Blockchain Technology: Impacts in Financial Institutions in Nigeria

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Abstract

The present study aims to explore the effects of blockchain technology on financial institutions by addressing three research objectives: the need for blockchain technology, the tools and applications, and the associated challenges. The study emphasises the need for greater transparency, lower transaction costs, and improved security, which drives the need for blockchain technology to be used in modernising financial systems. It looks at different blockchain tools and their applications within financial institutions, like real-time tracking and automated compliance through smart contracts. These tools provide significant benefits, like improved efficiency and integrity in financial transactions. However, the study also identifies important obstacles to the adoption of blockchain technology, including scalability and regulatory compliance issues. By examining these variables, the research offers a thorough picture of how blockchain technology is changing the financial industry and sheds light on both its potential for transformation and its limitations. The conclusions are intended to assist financial institutions in utilising blockchain technology to improve operational efficiency and security while navigating its drawbacks, and they suggest that they adopt advanced scaling technologies and investigate different consensus mechanisms to address limitations on transaction speed and throughput. They should also work with regulators to create clear, standardised guidelines that preserve the advantages of blockchain technology while facilitating compliance.

Key words: Blockchain Technology, Revolutionized, Database, Crypto currencies

SECTION ONE

1.1   Introduction

A distributed records system called blockchain technology manages the transactional database. It is a digital event that serves as a secure record system. Cryptocurrencies like Bitcoin and other enabled currencies are used to support block chain technology. These currencies are more valuable since they facilitate social, financial, and economic transactional records systems (Beck et al., 2017). Block chain technology, which has been adopted by major businesses, is based on a digital network that maintains records of each data transaction in a network. It does not require third-party verification (Beck et al., 2017).

The international economy's transactional system is primarily dependent on corporations, individuals, and trust entities that create, store, and equally facilitate essential work in a system. Large organisations that use data for their records system construct, maintain their business platform (Wu & Liang, 2017). Financial institutions, such as the banking industry, typically use, store customer information in the form of records in, and take advantage of blockchain technology in dealing with their national and international business transactions. The banking industry has led the way in developing applications and models that are widely used by customers using blockchain technology (Friedrich et al., 2017). Other sectors are finding use for blockchain technology.

Professional insurance companies, healthcare providers, the entertainment industry, shipping, and transportation are among those actively utilising blockchain technology for business operations, processing, directing, and coordination (Beck et al., 2017). According to a report by the European Commission, blockchain technology has the potential to revolutionise many industries. It will, however, lower bank operating costs. Additionally, Bloomberg reported that Google is one of the leading blockchain investors (Witold & Adrian, 2018). Other industry participants include banks, who keep client financial records, and hospitals, which gather patient data, store it in record systems, and use it for diagnosis and treatment.

Information on students is gathered by universities as higher education establishments and kept for academic purposes in the university repository system. The aforementioned data, which is kept as records, is used in an organization's major planning and decision-making processes. The goal of the research is to ascertain how blockchain technology might improve customer payments in the banking sector. This is to look into how the financial industry's use of Blockchain technology affects payments. Many financial institutions, like J.P. Morgan, Goldman Sachs, and Standard Chartered Bank, have set up their laboratories by working with blockchain platforms, and many more are now testing their transactions on the blockchain. Ye and Chen (2016)

Technology has completely changed the banking industry, and in order to stop the current downward trend, new growth sources are needed. One such source of growth is the development of FinTech, a new trend that is characterised by the banking industry's application of technology revolutionised. Every new technology that enters the market presents a new set of challenges. In the service sector, this is mostly due to technological discontinuities, which cause the majority of the top firms to fall behind of their rivals (Friedrich et al., 2017). Because of the financial service crises that the organisation experienced in the past, financial services like banks have undergone a significant transition in recent years. Many organisations are

having to reevaluate their procedures, plans, and strategies in light of the computerisation drive towards digital processes, services, and electronic delivery of online payment services. This evolution is the reason why the financial banking sector is becoming more interested in and conducting research on a new technology known as Blockchain. Since technology has been facilitating payments directly between parties, affiliations, and customers, there is no need for middlemen. It is now recognised that the advancement of technology in the payment sector has led to a notable increase in the banking industry's use of the same technology.

