# Blockchain Distributed Ledger Technology and Financial Efficiency of Banks in Nigeria

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## Abstract

The Nigerian banking sector plays a critical role in the economy by promoting financial inclusion, enabling transactions, and enhancing capital allocation. However, inefficiencies such as delayed transaction processing, fraud, and inconsistent reporting continue to reduce financial performance. This study investigated the effect of blockchain distributed ledger technology (BDLT) on the financial efficiency of banks in Nigeria. The study adopted a quantitative survey research design and utilized data collected through structured questionnaires administered to respondents selected using purposive sampling, which was justified as appropriate for targeting knowledgeable employees directly involved with banking operations, though this limits generalizability. The regression results showed that the overall models for net profit margin, return on assets, and return on equity were statistically significant ($p < 0.05$). However, at the individual variable level, reliability significantly influenced net profit margin ($p = 0.000$); reliability and timeliness significantly influenced return on assets ($p = 0.000$); but none of the three blockchain qualities transparency, reliability, or timeliness had a statistically significant effect on return on equity. Respondents perceived that blockchain contributes to improved accuracy, real-time transaction processing, and fraud reduction, leading to more efficient banking operations. However, challenges such as regulatory uncertainty and technological readiness still hinder full adoption. The study concludes that qualities of blockchain technology provide practical solutions to improve financial efficiency in Nigerian banks. It recommends banks prioritize blockchain integration to streamline operations, reduce fraud, and enhance reporting transparency. Policy reforms and investment in blockchain infrastructure are also advised to encourage sector-wide adoption and long-term sustainability.

**KEYWORDS:** Blockchain, distributed ledger technology, financial efficiency, fraud mitigation, transaction speed

## Introduction

Despite significant technological advances, financial reporting errors remain a pervasive global issue, undermining stakeholder confidence and posing substantial risks to economic stability. These errors stem from complex accounting standards, outdated systems, and reliance on manual processes, as highlighted by corporate scandals like Enron and Wells Fargo (Bajaj & Bhattacharya, 2020). In Nigeria, persistent transparency and accountability gaps within the financial system have led to eroded trust and the revocation of 53 Deposit Money Bank licenses since 1994 (Legit.ng, 2023; Emefiele, 2022). The opacity and exclusivity

of traditional accounting where only managers and auditors fully grasp a firm's activities further diminish reliability, highlighting the need for transparent, real-time verification methods (Tapscott & Tapscott, 2019).

Blockchain technology is considered a transformative solution, offering a decentralized, transparent, and secure framework that could address these systemic flaws. By integrating distributive digital technologies, blockchain enables all network participants to hold real-time, immutable ledgers that enhance transparency, reliability, and timeliness in financial reporting (Milosavljevic et al., 2019; Dai et al., 2019). Scholars regard blockchain as a "mirror lens of future accounting," capable of curbing poor reporting practices and restoring investor confidence in an increasingly digital financial world (Ortman, 2018; Rahmawati et al., 2021). In Nigeria's banking sector, which struggles with inefficiencies, high transaction costs, and regulatory bottlenecks (Ojo, 2020; Udo, 2022), blockchain presents opportunities to streamline cross-border payments, enhance KYC processes, and prevent fraud (Akinyemi & Aderemi, 2021; Ogundipe, 2022). Initiatives like the Nigeria Interbank Settlement System's blockchain-based payment service demonstrate its potential for improving efficiency and security (NIBSS, 2021).

However, despite global adoption and proven benefits in other regions such as the U.S. and Europe, where blockchain reduces transaction costs and increases transparency (Catalini & Gans, 2016; EIB, 2021), academic research on blockchain's capacity to eliminate financial reporting errors in Nigerian banks remains limited. Existing technologies like AI and data analytics have only minimized errors, not eradicated them (Oseni et al., 2019). There is an urgent need for empirical research to explore blockchain's potential in eliminating errors of commission, omission, and timing errors that perpetuate financial misreporting and weaken stakeholder trust (Brock & Evans, 2018; Alqarni et al., 2019). Embracing blockchain could modernize accounting practices, enhance reporting accuracy and foster transparency and accountability in the financial ecosystem in Nigeria. Thus, the study aimed to examine the effect of blockchain distributed ledger technology on the financial efficiency of Nigerian banks.

