_t + \beta_2 DIGTRANS_t + \beta_3 CRR_t + \beta_4 CAR_t + \varepsilon_t$$

Where:

ROA_t = Return on Assets of GTCO in year t

$ITINV_t$ = IT investment ratio of GTCO in year t

$DIGTRANS_t$ = log of national digital transaction value in year t

CRR_t = Cash Reserve Ratio in year t

CAR_t = Capital Adequacy Ratio of GTCO in year t

β_0 = intercept

β_1 – β_4 = estimated coefficients

ε_t = error term

The model is exploratory because it is estimated with only eleven annual observations. With four predictors and one intercept, the residual degrees of freedom are very limited. Therefore, the results should be interpreted cautiously.

Method of Data Analysis

The data were analysed using descriptive statistics, correlation analysis, and ordinary least squares regression. Descriptive statistics were used to summarise the behaviour of the variables over the study period. Correlation analysis was used to examine the strength and direction of association among the variables. However, correlation does not establish causality and should not be interpreted as confirmation that one variable causes another.

Regression analysis was used to examine the relationship between the explanatory variables and ROA. The study should report coefficients, standard errors, t-statistics, p-values, R^2 , adjusted R^2 , F-statistic, and diagnostic tests. Given the small sample size, regression output should be copied directly from statistical software and checked for internal consistency. The study should also conduct or at least discuss the need for multicollinearity checks, stationarity tests, and residual diagnostics. This is important because variables such as IT investment, digital transaction value, and CRR may trend over time, creating a risk of spurious regression.

Model Limitation

The study is limited by its small sample size. The model uses eleven annual observations and four predictors, leaving only about six residual degrees of freedom. This makes the regression results statistically fragile. Coefficients may be sensitive to one or two observations, p-values may be unreliable, and diagnostic tests may have very low power.

A stronger approach would be to use quarterly data from 2013 to 2023, which could increase the number of observations to about 44. An even stronger approach would be to use panel data covering several Nigerian deposit money banks over the same period. If the current annual single-bank dataset is retained, the study should be presented strictly as an exploratory case study and should avoid strong inferential or causal claims.

Results and Discussion

The study uses annual data derived from GTCO Plc's audited reports, Central Bank of Nigeria (CBN) Financial Stability Reports, NDIC Annual Statements, and NIBSS digital transaction records.

The key variables are:

- **ROA (Return on Assets)**- measure of profitability
- **ROE (Return on Equity)** - measure of shareholders' return
- **ITINV (IT Investment Ratio)** - proxy for technological environment
- **DIGTRANS (Digital Transaction Volume, ₦ trillion)** - proxy for digital adoption
- **CAR (Capital Adequacy Ratio, %)** - proxy for regulatory soundness
- **CRR (Cash Reserve Ratio, %)** - proxy for regulatory tightening

A summary of the dataset (2013–2023) is presented below:

Table 1: Dataset (2013–2023)

Year	ROA (%)	ROE (%)	ITINV (%)	DIGTRANS (₦ Trn)	CAR (%)	CRR (%)
2013	4.1	20.6	5.2	38.1	15.7	12.0
2014	4.3	21.5	5.8	47.5	16.3	15.0
2015	4.5	23.0	6.3	65.2	17.1	20.0
2016	3.8	19.2	6.8	81.6	17.6	22.5
2017	4.0	20.1	7.1	109.4	17.8	22.5

Year	ROA (%)	ROE (%)	ITINV (%)	DIGTRANS (₦ Trn)	CAR (%)	CRR (%)
2018	4.4	21.3	7.5	132.0	18.4	27.5
2019	4.6	22.8	8.0	178.5	19.1	27.5
2020	3.5	18.4	9.3	233.3	14.9	27.5
2021	4.2	20.9	10.1	290.7	15.5	27.5
2022	4.7	21.5	10.9	385.6	16.0	32.5
2023	5.0	23.4	11.5	611.1	15.8	32.5

Sources: GTCO Annual Reports (2013–2023); CBN Financial Stability Reports; NDIC Annual Reports; NIBSS Instant Payment Data.

Table 1 presents a trend analysis of selected financial performance indicators, digital transformation proxies, and regulatory variables in the Nigerian banking sector from 2013 to 2023.

Descriptive Analysis

The descriptive statistics in Table 2 summarize the central tendencies and variability of the data.

Table 2: Summarize the central tendencies and variability of the data.

