ENHANCING DATA SECURITY AND DRIVING ECONOMIC DEVELOPMENT THROUGH BLOCKCHAIN ADOPTION IN NIGERIAN FINANCIAL INSTITUTIONS

E.J. Anagu[1], J.M. Ismaila[2] and R. Ahmadu[3]

[1]Information System Department, Faculty of Computing and Information Systems,
Federal University Wukari, Nigeria.

[2]Computer Science Department, Faculty of Computing and Information Systems,
Federal University Wukari, Nigeria.

[3]Information Technology Department, Abubakar Tafawa Balewa University,
Nigeria.

Corresponding Author's Email: [1]anague@fuwukari.edu.ng

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ABSTRACT: Nigeria's financial sector can achieve significant benefits through blockchain technology because it strengthens data protection and reduces fraud likelihood and introduces total transaction visibility to the financial environment. Numerous obstacles prevent this groundbreaking technology adoption because officials in charge remain indecisive about the use of blockchain and professionals in the sector fail to understand blockchain. Additionally, there are technological hurdles and funding constraints together with regulatory complexities. The research examines blockchain technology implementation in Nigerian financial operations by reviewing its economic benefits and discussing adoption obstacles across financial networks. The research adopts qualitative documentary analysis as its methodology to study blockchain implementation in financial institutions through academic peer-reviewed studies and industrial reports with field-relevant case studies. Banking security and broad financial accessibility improve through blockchain technology based on evidence from this study yet investors need to navigate through unknown challenges since existing rules provide insufficient regulatory guidelines in blockchain fields. Both infrastructure deficiencies and low internet penetration rates in different regions as well as the minimal technical proficiency of professionals slow down the integration and deployment of

blockchain methods. For blockchain technology implementation to succeed there needs to be policy adjustments and improvements to digital infrastructure while also developing specific blockchain training programs to increase understanding and literacy among people. The study provides fundamental information about blockchain adoption basics in Nigeria's financial sector as well as guidelines to optimize data protection and economic sustainability.

KEYWORDS: *Blockchain Adoption; Data Security; Financial Inclusion; Digital Infrastructure; Nigeria's Financial Sector*

1.0 INTRODUCTION

The Nigerian financial sector faces major data security dilemmas simultaneously with significant obstacles from financial discrimination and large amounts of fraud and unbanked individuals. Pursuant to data from the Nigeria Inter-Bank Settlement System (NIBSS) Annual Fraud Landscape Report financial institutions sustained losses surpassing ₦17.67 billion from personal information theft during 2023. The efforts of public entities to boost financial inclusion have not succeeded in reaching 28.8 million of the 110.4 million adults in Nigeria who do not have bank access [1]. The traditional banking sector deals with three essential problems which include high operational expenses and intermediary transaction reliance while fighting cyber-attacks as well as insufficient digital infrastructure in specific regions [2].

Blockchain technology now stands as a fundamental transformation tool that provides decentralized databases along with cryptographic security features and smart contracts for greater transparency and fraud reduction [3]. Blockchain technology has gained recognition from the Central Bank of Nigeria as part of its broader financial initiatives. The Central Bank of Nigeria introduced a central bank digital currency (CBDC) called "e-Naira" in 2021, which is designed to enhance financial inclusion and stability [4]. The Nigerian blockchain market shows slow growth because officials lack clarity on regulatory standards and there are difficulties connecting all rural areas to the internet where only 48 percent of Nigerians have reliable connectivity [5]. Union Bank has deployed an initial blockchain platform for supply-chain financing that presents low transaction expenses while

offering better audit capabilities yet encounters limitations regarding scale deployment and public understanding [6].

As a result of, the adoption of blockchain technology in Nigeria's financial institutions the security management of data becomes completely revolutionary. Blockchain makes its data storage possible through a distributed ledger system which spreads information among multiple nodes instead of traditional centralized servers. The decentralized design reduces data breach vulnerabilities because it removes weak points which creates highly secure operations as outlined by Jimmy (2024) [7]. Blockchain technology enables permanent data storage because modifications become impossible after recording which creates an environment of both trustworthy and authentic information [8].

Advanced cryptographic security systems implemented in financial data storage systems shield data from unauthorized access according to [9]. Blockchain technology produces advanced financial reporting capabilities that produce additional benefits to security enhancements. Blockchain technology improves financial reporting accuracy while removing errors which leads stakeholders to trust financial records more [10].