## LITERATURE REVIEW

### 2.1 Conceptual Review

#### 2.1.1 Financial Efficiency

Financial efficiency, the strategic maximization of resources to achieve optimal outcomes with minimal waste, is a cornerstone of sound financial management. It is measured using key performance ratios that assess profitability and resource utilization. Return on equity (ROE) evaluates how effectively a company generates profit from shareholders' equity, serving as a crucial indicator of financial health and shareholder return (Brigham & Ehrhardt, 2020; Penman, 2022). Net Income Margin reveals the percentage of revenue remaining as profit after all expenses, directly reflecting operational efficiency and cost management (Graham et al., 2005; Laux & Leuz, 2022). Return on assets (ROA) measures the efficiency of using total assets to generate earnings, providing insight into management's effectiveness in leveraging the company's resource base (Brigham & Ehrhardt, 2020). Together, these metrics enable organizations to gauge performance, drive profitability, ensure long-term sustainability through practices like budgeting and forecasting (Moyer et al., 2017), and maintain a competitive edge, often enhanced by adopting technologies like data analytics for better decision-making (Moyer et al., 2017).

### 2.1.2 Blockchain Technology

Blockchain technology is a decentralized and distributed digital ledger in which transactions are recorded immutably and chronologically across a network of participant computers, known as nodes. Each node maintains an identical copy of the ledger, and transactions representing an exchange of value, rights, or ownership are only added after consensus is achieved among participants, eliminating intermediaries and reducing costs and processing times (Kwilinski, 2019; Deloitte, 2021). The technology's foundation lies in the secure digital timestamping concept introduced by Haber and Stornetta in 1991, which evolved into a cryptographically secured chain of blocks that prevents retroactive or prospective alteration of records (Moll & Yigitbasioglu, 2019; O'Leary, 2019). Although conceptualized earlier, blockchain gained widespread recognition with Satoshi Nakamoto's 2008 Bitcoin whitepaper, marking its first major application in digital currency, despite ongoing skepticism about its full potential (Raiborn & Sivitanides, 2015; Schmitz & Leoni, 2019).

Blockchain systems vary in design **and are primarily categorized as** public (open and transparent, e.g., Bitcoin), private (restricted access for control and privacy, e.g., Hyperledger Fabric), permissioned (balanced decentralization with controlled membership), and consortium (collaborative multi-organization networks, e.g., IBM Food Trust) (Sharma, 2023; Joannou et al., 2020).

Three core attributes define blockchain's operational value: timeliness, referring to the near-real-time processing and recording of transactions, which enhances efficiency despite variability across networks (Narayanan et al., 2016); transparency, whereby all participants have real-time access to an immutable transaction history, fostering trust, deterring fraud, and simplifying auditability (Tapscott & Tapscott, 2022; PwC, 2020); and reliability, ensured through decentralized data replication across nodes and consensus mechanisms like Proof of Work or Proof of Stake, which maintain data accuracy and resilience against failures or attacks (Nakamoto, 2008; Crosby et al., 2021). Together, these characteristics underpin blockchain's capacity to provide a secure, efficient, and trustworthy framework for diverse applications, from financial reporting to supply chain management.

## 2.2 Theoretical Review

The theoretical framework for this study integrates three key theories to analyze the adoption and impact of blockchain technology. Innovation Diffusion Theory (Rogers, 2003) provides a framework for understanding how blockchain spreads across a social system, moving through adopter categories (innovators, early adopters, early majority, late majority, and laggards) and influenced by factors such as its perceived relative advantage, compatibility, and complexity (Narayanan et al., 2020). Blockchain's benefits in transparency, security, and efficiency are key drivers of its adoption (Narayanan et al., 2020; Tapscott & Tapscott, 2022), though successful integration depends on compatibility with existing systems (Catalini & Gans, 2023). While the theory is critiqued for its linear assumption and underemphasis on social, political, and power dynamics (Fichman, 1992; Van de Ven et al., 2019; Greenhalgh et al., 2020), its focus on social systems and the influential role of early adopters in reducing perceived risks remains valuable for understanding blockchain's diffusion (Rogers, 2003; Gohar et al., 2021).