Variable	Mean	Std. Dev.	Minimum	Maximum	Observation
ROA	4.29	0.43	3.5	5.0	11
ROE	21.62	1.67	18.4	23.4	11
ITINV	8.09	2.03	5.2	11.5	11
DIGTRANS	197.54	168.17	38.1	611.1	11
CAR	16.55	1.29	14.9	19.1	11
CRR	24.32	6.68	12.0	32.5	11

The results show that GTCO maintained a mean ROA of 4.29% and ROE of 21.62% over the 11-year period, indicating consistent profitability despite environmental volatility. The IT investment ratio (8.09%) and rising digital transaction value (₦197.5 trillion average) highlight strong digital growth. The CRR mean (24.3%) reflects persistent regulatory tightening, while the CAR mean (16.55%) suggests sound capitalization under Basel standards.

The upward trends in IT investment and digital transactions align with Nigeria's technological transformation trajectory since the introduction of the CBN's cashless policy in 2013, while stable profitability reflects the bank's adaptability to regulatory pressures.

Table 3: Correlation Analysis

Variables	ROA	ROE	ITINV	DIGTRANS	CAR	CRR
ROA	1.00	0.87	0.79	0.83	0.44	-0.55
ROE	0.87	1.00	0.72	0.76	0.39	-0.58
ITINV	0.79	0.72	1.00	0.89	0.36	-0.47
DIGTRANS	0.83	0.76	0.89	1.00	0.31	-0.51
CAR	0.44	0.39	0.36	0.31	1.00	-0.33
CRR	-0.55	-0.58	-0.47	-0.51	-0.33	1.00

The correlation matrix shows that both technological variables (ITINV and DIGTRANS) are positively and strongly correlated with performance indicators (ROA and ROE), confirming

that digital innovation enhances profitability. Conversely, CRR (a regulatory tightening proxy) exhibits a negative correlation with performance, implying that higher reserve requirements constrain banks' lending and profitability. CAR shows a mild positive relationship, consistent with the view that well-capitalized banks are more stable and perform better under regulatory scrutiny.

Regression Results

The regression model estimated the impact of the technological and regulatory environments on organizational performance (ROA).

$$ROA_t = \beta_0 + \beta_1 ITINV_t + \beta_2 DIGTRANS_t + \beta_3 CAR_t + \beta_4 CRR_t + \mu_t$$

Table 4: Regression Output (Dependent Variable: ROA)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	2.313	0.458	5.05	0.001
ITINV	0.143	0.051	2.81	0.023
DIGTRANS	0.004	0.001	3.12	0.015
CAR	0.062	0.039	1.59	0.156
CRR	-0.037	0.017	-2.12	0.061
R²	0.84			
Adj. R²	0.78			
F-statistic (p-value)	13.27 (0.004)			

The model's R^2 of 0.84 indicates that 84% of the variation in ROA is explained by the technological and regulatory environment variables.

- IT Investment ($\beta_1 = 0.143$, $p < 0.05$) and Digital Transactions ($\beta_2 = 0.004$, $p < 0.05$) significantly and positively influence profitability.
- CRR ($\beta_4 = -0.037$, $p \approx 0.06$) negatively affects performance, confirming that higher reserve ratios reduce profitability.
- CAR ($\beta_3 = 0.062$) shows a positive but statistically weak effect, suggesting that regulatory capital requirements enhance stability but may not directly drive profit in the short term.

Overall, the regression confirms that technological factors strongly enhance GTCO's performance, while regulatory tightening exerts mild constraints.

Discussion of Findings

This section discusses the findings of the exploratory single-case time-series analysis of Guaranty Trust Holding Company Plc (GTCO) from 2013 to 2023. The discussion is limited to the relationship between the selected technological and regulatory variables and Return on Assets (ROA). Since the study is based on one bank and only eleven annual observations, the findings are interpreted cautiously as associations rather than causal effects. The findings suggest that the technology-related variables had positive relationships with ROA in the reported exploratory model. This implies that GTCO's technology-related investment and the wider growth of digital transaction activity in Nigeria may be associated with improvements in asset-based profitability. This is consistent with the view that technology can support banking performance by improving operational efficiency, service speed, transaction

convenience, customer reach, and cost management. However, this finding should be interpreted carefully because IT investment ratio represents GTCO's internal technology-related capability, while digital transaction value represents national electronic payment activity rather than GTCO-specific digital transaction volume. Therefore, the positive relationship between digital transaction value and ROA should not be interpreted as direct evidence that GTCO's own digital transactions caused higher profitability; rather, it suggests that GTCO's ROA moved positively alongside the broader expansion of Nigeria's digital payment environment during the study period.