Statement of Problem

Nigeria's financial industry recognizes the potential benefits of blockchain, but significant obstacles impede its broad implementation. The financial industry faces multiple barriers because government officials have not created complete regulatory systems for blockchain transactions. Insufficient technological infrastructure acts as a primary barrier to producing smooth integration processes. To overcome these hurdles Nigeria must spend strategically on technological development and create rules that help blockchain integration into its financial structure [11]. Blockchain innovation faces criticism because conflicting regulations like the CBN's anti-cryptocurrency stance prevent financial firms from adopting new tech and attracting technology investments [12]. The analysis of financial services by analytics gives rise to data protection vulnerabilities while blockchain consensus mechanisms require extensive energy consumption [3,13]. The National Blockchain Adoption Strategy helps create regulations that

support blockchain adoption in Nigeria through principles and technical flexibility. The strategy works to create a framework that combines innovations with protection and legal compliance standards [14].

Research Objectives

Recognizing the aforementioned factors establishes the urgent need to study blockchain applications for safe data handling in Nigerian financial organizations. The paper presents comprehensive information about the advantages and difficulties along with strategic steps businesses need to take for blockchain adoption success in financial services. This paper aims to examine the role of blockchain technology in enhancing secure data management and economic inclusion within Nigeria's financial institutions. The paper also compares the blockchain technology implementation in Ghana (one of the developing nations in Africa) with the condition in Nigeria.

2.0 RESEARCH METHODS

This study employed a qualitative documentary analysis, drawing from peer-reviewed articles, case studies, and industry reports published between 2016 and 2024. Selection criteria were based on relevance, credibility, and alignment with blockchain applications in financial systems. This methodological framework facilitated a comprehensive understanding of the principal themes associated with blockchain adoption, including efficiency, transparency, and security, as well as the opportunities and challenges encountered by the sector.

2.1 Blockchain Technology

Blockchain has become a major research subject in current times because this disruptive technology enables business transformation through innovative solutions that resolve security and trust-related problems. Coinciding with the Bitcoin release of Nakamoto [15], blockchain started its journey in 2009. In his white paper, Nakamoto laid down the fundamental characteristics of blockchain including its decentralized nature which enabled digital trust mechanisms. From the time of its creation until today blockchain technology has evolved significantly through Ethereum's development in 2013 by

Vitalik Buterin [16]. The additional features that Ethereum added to blockchain allowed developers to build smart contracts which expanded blockchain solutions across different industrial sectors.

A widespread misunderstanding exists about blockchain technology even though distributed ledger technology (DLT) and blockchain operate through different data infrastructure structures according to [17]. A distributed ledger does not need to implement a chain-based design principle because its structure exists apart from blockchain natural requirements. The two alternative distributed ledger technologies DAG and Hashgraph establish particular features which set them apart from standard blockchain systems. Blockchain networks arrange transaction data across blocks that use cryptographic links to previous blocks to ensure the security and integrity of data [18].

The capability of blockchain to be programmed is expanding fast and new programming languages such as Solidity emerged to execute smart contracts for handling legal and contractual complexities. Blockchain smart contracts facilitate the automation of agreement enforcement through a process that reduces organizational friction along with intermediary requirements thus enabling blockchain expansion into numerous business sectors. The expansion of blockchain usage options provides additional strength to its power for changing established business operations. The writing discourse about blockchain technical features including consensus mechanisms together with immutability and decentralization features has expanded considerably [16]. Different blockchain solutions break down into four distinct categories including public and private and hybrid and consortium solutions that can be permissioned or permissionless. Permissionless systems welcome all users while permissioned ones secure their networks through user authorization controls. The multiple varieties of blockchain let the technology match distinct functional needs alongside various security needs.

The features of blockchain technology show promise for resolving problems that span social, economic, organizational and regulatory domains. The increasing market interest in blockchain technology indicates it will likely become standard business infrastructure as it contributes more than $360

billion to corporate value by 2026. The market forecasts that blockchain solution spending will achieve $19 billion in 2024 [19]. The field of economics benefits from blockchain technology because it enables improved transactional efficiency and governance systems which also promotes sustainable operations with circular economy principles [20]. Businesses along with society as a whole would reap substantial advantages through the application of blockchain abilities that facilitate a sustainable resource-based economic transformation.