Agency Theory (Jensen & Meckling, 1976) explains how blockchain can mitigate the principal-agent problem by reducing information asymmetry through its immutable and transparent ledger, thereby minimizing managerial opportunism and aligning the interests of managers (agents) with shareholders (principals) (Eisenhardt, 1989). Blockchain's decentralized nature

enhances the integrity of financial records and fosters accountability (Catalini & Gans, 2023; Tapscott & Tapscott, 2021), while smart contracts automate compliance and performance evaluation, further aligning incentives (Nakamoto, 2008; Buterin, 2021). Critics argue the theory oversimplifies human behavior by focusing narrowly on self-interest and control, potentially fostering distrust and overlooking intrinsic motivations and modern business complexities (Donaldson, 2021; Shleifer & Vishny, 2020; Miller & Shamsie, 2019). Nonetheless, blockchain provides a powerful real-time monitoring mechanism that complements the theory's emphasis on verification and incentive alignment (Nakamoto, 2019; Buterin, 2021; Dai et al., 2019).

Contingency Theory (Fiedler, 1964) posits that organizational effectiveness depends on aligning practices with specific contextual factors. Applied to blockchain, this theory asserts that successful implementation is contingent on tailoring the technology to an organization's unique needs, size, regulatory environment, and operational complexity (Li et al., 2020; Mertens et al., 2021). Blockchain's potential to enhance financial reporting accuracy and reduce fraud is maximized when its deployment is aligned with specific reporting requirements and regulatory frameworks (Kshetri, 2021). Critics contend the theory can be overly deterministic, lack practical implementation guidance, and underestimate managerial agency and the dynamic nature of modern business environments (Donaldson, 2020; Lawrence & Lorsch, 1967; Fiedler, 2019). However, supporters emphasize its necessity for a contextualized approach, arguing that blockchain's benefits in transparency and security are contingent upon proper alignment with organizational strategy and infrastructure (Deveraj et al., 2018; Granados et al., 2020; Gohar et al., 2021; Catalini & Gans, 2023).

Collectively, these theories form a comprehensive analytical lens: Diffusion of Innovation explains the pattern of blockchain's adoption, Agency Theory elucidates its role in resolving governance and reporting conflicts, and Contingency Theory highlights the contextual factors determining the success of its implementation.

### 2.3 Empirical Review

Multiple studies confirm that blockchain adoption has a significant positive effect on core financial performance indicators. Research has shown it enhances net income (Wu et al., 2020; Bonson & Badnarova, 2022; Bashaer, 2023; Abu et al., 2023), earnings per share (Nguyen & Hoang, 2023; Rehab, 2023; Bonsón & Bednárová, 2019), return on equity (Seyed & Jafar, 2021; Schmitts & Leoni, 2019), and return on investment (Nguyen & Hoang, 2023; Dai & Vasarhely, 2017; Martinez, 2020). The primary mechanisms driving these improvements are the enhancement of information quality, accuracy, and timeliness (Wu et al., 2020; Bonson & Badnarova, 2022; Oleg & Volodymyr, 2023), which reduce errors and fraud, thereby leading to more reliable financial statements and better decision-making.

A dominant theme across the literature is blockchain's revolutionary potential for auditing. Studies consistently find that blockchain improves audit quality, efficiency, and security by enabling real-time or continuous auditing, providing immutable audit trails, and automating compliance through smart contracts (Sahlin & Levenby, 2018; Kim & Shin, 2019; Li et al., 2021; Kadir et al., 2022). This reduces audit costs, minimizes human error, and expands the scope for advisory services (Bonson & Badnarova, 2022; Rehab, 2023). However, this transformation necessitates the evolution of audit methods, standards, and auditor skills,

areas identified as critical gaps in current research (CPA Ireland, 2023; Brender & Gauthier, 2019; Hossain, 2025).

The adoption of blockchain is framed by several theoretical lenses, including the Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT), Agency Theory, and Contingency Theory. Drivers of adoption include its perceived usefulness and relative advantage in improving performance and transparency (Seyed & Jafar, 2021; Wu et al., 2020), as well as its capacity to mitigate principal-agent conflicts by reducing information asymmetry (Martinez, 2020; Sonia et al., 2021). Significant barriers persist, particularly technological complexity, integration challenges with legacy systems, and a lack of regulatory clarity (Pereraa & Abeygunasekera, 2022; Tapscott & Tapscott, 2021; Sundarasen et al., 2023). Crucially, Contingency Theory underscores that successful implementation is highly dependent on contextual factors like organizational size, IT infrastructure, and the regulatory environment (Nguyen & Hoang, 2023; Nidal & Hamza, 2024; Dai & Vasarhely, 2017).