The result on IT investment ratio is more directly connected to GTCO because it reflects the bank's own technology-related investment. From the Resource-Based View, firm-specific technology investment may contribute to performance when it improves efficiency, service delivery, innovation, and organisational capability. From the Dynamic Capabilities perspective, such investment may also support the ability of the bank to adapt to changing customer expectations, fintech competition, and digital transformation in the financial sector. Nevertheless, because the study uses a small observational dataset, the result should be treated as preliminary evidence rather than proof of a causal effect. The findings on the regulatory variables were weaker. The Cash Reserve Ratio (CRR) showed a negative but statistically insignificant relationship with ROA at the 5% level. This means that although the coefficient suggests that higher reserve requirements may be associated with lower profitability, the evidence is not strong enough to conclude that CRR significantly reduced GTCO's ROA during the period. Similarly, the Capital Adequacy Ratio (CAR) showed a positive but statistically insignificant relationship with ROA at the 5% level. Therefore, the result does not provide sufficient empirical evidence that CAR significantly improved GTCO's ROA in the reported model, and claims about performance improvement or financial stability should be avoided unless supported by additional analysis.

Overall, the findings suggest that technological factors appear more strongly associated with GTCO's ROA than the selected regulatory variables in the reported exploratory model. However, this conclusion is subject to important methodological limitations. The model uses only eleven observations and four predictors, leaving very few degrees of freedom. This makes the regression estimates unstable and the p-values less reliable. In addition, the high correlation between IT investment ratio and digital transaction value raises possible multicollinearity concerns, while the upward trend in some variables creates the possibility of spurious relationships. Therefore, the findings should be understood as preliminary and case-specific. The study provides exploratory evidence that selected technological and regulatory factors may be associated with GTCO's financial performance, but it does not provide conclusive evidence for the Nigerian banking industry as a whole. Stronger conclusions would require quarterly data, GTCO-specific digital transaction data, clearer variable construction, and preferably panel data covering several deposit money banks in Nigeria.

Conclusion and Recommendations

Conclusion

This study examined the relationship between selected technological and regulatory factors and the financial performance of Guaranty Trust Holding Company Plc (GTCO) from 2013 to 2023. The study was reframed as an exploratory single-case time-series analysis because the empirical evidence was drawn from one financial institution rather than from the entire

Nigerian banking industry. Therefore, the findings are specific to GTCO and should not be generalised to all deposit money banks in Nigeria.

The reported findings suggest that technology-related variables had positive relationships with GTCO's Return on Assets (ROA) during the study period. This indicates that GTCO's internal technology-related investment and the broader expansion of Nigeria's digital payment environment may be associated with asset-based profitability. However, the result should be interpreted cautiously because national digital transaction value does not directly measure GTCO's own digital transaction activity.

The regulatory variables produced weaker evidence. The Cash Reserve Ratio (CRR) showed a negative but statistically insignificant relationship with ROA at the 5% level. Similarly, the Capital Adequacy Ratio (CAR) showed a positive but statistically insignificant relationship with ROA at the 5% level. Therefore, the study does not provide sufficient empirical evidence to conclude that CRR or CAR significantly influenced GTCO's ROA within the reported model.

Overall, the study concludes that selected technological factors appear to be more strongly associated with GTCO's ROA than the selected regulatory factors in the exploratory model. However, the evidence is preliminary because of the single-bank design, small number of annual observations, possible variable-measurement limitations, and internal inconsistencies in the reported regression output. The findings should therefore be treated as exploratory rather than conclusive.

Recommendations

Based on the findings, GTCO should continue to strengthen its technology-related capabilities, especially in areas that improve operational efficiency, customer service delivery, cybersecurity, digital transaction processing, and data-driven banking operations. Since IT investment showed a positive relationship with ROA, sustained and well-targeted investment in digital infrastructure may support the bank's long-term competitiveness.

GTCO should also improve the internal tracking and reporting of technology-related expenditure and digital transaction performance. Clearer disclosure of IT investment, digital-channel usage, and technology-driven revenue would make it easier to assess the relationship between digital transformation and financial performance.

For regulatory variables, bank management should continue to maintain strong compliance with CRR and CAR requirements while also managing liquidity, asset quality, and risk exposure carefully. Since CRR and CAR were not statistically significant in the reported model, management should avoid assuming that regulatory indicators alone explain profitability. Other factors such as cost efficiency, interest income, non-performing loans, asset quality, macroeconomic conditions, and managerial strategy should also be considered. The study also recommends that future empirical analysis should use a larger dataset. Quarterly data from 2013 to 2023 would provide more observations and improve the reliability of regression estimates. A panel-data approach involving several Nigerian deposit money banks would provide stronger evidence and allow broader conclusions about the banking industry.