Numerous issues beset Nigeria's financial system, such as poor transaction processing efficiency, excessive operating expenses, security flaws, and restricted access to financial services for a sizable segment of the populace (KPMG, 2019). Nigeria, the biggest economy in Africa, has problems with its financial institutions, including long settlement periods, a high rate of fraud, and a sizable population of underbanked people (Central Bank of Nigeria, 2018). By giving financial transactions a decentralised, transparent, and secure platform, blockchain technology presents a viable answer to these problems. It can greatly improve operational efficiency and cut transaction costs because of its capacity to support real-time processing and lessen reliance on middlemen (World Bank, 2020). Additionally, blockchain can increase security and transparency, which lowers fraud and boosts confidence in financial systems (Deloitte, 2018).

The banking sector in Nigeria is currently lagging behind in the implementation of blockchain technology, despite these potential advantages. Significant obstacles to the general adoption of blockchain technology include unclear regulations, a lacklustre technological infrastructure, and a lack of stakeholder knowledge of the technology's potential (PwC, 2017). Challenges include assuring compliance with legal requirements including know-your-customer (KYC) and anti-money laundering (AML) standards, as well as integrating blockchain with current financial systems (Ernst & Young, 2019). The issue is that, despite the fact that blockchain technology has the potential to greatly improve the effectiveness, security, and accessibility of Nigeria's financial institutions, a number of challenges need to be addressed in order to reap these rewards. This study aims to investigate the influence of blockchain technology in financial institutions in order to close this gap.

Research objectives
The general objectives of this study is to examine the impacts of blockchain technology in financial institutions in Nigeria. The specific objectives are;
1. To brief about blockchain technology and its importance in the financial industry in Nigeria.
2. To explore the various tools of blockchain technology in financial industry in Nigeria.
3. To identify and study its challenges and the significant application of Blockchain technology in financial industry in Nigeria.

SECTION TWO
Literature review

2.1   Conceptual review

Industry flows
- Settlements
- Change of supplier
- Meter data
- Real-time capacity matching

Asset management
- Autonomous network configuration
- Self-serve maintenance
- Asset and inventory tracking
- Cross asset/industry data sharing

Smart contracts
- EV charging
- Peer-to-peer trading
- Demand-side management
- Network services

Identity management
- Eligibility for social tariffs
- Safety authorisations and permit to work
- Fraud detection
- Loyalty schemes

2.1.1   Concept Blockchain:

Blockchain is a distributed and decentralised digital ledger technology that records transactions over a computer network. It operates on the principles of openness, safety, inalterability, and accord. Transactions are arranged into blocks, linked in a sequential manner, and encrypted using cryptographic hashing to ensure data integrity (Ghiro et al., 2021). Blockchain guarantees security and transparency, but it also significantly lowers costs. It accomplishes this by doing away with middlemen and fees. Additionally, blockchain makes cross-border transactions almost instantaneous. Fintech companies seeking to streamline their operations will find this to be especially appealing. Smart contracts are another important feature of blockchain technology. These self-executing contracts with predefined rules automate complex processes, including financial agreements and settlements (Thankor, 2020).

The decentralized and secure ledger system of Blockchain technology has revolutionized the financial sector globally, and Nigeria is no exception. The adoption of Blockchain technology by Nigerian financial institutions has been characterized by a gradual embrace of technological advancements, regulatory challenges, and efforts to leverage its benefits for financial inclusion and security. Early interest in Blockchain technology in Nigeria began in the early 2010s, following the global emergence of cryptocurrencies like Bitcoin. By 2014, the Central Bank of Nigeria (CBN) had issued a circular warning the public about the risks associated with cryptocurrencies, signaling the start of regulatory attention towards Blockchain and related activities (Central Bank of Nigeria, 2014). Despite initial caution, the potential advantages of Blockchain technology—such as enhanced security, transparency, and efficiency—began to capture the interest of Nigerian financial institutions.

In an effort to enhance banking operations, a number of significant Nigerian institutions, notably Diamond Bank, began investigating blockchain technology around 2017. To learn how the technology may be incorporated into their systems to improve security and efficiency, these organisations took part in a number of blockchain forums and projects (Adetunji, 2017). During this time, banks started actively exploring blockchain technology after realising its potential to transform financial services, which was a huge change from

simply being curious. Nonetheless, Nigeria's blockchain regulatory landscape remained convoluted. A committee to research cryptocurrencies and blockchain technology was formed in 2018 by the Central Bank of Nigeria and the Nigeria Deposit Insurance Corporation (NDIC). The goal of this program was to create a regulatory framework that would protect consumers and foster innovation at the same time as reducing the danger of fraud (Olanrewaju, 2018). The government's approach, which struck a balance between encouraging innovation and safeguarding the financial system, remained cautious in spite of these efforts.