Despite the volume of research, the review highlights several persistent gaps. A major shortcoming is the lack of generalizable empirical evidence, with many studies focused on single countries or sectors (Bashaer, 2023; Abu et al., 2023; Sonia et al., 2021). There is a pronounced need for more research on the practical implementation challenges, organizational adjustments, and the development of necessary legislative frameworks (Sahlin & Levenby, 2018; Rehab, 2023; Schmitz & Leoni, 2019). Other critical gaps include understanding the integration of blockchain with IoT and non-financial data (Dai & Vasarhelyi, 2017), its broader implications for accounting practices beyond technical ledger-keeping (Asuman & Göksal, 2021), and the ethical, regulatory, and cross-cultural dimensions of its adoption in auditing (Kim & Shin, 2019; Schmitz & Leoni, 2019; Natalia et al., 2024).

## METHODOLOGY

This study employed a quantitative survey research design to investigate the impact of blockchain distributed ledger technology on financial efficiency within the Nigerian banking sector. The target population comprised 113,000 employees across ten purposively selected listed deposit money banks. Purposive sampling was adopted to target respondents with direct knowledge and involvement in banking operations, digital transformation, and financial reporting processes, thereby ensuring the relevance and quality of responses. However, this choice limits the generalizability of findings, using the Taro Yamane formula, a sample size of 382 respondents was determined, with data collected via a structured questionnaire distributed electronically. The questionnaire employed a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Validity was established through expert review (content validity), and reliability was tested using Cronbach's Alpha, with all constructs exceeding the acceptable threshold of 0.70. Data analysis was conducted using SPSS software, employing descriptive statistics and relevant inferential tests with respect to the research objectives. Diagnostic checks for multicollinearity (VIF), normality, and heteroskedasticity were conducted and met acceptable thresholds.

**Model Specification**

Y = f(X)

Y = Dependent variable (Financial Efficiency) (FIE)
X = Independent variable (Blockchain Distributed Ledger Technology) (BDL)

Y = $y_1$, $y_2$, $y_3$
$y_1$ = Net Profit Margin (NPM)
$y_2$ = Return on Assets (ROA)
$y_3$ = Return on Equity (ROE)

X = $x_1$, $x_2$, $x_3$
$x_1$ = Transparency (TRA)
$x_2$ = Reliability (REL)
$x_3$ = Timeliness (TIM)

**Functional Relationships**

NPM = f(TRA, REL, TIM) ..... equation 1
ROA = f(TRA, REL, TIM) ..... equation 2
ROE = f(TRA, REL, TIM) ..... equation 3

**Therefore, the regression equations are:**

$ROA = \beta_0 + \beta_1 TRA + \beta_2 REL + \beta_3 TIM + \mu$ ..... Model i
$ROE = \beta_0 + \beta_1 TRA + \beta_2 REL + \beta_3 TIM + \mu$ ..... Model ii
$NPM = \beta_0 + \beta_1 TRA + \beta_2 REL + \beta_3 TIM + \mu$ ..... Model iii

Where:
$\beta_0$ = Intercept
$\mu$ = Error Term
$\beta_1 - \beta_3$ = Coefficients of the Independent Variables

**Results Presentation and Discussion of Findings**

**4.1 Descriptive Statistics**

| Variable (Construct) | Overall Mean ($\bar{x}$) | Overall Standard Deviation (SD) |
|---|---|---|
| Transparency (TRA) | 2.18 | 1.084 |
| Reliability (REL) | 2.26 | 1.059 |
| Timeliness (TIM) | 2.3 | 1.028 |
| Net Profit Margin (NPM) | 2.21 | 1.038 |
| Return on Assets (ROA) | 2.26 | 0.974 |
| Return on Equity (ROE) | 2.16 | 0.933 |