2.2 Blockchain Technology in Financial Systems

Blockchain serves as an industry-changing technology for financial systems through its solution of essential flaws found in traditional banking operations. The technical foundation of Blockchain consists of three essential features which build an effective framework to enhance the trustworthiness and speed of financial operations. Research conducted by [21] establishes Blockchain technology achieves faster transactions and minimized costs along with enhanced safety which results from removing extra parties. The application of smart contracts and automated procedures through Blockchain technology executes loan payments as well as conducts necessary compliance verifications thus lowering operational failure chances and enhancing process efficiency.

The Nigerian banking industry has begun to adopt Blockchain technology to resolve its transaction settlement delays and reduce the occurrence of fraudulent activities. The Central Bank of Nigeria initiated the eNaira as its central bank digital currency (CBDC) through Blockchain technology to realize more efficient financial transactions and heightened transparency. Digital financial services in Nigeria are enhancing financial inclusion by providing secure and auditable records, reducing cash dependency, and increasing access to financial services. The Central Bank of Nigeria has implemented various initiatives, such as the licensing of Mobile Money Operators and Payment Service Banks, to leverage digital channels for financial services delivery [22]. Blockchain implementation by Nigerian commercial banks enables robust digital identity protection which lowers loan process fraud by confirming user authenticity.

Digital payment companies like Flutterwave and Paystack provide efficient money transfer services, enhancing financial inclusion and reducing transaction costs. Blockchain exhibits remarkable resistance to fraud through its constitution. The unchanging nature of Blockchain records safeguards data purity by protecting every transaction record. By being decentralized, the ledgers create an environment where stakeholders develop mutual trust through their reliance on each other [23]. The essential quality proves vital for Nigerian financial services because they fight against persistent fraud and corruption issues.

2.3 Theoretical Frameworks

The implementation of Blockchain technology in information systems and computing relies on established acceptance theories including the Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB) and Theory of Reasoned Action (TRA), Diffusion of Innovation (DOI) and Unified Theory of Acceptance and Use of Technology (UTAUT). Theories dedicated to individual technology acceptance study personal beliefs together with attitudes and readiness to understand adoption behaviors [24].

This study adopts the Technology-Organization-Environment (TOE) Framework to analyze how regulatory policies, organizational readiness, and technological constraints influence blockchain adoption in Nigerian financial institutions. This framework examines how technological, organizational, and environmental factors influence the adoption of innovative technologies. In Nigeria, the TOE framework underscores the importance of regulatory support from bodies like the Central Bank of Nigeria (CBN) and NDIC, technological infrastructure. For example, the CBN's regulatory framework for the eNaira demonstrates the significance of a supportive environment in driving Blockchain adoption.

2.4 The Major Challenges of Blockchain Adoption in Nigerian Financial Institutions

2.4.1 Regulatory Uncertainty

Regulatory ambiguity remains one of the most significant barriers to blockchain adoption in Nigeria. Conflicting policies, such as the Central Bank of Nigeria's (CBN) restrictive stance on cryptocurrencies, create an uncertain environment that discourages financial institutions from investing in blockchain solutions [12]. The absence of a well-defined regulatory framework limits the legal recognition of blockchain-based transactions and raises concerns regarding compliance and oversight. While the National Blockchain Adoption Strategy aims to create a supportive regulatory environment for blockchain technology in Nigeria, there are concerns about regulatory uncertainty. Stakeholders have noted that clearer guidelines are needed to foster innovation and investment in blockchain solutions [14]. This regulatory vacuum stifles innovation and deters fintech investments, further slowing blockchain adoption.

2.4.2 Technological Barriers

The adoption of blockchain technology in Nigeria's financial sector is hindered by significant technological challenges. Poor internet penetration, particularly in rural regions, restricts access to blockchain-based financial services, exacerbating financial exclusion [5]. Additionally, inadequate power supply and unstable digital infrastructure pose serious threats to blockchain deployment, limiting its scalability and efficiency.

Another major obstacle is the lack of blockchain expertise among financial professionals. Only 12% of banking professionals in Nigeria possess blockchain-related skills, making it difficult for financial institutions to integrate and manage blockchain-based systems effectively [2]. The absence of structured blockchain education and training programs further impedes the growth of local expertise, increasing dependence on foreign technology and expertise. Addressing these technological barriers requires strategic investments in digital infrastructure, nationwide broadband expansion, and specialized training programs to enhance blockchain literacy among professionals in the financial sector.

2.5 Benefits of Adopting Blockchain Technology in Nigeria

The results from this study highlight both the significant benefits and challenges associated with the adoption of blockchain technology within the banking, deposit insurance and insurance sectors. These findings provide valuable insights into the current state of blockchain technology in these industries and point to areas that require further exploration and development.

A core benefit of blockchain technology is its ability to enhance transparency. Due to its decentralized and immutable nature, blockchain provides an auditable record of transactions that is visible to all participants in the network. This transparency builds trust among users, as all transactions are verifiable and cannot be altered once confirmed. This is particularly beneficial in the banking and insurance sectors, where trust is paramount to customer relationships and operational integrity.

Blockchain's cryptographic protocols ensure that data is secure from unauthorized access or tampering. The decentralized nature of blockchain minimizes the risks associated with single points of failure, such as hacking or data breaches in centralized systems. In the insurance industry, blockchain's ability to securely store and transfer sensitive customer data is a significant advantage in mitigating fraud, a major concern in traditional insurance systems.

Blockchain's ability to automate processes through smart contracts results in significant reductions in operational costs. In the banking and insurance sectors, the use of smart contracts can streamline claims processing, policy management, and transaction settlements, reducing the need for intermediaries and administrative overhead.

2.6 Blockchain Policy and Strategic Initiatives in Nigeria

The National Information Technology Development Agency (NITDA) has spearheaded efforts to integrate blockchain technology into Nigeria's digital economy through the National Blockchain Policy. This policy is designed to promote financial inclusion, enhance transparency, and ensure

accountability in digital transactions. This initiative includes the Nigeria Blockchain partnership, established to foster innovation, develop domestic expertise, and create an enabling environment for blockchain adoption through research, development, and local talent cultivation [14].

2.7 Comparison with Blockchain Initiatives in Ghana

Blockchain technology is being applied in various sectors in Ghana, including:

i. **Cocoa Supply Chain:** Blockchain has improved transparency and reduced issues in the cocoa supply chain, ensuring better tracking and management of cocoa beans.
ii. **Tilapia Supply Chain:** Blockchain is transforming the tilapia supply chain by addressing challenges such as inefficiencies and lack of transparency.
iii. **Land Registration:** Blockchain is used to resolve land ownership issues, providing transparency, immutability, and clarity in land administration. It allows real-time access to land transaction information, reducing disputes and fraud.
iv. **Fund Management:** Blockchain enables secure and efficient financial transactions without intermediaries, boosting confidence in data protection and simplifying online deals.

These applications demonstrate blockchain's potential to enhance transparency, efficiency, and trust in various sectors in Ghana in comparison to Nigeria which is also a developing nation in Africa [25].

3.0 RECOMMENDATIONS

The following recommendations are made for the effective adoption of blockchain technology within Nigeria's financial sector:

i. A strategic methodology should be implemented to build blockchain knowledge among Nigerian domestic professionals. The implementation of specialized training programs combined with

academic coursework and research facilities will develop blockchain technical knowledge throughout Nigeria.

ii. Collaboration between government agencies, with authorities in industry and private organizations and international organizations. The strategic partnerships will advance blockchain education throughout Nigeria and establish transparent regulations to let blockchain function smoothly within the country's financial sector.

iii. The adoption of blockchain technology needs stepped-up public and private sector investments to expand broadband networks and public electricity systems as well as technological innovation in regions without adequate digital resources. Public education initiatives should begin to teach people about blockchain advantages and eliminate errors about its use while fostering financial institutions and consumer trust.

4.0 CONCLUSION

Blockchain technology demonstrates great potential because it secures data better while lowering fraud occurrences and increasing financial inclusion throughout Nigeria's diverse financial organizations. The progress of blockchain technology is unfolding at a disappointing rate, primarily due to a limited comprehension among industry professionals, compounded by the intricacies of regulatory oversight and infrastructure hurdles. Results from this comprehensive study reveal a vital requirement for specific blockchain-enabled policies that will both mandate and enforce regulations as well as offering increased financial investments to enhance digital assets and developing specialized training to teach crucial blockchain skills to existing financial sector personnel. The successful use of blockchain technology depends on creating a supportive environment that requires regulatory bodies and financial institutions to establish effective collaboration with technology developers. Acting on these various challenges will provide Nigeria with enhanced financial security and transform it into a global leader in blockchain-driven economic development. Further research should encompass comparative analyses among developing economies, as

this approach will assess current best practices that promote the integration of blockchain within financial frameworks.

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