The development of blockchain technology into official financial institutions was momentarily slowed down by a directive issued by the Central Bank of Nigeria in 2021 that forbade banks from assisting cryptocurrency transactions (Central Bank of Nigeria, 2021). This action brought to light the continuous conflict between regulatory restraint and the burgeoning enthusiasm in the revolutionary potential of blockchain technology.

Nonetheless, Nigerians' interest in blockchain technology is still growing. Blockchain applications for identity verification, cross-border payments, and smart contracts have been investigated by financial institutions and fintech startups. The introduction of the eNaira, Nigeria's digital currency, in October 2021 marked a significant turning point in the country's digital financial environment (Central Bank of Nigeria, 2021). The government's acknowledgement of blockchain technology's potential advantages, including increased financial inclusion, lower transaction costs, and improved monetary system efficiency, is reflected in the eNaira (Ebhota, 2021). A blockchain architecture consists of several parts, including

- Node: A system or user within a blockchain;
- Block: A data structure that keeps a set of transactions distributed to all nodes in the network;
- Miner: A node that performs block validation and verification;
- Transaction: The smallest component of a Blockchain system; v. Chain: An ordered sequence of blocks in a Blockchain system; and
- Consensus: A set of rules that govern the operations in a Blockchain system

2.1.2 The need for Blockchain Technology

Because Blockchain technology can solve a number of persistent issues, it is becoming more and more recognized in the financial sector as a revolutionary force. The banking sector requires Blockchain technology for the following main reasons (National Blockchain Policy For Nigeria, 2020):

1. **Improved Transparency and Accountability:**
   Blockchain Technology can help to increase transparency and accountability in various sectors in Nigeria. By using a distributed ledger system, all transactions are recorded and can be accessed by anyone on the network. This can help to reduce corruption, fraud, and other illegal activities.
2. **Increased Efficiency:**
   Blockchain Technology can also help to improve the efficiency of various processes, such as payment processing, supply chain management, and identity verification. By leveraging Blockchain features like smart contracts, transactions can be executed automatically, reducing the need for intermediaries and streamlining the process.

3. **Enhanced Security:**
   Blockchain Technology is highly secure due to its decentralised nature. Transactions are recorded on multiple nodes, making it nearly impossible to tamper with the data. This can help to protect sensitive data and prevent cyber-attacks across multiple sectors of the economy.

4. **Financial Inclusion:**
   Blockchain Technology can help to increase financial inclusion in Nigeria by providing access to financial services to those who may not have had access before. By using blockchain-based payment systems, individuals can send and receive money easily and securely.

5. **Job Creation:**
   Blockchain adoption in Nigeria has the potential to create significant job opportunities across a range of sectors. With a young and techsavvy population, Nigeria is well-positioned to become a blockchain hub in Africa. The adoption of Blockchain Technology creates new job roles, such as blockchain developers, cybersecurity experts, and smart contract engineers. Furthermore, Blockchain Technology enables the creation of new industries, such as cryptocurrency exchanges and blockchain based payment systems, which could create jobs across various sectors, including finance, technology, and manufacturing. The implementation of Blockchain Technology in Nigeria shall also improve transparency and reduce corruption, which boosts investor confidence and create additional job opportunities. Overall, the job creation benefits of blockchain adoption in Nigeria have the potential to play a significant role in the country's economic development and growth.