**Interpretation:** On a Likert scale where 1 = Strongly Agree and 5 = Strongly Disagree, lower mean scores indicate stronger agreement. The analysis of respondent perceptions reveals a generally positive view, with mean scores ranging from 2.16 to 2.30 indicating agreement that blockchain distributed ledger technology (DLT) enhances financial efficiency and key performance metrics in Nigerian banks. The strongest agreement and highest consensus were observed for return on equity (ROE) (mean: 2.16, SD: 0.933), reflecting unified

confidence in blockchain's ability to improve profitability relative to shareholder capital. In contrast, while respondents agreed that transparency (TRA) (mean: 2.18) is beneficial, it showed the highest variability in responses (SD: 1.084), indicating less uniform opinions on its specific impact. The remaining constructs reliability (REL), timeliness (TIM), net profit margin (NPM), and return on assets (ROA) all received moderately positive ratings with standard deviations near or above 1.0, suggesting overall agreement tempered by some divergence in views regarding the extent of their influence on financial efficiency.

### 4.2 Testing of Hypotheses

**Table 4.2.1: Regression Analysis of Qualities of Blockchain and Net Profit Margin (NPM)**

| **Model One** | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std.Err** | **t-stat.** | **Probability** |
| (Constant) | 1.287 | 0.135 | 9.527 | 0.000 |
| TRA | -0.003 | 0.033 | -0.09 | 0.929 |
| REL | 0.411 | 0.043 | 9.469 | 0.000 |
| TIM | -0.001 | 0.037 | -0.041 | 0.968 |
| **F-stat** | 31.941 | | | |
| **P-value** | 0.000 | | | |
| **Adjusted $R^2$** | 0.202 | | | |

**Source**: *Field Survey 2025*

**Model 1**

$$NPM = 1.287 - 0.003TRA + 0.411REL - 0.001TIM + \mu$$

**Regression Estimate Interpretation**

The regression analysis reveals a statistically significant positive effect of blockchain's reliability (REL) on net profit margin (NPM), with a coefficient of 0.411 (p = 0.000), indicating that a one-unit increase in reliability leads to a 0.411 unit increase in NPM. In contrast, the coefficients for transparency (TRA) and timeliness (TIM) were -0.003 (p = 0.929) and -0.001 (p = 0.968), respectively, showing no statistically significant impact on NPM. The overall model is significant (F-statistic = 31.941, p = 0.000), but the adjusted $R^2$ of 0.202 indicates that only 20.2% of the variation in NPM is explained by these blockchain qualities, implying other external factors are influential. Consequently, the null hypothesis ($H_{0\ 1}$) is partially rejected; reliability enhances profitability, while transparency and timeliness do not.

These findings align with studies highlighting blockchain reliability's role in improving data accuracy and cost efficiency (Cao et al., 2022; Olaleye et al., 2025) but contrast with research emphasizing transparency's direct link to performance (Lee & Li, 2021) or timeliness's impact on financial outcomes (Cardona-Montoya et al., 2019). The model's low explanatory power confirms that external elements such as regulation and market competition are major drivers of profitability. These findings indicate that while banks should focus on implementing reliable blockchain systems, these efforts must be part of a wider strategy to effectively enhance net profit margins.

**Table 4.2.2: Regression Analysis of Qualities of Blockchain and Return on Assets (ROA)**

| **Model Two** | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std.Err** | **t-stat.** | **Probability** |
| (Constant) | 1.332 | 0.116 | 11.489 | 0.000 |
| TRA | -0.010 | 0.028 | -0.341 | 0.734 |
| REL | 0.153 | 0.037 | 4.097 | 0.000 |
| TIM | 0.265 | 0.032 | 8.372 | 0.000 |
| **F-stat** | 31.134 | | | |
| **P-value** | 0.000 | | | |
| **Adjusted $R^2$** | 0.602 | | | |

**Source**: *Field Survey 2025*

**Model 2 :**

ROA = 1.332 − 0.010TRA + 0.153REL + 0.265TIM + μ

**Regression Estimate Interpretation**

Based on the regression analysis, blockchain's qualities have a differentiated impact on return on assets (ROA) in Nigerian banks. Both reliability (REL) and timeliness (TIM) show a statistically significant positive effect, with coefficients of 0.153 (p = 0.000) and 0.265 (p = 0.000), respectively. This indicates that improvements in financial reliability and faster transaction processing directly enhance asset utilization and efficiency. In contrast, transparency (TRA) has a negligible and statistically insignificant coefficient of -0.010 (p = 0.734), suggesting it does not meaningfully influence ROA.

The overall model is statistically significant (F-statistic = 31.134, p = 0.000) and demonstrates strong explanatory power, with an adjusted $R^2$ of 0.602, meaning that 60.2% of the variation in ROA is explained by these blockchain factors. Consequently, the null hypothesis ($H_{0\ 2}$) is partially rejected; reliability and timeliness positively impact ROA, while transparency does not.

These findings align with prior research emphasizing that blockchain's reliability improves financial accuracy and asset management (Wang & Kogan, 2019; Adebayo et al., 2021) and that its timeliness enhances asset turnover (Mol-Gómez-Vázquez et al., 2025). The non-significant role of transparency, however, contrasts with studies linking it to investor confidence (Khan et al., 2019), suggesting that in banking, operational efficiency factors may outweigh transparency's direct effect on asset returns. The substantial unexplained variance (nearly 40%) implies that external factors like regulation and market conditions also critically shape ROA.

**Table 4.2.3: Regression Analysis of Qualities of Blockchain and Return on Equity (ROE)**

| **Model Three** | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std.Err** | **t-stat.** | **Probability** |
| (Constant) | 2.201 | 0.121 | 18.201 | 0.000 |
| TRA | -0.031 | 0.029 | -1.046 | 0.296 |

| | | | | |
|---|---|---|---|---|
| REL | -0.023 | 0.039 | -0.600 | 0.549 |
| TIM | 0.035 | 0.033 | 1.060 | 0.290 |
| **F-stat** | 31.134 | | | |
| **P-value** | 0.000 | | | |
| **Adjusted $R^2$** | 0.551 | | | |

**Source**: *Field Survey 2025*

**Model 3**

ROE = 2.201 − 0.031TRA − 0.023REL + 0.035TIM + μ

**Regression Estimate Interpretation**

Based on the regression analysis, none of the studied blockchain qualities transparency (TRA), reliability (REL), and timeliness (TIM) have a statistically significant effect on return on equity (ROE) in Nigerian banks at the 0.05 significance level. Their coefficients are -0.031 (p = 0.296), -0.023 (p = 0.549), and 0.035 (p = 0.290), respectively, all with p-values greater than 0.05. Consequently, the null hypothesis ($H_{0\ 3}$) that blockchain distributed ledger technology has no significant effect on ROE.

Despite the individual insignificance of the variables, the overall model is statistically significant (F-statistic = 31.134, p = 0.000) and has moderate explanatory power, with an adjusted $R^2$ of 0.551, indicating that 55.1% of the variation in ROE is explained by these factors collectively. The discussion suggests that ROE is influenced more by financial leverage, capital structure, regulatory policies, and macroeconomic conditions than by the operational efficiencies blockchain provides (such as fraud reduction and transaction speed). While blockchain may enhance banking processes, these improvements do not directly translate into higher shareholder returns, implying that banks should integrate blockchain adoption within broader financial and strategic frameworks to impact ROE meaningfully.

### 4.3 Implications of the Findings

The findings of this study, which examine the effect of the qualities of blockchain distributed ledger technology on financial performance in Nigerian banks, hold significant implications for various stakeholders, including bank management, policymakers, financial analysts, and researchers.

For bank management, the results indicate that while blockchain technology offers operational benefits such as increased transparency, reliability, and timeliness, these do not significantly impact financial performance metrics such as return on assets (ROA) and return on equity (ROE) at the individual variable level for ROE, though reliability and timeliness do affect ROA. This suggests that banks should not expect immediate financial gains solely from blockchain adoption. Instead, they should integrate blockchain solutions strategically, focusing on improving efficiency, preventing fraud, and enhancing transaction security. The finding that blockchain does not significantly influence ROE implies that banks must align its implementation with broader profitability strategies, such as improving lending models, optimizing capital allocation, and reducing costs. Furthermore, since blockchain did not show a strong direct impact on financial returns, management should assess whether the cost of

implementation outweighs its benefits, ensuring that investments in distributed ledger technology align with long-term growth objectives.

For policymakers, the study highlights the need to create regulatory frameworks that support blockchain adoption while ensuring financial stability. While blockchain has the potential to improve banking operations by reducing fraud, enhancing transaction speed, and increasing transparency, its lack of significant impact on some financial returns suggests that banks may be hesitant to adopt it on a large scale. Policymakers should therefore consider offering incentives, such as tax reductions or grants, to encourage banks to integrate blockchain technology while managing potential risks associated with data security and regulatory compliance. Additionally, as blockchain adoption increases globally, Nigerian financial regulators must ensure that domestic banks remain competitive by developing policies that facilitate the secure and efficient use of blockchain in financial transactions. This includes establishing standardized guidelines for blockchain-based banking operations and ensuring that data privacy regulations align with international standards.

For financial analysts, the findings suggest that blockchain implementation should not be viewed as a direct indicator of a bank's profitability. While blockchain may improve banking processes, its impact on key financial metrics like ROA and ROE is mixed positive for ROA (via reliability and timeliness) but insignificant for ROE meaning analysts should focus more on traditional performance drivers such as interest income, credit risk management, and cost-to-income ratios when assessing a bank's financial health. Additionally, the study suggests that blockchain may provide long-term operational advantages rather than immediate financial benefits. As such, analysts should consider the long-term strategic role of blockchain adoption when evaluating a bank's future growth potential, rather than expecting short-term profitability increases.

For researchers, this study presents opportunities for further exploration into how blockchain technology influences financial performance in different contexts. Given that blockchain did not significantly affect ROE and had mixed effects on ROA and NPM, future studies could investigate whether other performance indicators, such as cost efficiency, non-performing loan ratios, or customer acquisition rates, are more directly impacted by blockchain implementation. Additionally, comparative studies between banks that have fully integrated blockchain solutions and those that have not could provide deeper insights into the specific conditions under which blockchain contributes to financial growth. Researchers may also explore the long-term effects of blockchain adoption, particularly its role in financial risk management, cybersecurity, and regulatory compliance, to understand whether its impact on banking profitability evolves over time.

Ultimately, the findings suggest that while blockchain technology enhances operational aspects of banking, it does not automatically translate into higher financial returns. Stakeholders should therefore view blockchain as a tool for improving efficiency and security rather than expecting it to be a primary driver of profitability. For blockchain to have a more significant impact on financial performance, banks may need to integrate it with other strategic initiatives, such as digital banking expansion, cost optimization, and enhanced financial product offerings.

## Conclusion and Recommendations

### 5.1 Conclusion

This study investigated the impact of blockchain distributed ledger technology on key financial performance indicators return on assets (ROA) and return on equity (ROE) in Nigerian banks. The regression analysis found that at the individual variable level, reliability and timeliness had statistically significant positive effects on ROA, while reliability alone significantly influenced NPM. However, none of the three blockchain qualities (transparency, reliability, and timeliness) had a statistically significant effect on ROE. The overall models for NPM, ROA, and ROE were statistically significant, indicating that these blockchain-related factors collectively explain meaningful portions of the variance in these metrics. The findings challenge the assumption that blockchain is a direct driver of profitability. Instead, they position it as a strategic tool for enhancing long-term operational efficiency, security, and structural integrity within banks. Consequently, for blockchain to impact financial performance, it must be integrated as part of a broader strategic transformation rather than as a standalone financial solution.

### 5.2 Recommendations

Based on the study's findings that blockchain distributed ledger technology has mixed effects on financial efficiency indicators (significant for ROA and NPM via reliability and timeliness, but insignificant for ROE) in Nigerian banks, the following interconnected recommendations are proposed to harness its potential. First, banks Directors should prioritize the strategic implementation of blockchain for operational efficiency, targeting areas like cross-border payments and fraud detection to yield long-term cost and security benefits. To ensure effectiveness, investment in employee training and capacity building is essential to bridge knowledge gaps and foster innovation in blockchain applications. Concurrently, collaboration with regulatory bodies is needed to develop clear, supportive frameworks that mitigate adoption risks and encourage industry-wide integration. Furthermore, to enhance its impact, blockchain should be integrated with complementary technologies like AI and big data analytics to unlock new revenue streams and improve decision-making, thereby indirectly supporting financial performance over time.

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