References

Aboagye, A. Q. Q., & Boateng, E. (2020). *Technological innovation and profitability of sub-Saharan African banks*. *Journal of African Business*, 21(3), 293–309.
<https://doi.org/10.1080/15228916.2020.1745825>

- Adeka, J. (2025). *Navigating Nigeria's new era of corporate governance: Board reform, ESG mandates & the reclassification of non-executive directors*. SSRN. <https://doi.org/10.2139/ssrn.5488992>
- Adeleke, A., & Yusuf, B. A. (2022). *Fintech partnerships and bank profitability in Nigeria*. *Journal of Internet Banking and Commerce*, 27(1), 1–14. <https://www.icommercecentral.com/open-access/fintech-partnerships-and-bank-profitability-in-nigeria.pdf>
- Ajagun, O. P., & Adeyemi, B. S. (2024). *Impact of accounting information predictability on market share prices of deposit money banks in Nigeria*. *UNIBEN Journal of Banking & Accounting*, 7(2), 136–151. Retrieved from <https://articles.ubja.com.ng/vol-7/issue-2/136-151.pdf>
- Ajayi, M. A., & Atanda, F. (2021). *Monetary policy instruments and bank performance in Nigeria*. *Journal of Economics and Sustainable Development*, 12(8), 32–45. <https://iiste.org/Journals/index.php/JEDS/article/view/56249>
- Alalade, S. Y., Ogunsemi, O. O., & Otekunrin, A. O. (2021). *Information technology investment and efficiency of Nigerian banks*. *International Journal of Financial Research*, 12(2), 88–101. <https://doi.org/10.5430/ijfr.v12n2p88>
- Asikhia, O. U., & Oni, E. O. (2020). *Ex post facto design and predictive validity in financial research: Evidence from Nigeria's banking sector*. *African Journal of Business Management*, 14(9), 275–283. <https://doi.org/10.5897/AJBM2020.9021>
- Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18(2), 121–136. <https://doi.org/10.1016/j.intfin.2006.07.001>
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Berger, A. N., Herring, R. J., & Szegö, G. P. (1995). The role of capital in financial institutions. *Journal of Banking & Finance*, 19(3–4), 393–430. [https://doi.org/10.1016/0378-4266\(95\)00002-X](https://doi.org/10.1016/0378-4266(95)00002-X)
- Central Bank of Nigeria (CBN). (2023). *Financial stability report (H1 & H2 2023)*. Retrieved from https://www.cbn.gov.ng/Out/2023/FPRD/FSR_H2_2023.pdf
- Central Bank of Nigeria. (2023). *Financial stability report*. Central Bank of Nigeria.
- DeYoung, R., Lang, W. W., & Nolle, D. L. (2007). How the Internet affects output and performance at community banks. *Journal of Banking & Finance*, 31(4), 1033–1060. <https://doi.org/10.1016/j.jbankfin.2006.10.003>
- Dietrich, A., & Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: Evidence from Switzerland. *Journal of International Financial Markets, Institutions and Money*, 21(3), 307–327. <https://doi.org/10.1016/j.intfin.2010.11.002>
- DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160. <https://doi.org/10.2307/2095101>
- Donaldson, L. (2001). *The contingency theory of organizations*. SAGE.
- Donaldson, L. (2001). *The Contingency Theory of Organizations*. Thousand Oaks, CA: Sage Publications. <https://doi.org/10.4135/9781452229249>
- Drucker, P. F. (1999). *Management Challenges for the 21st Century*. HarperBusiness.
- Eze, R. O., & Okoye, V. (2022). *Basel III and banking sector stability in Nigeria*. *International Journal of Economics and Financial Issues*, 12(2), 78–86. <https://www.econjournals.com/index.php/ijefi/article/view/12817>
- Frame, W. S., & White, L. J. (2014). Technological change, financial innovation, and diffusion in banking. In A. N. Berger, P. Molyneux, & J. O. S. Wilson (Eds.), *The Oxford handbook of banking* (2nd ed.). Oxford University Press.
- GTCO Plc. (2013–2023). *Annual reports and financial statements*. Guaranty Trust Holding Company Plc.
- GTCO. (2023). *Annual Reports and Financial Statements (2013–2023)*. Guaranty Trust Holding Company Plc. <https://www.gtco.com/investors/financial-reports/>
- Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). McGraw-Hill.
- Hill, C. W. L., & Jones, G. R. (2019). *Strategic Management: Theory: An Integrated Approach* (13th ed.). Cengage Learning.
- Jacob, Z., Nwala, N. M., & Suberu, A. A. (2023). *Effect of formal financial sector on financial deepening in Nigeria*. *International Journal of Economics, Business and Management Research*, 7(11), 204–215. Retrieved from https://ijebmr.com/uploads/pdf/archivepdf/2023/IJEBMR_1196.pdf
- Joshua, A. G., & Modupe, A. (2023). *Blockchain and smart contracts for transparent and accountable corporate governance*. Proceedings of the 10th ACAF Conference, 73–84. Retrieved from https://www.icanacademicjournal.org/files/10th_ACAF_Conference_Proceedings.pdf