Tools and strategies of Blockchain technology in financial institutions
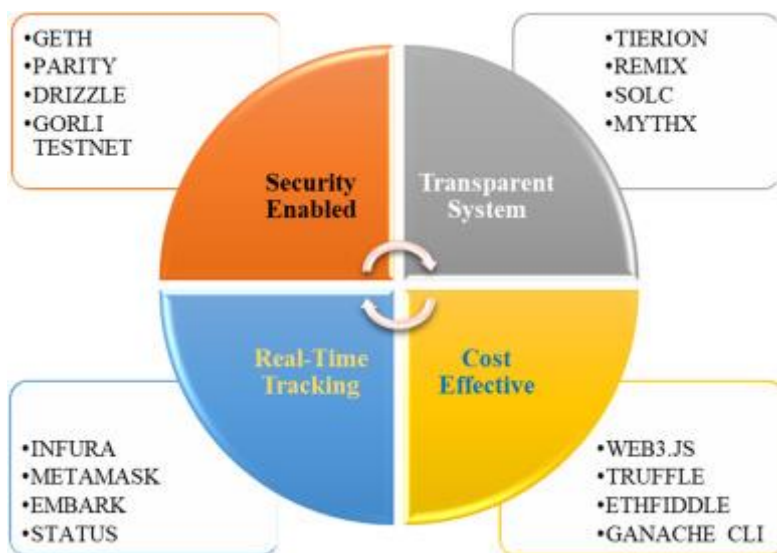
From the digram above, the tools of blockchain technology in financial institutions are analysed below;

2.1.3 Security-Enabled Tools and Their Applications in the Financial Industry

Security is essential in the financial sector for upholding confidence and guaranteeing the accuracy of data and transactions. A number of blockchain-based security tools are available, each having specialised uses in the banking industry. Geth, Parity, Drizzle, and the Gorli testnet are a few of these.

Geth, Ethereum Foundation, 2024) states that Go Ethereum, a popular Ethereum client, acts as a portal for communicating with the Ethereum blockchain. In addition to mining, it provides a number of other functions like transaction processing and smart contract deployment. Geth is essential to the financial sector for safely handling transactions and smart contracts. Its strong node management helps prevent unwanted access and tampering, and its use of cryptographic algorithms guarantees the security of transaction processing. Geth helps banks preserve the integrity and privacy of their blockchain-based operations by offering a safe environment for communication with the Ethereum network.

Parity,Another Ethereum client that is well-known for its security and performance qualities is OpenEthereum (Parity Technologies, 2023). It offers a safe interface to the Ethereum blockchain with cutting-edge security features including improved access control and encryption methods. Parity is used in financial applications to safeguard smart contracts and transactions, guaranteeing their safe and proper execution. It is a useful tool for financial organisations wishing to use Ethereum-based solutions while lowering the risks involved in transaction processing and smart contract execution because of its emphasis on efficiency and security.

Drizzle is a front-end framework created to make the Ethereum blockchain better for developing decentralised apps (dApps) (Truffle Suite, 2023). It guarantees the seamless and safe operation of decentralised applications by enabling safe interactions between the user interface and smart contracts. Blockchain applications, like trading platforms and financial management systems, are developed using Drizzle to create safe and intuitive user interfaces for the financial sector. Drizzle facilitates the creation of safe dApps that safeguard user information and transactions by abstracting the intricacies of blockchain interactions for developers.

Gorli Testnet is an Ethereum proof-of-authority testnet intended for regulated environment testing of applications and smart contracts (Goerli Network, 2024). Developers are able to properly test their blockchain solutions prior to deployment, as it mimics the conditions of the Ethereum mainnet with less risk involved. In order to help financial organisations find and fix possible security flaws before going live, the Gorli testnet is used to replicate smart contract activities and financial transactions. Thus, the likelihood of vulnerabilities and failures in the production environment is decreased and their blockchain applications are guaranteed to be dependable and safe.

2.1.4 Transparent System Tools and Their Applications in the Financial Sector

In the financial sector, transparency is essential for maintaining trust, ensuring accuracy, and fostering accountability in transactions and operations. Several blockchain tools contribute to transparency by enhancing the visibility and verification of data and smart contracts. Among these tools are TIERION, REMIX, SOLC, and MYTHX.

Tierion is a blockchain-based platform that specialises in offering fast, single-transaction verification and storage of verifiable data. (Tierion, 2024). Through the use of blockchain technology, TIERION guarantees the immutability and tamper-proofness of data. In the financial industry, where the accuracy of transaction records and supporting paperwork is essential, this functionality is especially useful. Financial organisations can utilise TIERION to generate an audit trail that is transparent for a range of financial documents and transactions, including compliance records and contracts. This improves data integrity and aids in regulatory compliance while streamlining auditing procedures.

Remix is an integrated development environment (IDE) created especially for Ethereum blockchain smart contract development (Ethereum Foundation, 2024). It offers a full suite of tools for leveraging Ethereum's Solidity programming language to create, test, and implement smart contracts. By giving developers the ability to monitor the real-time execution of their code, spot possible problems, and confirm contract behaviour before deployment, REMIX improves transparency in the creation of smart contracts. To make sure smart contracts for trading, asset management, and other financial processes work as planned and are error- and vulnerability-free, the financial industry can use REMIX to build and test them.

SOLC The compiler that transforms Solidity code into bytecode that can run on the Ethereum Virtual Machine (EVM) is called the Solidity Compiler (Solidity, 2024). SOLC offers a standardised process for assembling smart contracts, which is essential for maintaining transparency. This consistency aids in confirming that the produced code acts as anticipated and matches the source code. SOLC guarantees the correct compilation of smart contracts in financial applications, enabling the transparent execution of automated procedures, financial agreements, and transactions. By guaranteeing that smart contracts are carried out dependably and consistently, this openness promotes confidence among stakeholders.

Mythx is a thorough security analysis tool for smart contracts that is intended to find security holes and guarantee the security of blockchain code (MythX, 2024). It offers thorough auditing and analysis of smart contracts to find any security vulnerabilities before they are implemented. Through the provision of comprehensive reports on vulnerabilities and their ramifications, MYTHX enhances the transparency of smart contract security. To make sure smart contracts used in financial transactions, investing platforms, and other applications are safe and operating as intended, financial institutions can use MYTHX to audit them. This proactive approach to security keeps things visible and dependable, which helps avoid problems and fosters user trust.

2.1.5   Real-Time Tracking Tools and Their Applications in the Financial Sector

A vital component of contemporary financial systems is real-time tracking, which makes it possible to manage assets, transactions, and blockchain interactions instantly. Real-time tracking within blockchain networks is made possible by a number of excellent tools, such as INFURA, METAMASK, EMBARK, and STATUS.

Infura is a reliable infrastructure platform that offers scalable Ethereum blockchain access (Infura, 2024). Developers and financial organisations can engage with the Ethereum network through INFURA's suite of tools and APIs, eliminating the need for them to maintain their own nodes. Applications like asset tracking, transaction monitoring, and market analysis that demand real-time information depend on this real-time access to blockchain data. By integrating real-time data feeds into their applications using INFURA, financial institutions can guarantee that users have access to the most recent information and are able to make timely decisions based on the state of the market.

Metamask is a well-known cryptocurrency wallet and browser addon that makes interacting with other decentralised networks and the Ethereum blockchain easier (MetaMask, 2024). For storing digital assets, carrying out transactions, and communicating with decentralised applications (dApps), it offers users a safe and intuitive interface. Real-time tracking of digital asset portfolios, transaction statuses, and smart contract interactions is made possible in the financial sector via METAMASK. Financial institutions and their clients can monitor and manage their assets in real time by integrating METAMASK, which improves their capacity to react to market movements and carry out transactions effectively.

Embark is an Ethereum blockchain development platform that facilitates the creation and implementation of decentralised apps (dApps) (Embark, 2024). It offers resources for managing deployments, integrating smart contracts, and communicating with blockchain networks. Developing and monitoring financial applications requires the ability to track contract deployments and interactions in real-time, which is something that EMBARK's capabilities provide. In order to ensure that apps operate smoothly and that data is accurately represented in real time, financial institutions can use EMBARK to develop and implement dApps that require real-time tracking of financial transactions, contract states, and user interactions.

Status is a desktop and mobile application that serves as an Ethereum wallet and safe communications system (Status, 2024). With real-time access to blockchain data, it enables users to engage with dApps, send and receive cryptocurrency, and take part in decentralised governance. STATUS provides a safe, real-time method for financial institutions to monitor transactions and manage digital assets. Users may monitor their financial actions and stay connected to the Ethereum network thanks to its integrated wallet and messaging features, which improves financial operations' timeliness and transparency.

2.1.6 Cost-Effective Tools and Their Applications in the Financial Sector

Cost-effectiveness is a key consideration when applying blockchain technology in the financial industry. The following tools, among others, can help lower the expenses related to blockchain development and operations: WEB3JS, TRUFFLE, ETHFIDDLE, and GANACHECLI. These tools assist in cutting expenses, shortening development times, and streamlining procedures.

Web3j is a JavaScript library that offers an Ethereum blockchain interaction interface (Web3 Foundation, 2024). By linking their apps to Ethereum nodes, developers may create and oversee decentralised apps, or dApps. Because WEB3JS makes it easier to incorporate blockchain technology into online apps and eliminates the need for complex backend programming and server management, it is more affordable. By utilising the Ethereum infrastructure that is already in place and eliminating the need for bespoke backend solutions, WEB3JS helps the financial sector to create cost-effective apps for asset management, trading platforms, and financial analytics.

Truffle is an extensive Ethereum development framework designed to make the creation, testing, and implementation of smart contracts easier (Truffle Suite, 2024). Smart contracts can be constructed, deployed, managed, and integrated into dApps using its range of tools. Because TRUFFLE shortens the time needed to create and implement blockchain applications, it is a cost-effective solution. Financial institutions can use TRUFFLE to provide affordable solutions for a range of financial functions, including automated financial instruments, compliance monitoring, and transaction processing.

Ethfiddle allows developers to draft, compile, and test smart contracts right in the browser using an online Solidity compiler and integrated development environment (ETHFIDDLE, 2024). It offers an intuitive interface that eliminates the requirement for local development environments when experimenting with Solidity code. Because it does not require complicated local settings or equipment, ETHFIDDLE is more affordable and easier for developers to prototype and test smart contracts. ETHFIDDLE is a tool that the financial industry can use to quickly prototype smart contracts for use in compliance monitoring, decentralised finance (DeFi) applications, and financial transactions.

Ganachecli is a version of Ganache that can be used command-line for developing personal Ethereum blockchains (Truffle Suite, 2024). GANACHECLI offers a local blockchain environment for developers to test and debug applications and smart contracts. It is affordable because it enables thorough testing by developers without requiring access to the main Ethereum network or incurring transaction fees. Before releasing blockchain apps and smart contracts to the mainnet, financial institutions may ensure stability and cut development costs by using GANACHECLI to test and validate them in a controlled environment.

2.1.7 Challenges of blockchain technology in financial institutions

Notwithstanding its potential for revolution, blockchain technology confronts a number of important obstacles in the banking sector. Scalability, compliance, security, and other issues are all part of these concerns. Scalability is still one of the most important problems. Blockchain networks frequently have issues with transaction throughput and speed, especially those that use proof-of-work consensus mechanisms like Bitcoin and Ethereum. The time needed to process transactions can become a bottleneck as network demand rises, resulting in delays and increased transaction prices (Buterin, 2023). Financial institutions that handle enormous volumes of financial activity and need high-speed transactions would find this limitation especially challenging. The core of blockchain technology is security.

Due to its cryptographic roots, the blockchain itself is largely safe, however smart contracts, the software used to communicate with blockchain networks, and the handling of private keys can all have security flaws. According to Conti et al. (2023), security vulnerabilities or breaches can result in large financial losses as well as harm to an institution's reputation. To reduce these threats, strong security procedures and frequent audits are crucial.

CONCLUSION AND RECOMMENDATION

3.1 Conclusion

The research highlights how blockchain technology can revolutionise financial organisations by helping to meet important needs including security, cost-effectiveness, and transparency. Significant advantages of blockchain technology include enhanced efficiency, financial inclusion, transparency, and decentralised, irreversible ledgers. In order to build and implement blockchain solutions, tools like WEB3JS, TRUFFLE, and INFURA are essential since they facilitate effective integration and application within financial systems.

1. Blockchain deployment is not without its difficulties, though. Transaction throughput may be hampered by scalability problems, and significant obstacles may arise from regulatory

compliance and integration with existing systems. Thus, in order to properly utilise blockchain technology, the report suggests that financial institutions need;

2. **Invest in Scalability Solutions**: Adopt advanced scaling technologies and explore alternative consensus mechanisms to address transaction speed and throughput limitations.
3. **Enhance Regulatory Frameworks**: Collaborate with regulators to develop clear, standardized guidelines that facilitate compliance while preserving blockchain's benefits.
4. **Prioritize Security**: Implement robust security practices, including regular audits and secure key management, to safeguard against vulnerabilities.
5. **Integrate with Legacy Systems**: Develop strategies for seamless integration with existing systems to minimize disruption and maximize efficiency.
6. **Address Environmental Impact**: Explore energy-efficient consensus mechanisms and sustainable practices to reduce the environmental footprint of blockchain operations.

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