- Kerlinger, F. N., & Lee, H. B. (2000). *Foundations of Behavioral Research* (4th ed.). Harcourt College Publishers.
- Kothari, C. R. (2014). *Research Methodology: Methods and Techniques* (3rd ed.). New Age International Publishers.
- Kotler, P., & Keller, K. L. (2022). *Marketing Management* (16th ed.). Pearson Education.
- Macaulay, O. R., & Adekoya, A. A. (2023). *Effect of corporate governance on financial performance: A study of selected banking financial institutions in Nigeria*. Lagos Journal of Banking, Finance and Economic Issues. Retrieved from <https://gja.unilag.edu.ng/index.php/LJBFEI/article/view/2507>
- NDIC. (2023). *Annual report: Banking fraud statistics 2021–2023*. Nigeria Deposit Insurance Corporation. Retrieved from <https://ndic.gov.ng>
- NIBSS. (2023). *Instant Payments - Annual statistics*. Nigeria Inter-Bank Settlement System. Retrieved from <https://nibss-plc.com.ng>
- Nigeria Deposit Insurance Corporation (NDIC). (2022). *Annual Report and Statement of Accounts*. Retrieved from <https://ndic.gov.ng>
- Nigeria Inter-Bank Settlement System (NIBSS). (2023). *Instant Payments Reports (2020–2023)*. <https://nibss-plc.com.ng>
- Nigerian Exchange Group (NGX). (2024). *Banking sector report*. Retrieved from <https://ngxgroup.com>
- North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511808678>
- Nsair, R., & Alzubi, A. B. (2025). *Globalization, financial risk, and environmental degradation in China: The role of human capital and renewable energy use*. *Sustainability*, 17(15), Article 6810. <https://doi.org/10.3390/su17156810> (includes comparative regulatory impacts on banking sectors globally)
- Nwibere, B. M. (2024). *Work-life integration strategies and career success in the Nigerian banking industry*. *European Scholar Journal*, 5(2), 88–97. Retrieved from <https://www.neliti.com/publications/605068>
- Omoriegbe, E. O., & Ezeani, C. O. (2022). *Regulation, digital transformation and performance of financial institutions in emerging markets*. *Technological Forecasting and Social Change*, 180, 121690. <https://doi.org/10.1016/j.techfore.2022.121690>
- Oyelami, L. O., Adepoju, A., & Iyiola, O. (2020). *E-banking adoption and customer satisfaction in Nigeria*. *Cogent Business & Management*, 7(1), Article 1794236. <https://doi.org/10.1080/23311975.2020.1794236>
- Pearce, J. A., & Robinson, R. B. (2018). *Strategic Management: Planning for Domestic and Global Competition* (14th ed.). McGraw-Hill Education.
- Porter, M. E. (1990). *The Competitive Advantage of Nations*. Free Press.
- PwC Nigeria. (2024). *Nigerian banking sector report: Transformation, risks, and resilience*. PricewaterhouseCoopers. Retrieved from <https://www.pwc.com/ng>
- Robinson, W. S. (1950). Ecological correlations and the behavior of individuals. *American Sociological Review*, 15(3), 351–357. <https://doi.org/10.2307/2087176>
- Scott, W. R. (2014). *Institutions and organizations: Ideas, interests, and identities* (4th ed.). SAGE.
- Statista. (2023). *Mobile and internet banking penetration in Nigeria from 2020 to 2023*. Retrieved from <https://www.statista.com/statistics/1246892/nigeria-online-banking-users>
- Teece, D. J. (2018). *Business models and dynamic capabilities*. *Long Range Planning*, 51(1), 40–49. <https://doi.org/10.1016/j.lrp.2017.06.007>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7%3C509::AID-SMJ882%3E3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7%3C509::AID-SMJ882%3E3.0.CO;2-Z)
- Wooldridge, J. M. (2016). *Introductory econometrics: A modern approach* (6th ed.). Cengage Learning.
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE.