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# BLOCKCHAIN TECHNOLOGY FOR LAND REGISTRATION IN NIGERIA: A REVIEW OF OPPORTUNITIES AND CHALLENGES

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**ABSTRACT**
Land registration is critical for ensuring legal certainty and economic stability, yet Nigeria's system is plagued by inefficiencies, corruption, and inadequate technical infrastructure. These challenges result in prolonged processing times, high registration costs, insufficient technical skills, unqualified staff, excessive land charges, and an unclear legal framework. Additionally, institutional inefficiencies, ignorance among landowners regarding the importance of registration, multiple sales, unofficial charges, and lack of transparency exacerbate the problem. This study examines the potential of blockchain technology to address these systemic issues. Blockchain's decentralized and secure framework offers transformative potential by enhancing transparency, reducing fraud, and streamlining land registration processes. Drawing from global applications, the paper highlights blockchain's ability to create tamper-proof records, minimize human errors, and build public trust in land transactions. However, significant challenges to adoption in Nigeria include technical and infrastructural limitations, regulatory challenges, political resistance, and the need to train stakeholders. The study proposes a strategic framework focused on private permissioned blockchains, smart contracts, and integration with existing land records to ensure gradual implementation. Adopting blockchain could significantly reduce registration timelines, lower costs, improve transparency, and foster economic growth through a reliable and secure land tenure system. This research highlights blockchain's potential to modernize land administration in Nigeria while addressing critical challenges and enabling equitable access to land rights.

**Keywords**: Blockchain, Land registration, Cadastre, Technology, Infrastructure

## INTRODUCTION

Legal certainty and protection of land rights holders are fundamental aspects that significantly affect social and economic stability and the sustainability of development (Guo & Liu, 2021). Land ownership and rights must be appropriately regulated so as not to cause disputes and conflicts in the future. To establish legal certainty, one of the measures that a party controlling land can take is registering the land with the Land Registration Office, which the National Land Agency manages (Wajdi & Ramadhani, 2022). Land registration is an official process that includes recording proprietorship and use freedoms to land in a legitimately perceived enrolment framework. An effective registration system ensures that land rights are legally recognized and protected by law (Suyanto, Liliana, Yulies, & Afif, 2024). Effective land administration practices benefit not only the current generation but also future ones. They serve as a tool to guarantee fair access to land for all stakeholders, aligning with a country's policy framework (Ukaejiofo, 2008).

In Nigeria, certain states have introduced land administration reforms focused on land titling and registration systems. These reforms primarily target urban land and largely involve transitioning from manual to digital registration processes, rather than undertaking large-scale registration programmes. States such as Lagos, Anambra, Kano, Enugu, Kaduna, and the Federal Capital Territory Administration are at the forefront of these efforts. Additionally, the Federal Lands Department has developed the Federal Lands Information System (FELIS) to manage the registration of lands under federal control across the country. Typically, land registration occurs upon request. These reform initiatives, driven by both federal and state governments, highlight the significance placed on land administration in Nigeria. Consequently, exploring the factors that may challenge these programmes, as this study does, is critical to enhancing land administration in the country. (Nwuba & Nuhu, 2018).

Therefore, this paper investigates the challenges associated of land registration in Nigeria and evaluates the potential of blockchain technology to transform the country's land registration processes and its associated barriers.

### Landscape of Land Registration in Nigeria

Land registration in Nigeria dates back to 1863, when it was introduced by the British Colonial Administration (Federal Ministry of Housing and Urban Development, 2006). Despite this long-standing history and the critical role of land registration in facilitating land market operations, the proportion of registered land titles remains low (Federal Ministry of Housing and Urban Development, 2006). Across Africa, it is estimated that less than 15% of land is officially registered with title deeds, with the figure dropping to just 1% in sub-Saharan Africa. (Tibaijuka, 2004).

Deed registration is the primary land registration system in Nigeria. The Land Registration Act No 36 of 1924 as differently amended is the significant regulation controlling land registration in Nigeria, and it has been adopted and re-enacted in most states under various names (Nuhu, 2009). The Land Instruments Registration Laws of both states and at federal level have been explicitly validated by Section. 48 of the Land Use Act of 1978, provided that they align with the Act. Furthermore, section. 315(5)(d) of the 1999 Constitution upholds the sanctity of the Land Use Act. These laws mandate the establishment of land registries in each state, managed by a land registrar responsible for registering instruments related to land and maintaining the associated records (Olubodun, 2010). Deed registration in Nigeria is a system in which significant documents affecting land title are recorded in a government-maintained register. (Smith, 2007).

The land registration Act required all documents by which an interest in land is transferred or charged should be registered so as to facilitate search into the roots of any title to be alienated. In a similar vein, the Registration of title Act made provisions for the registration of title. The system operates to provide records of transactions in land to which recourse might be had whenever a transaction in land is contemplated. It serves as information bank and to this extent puts prospective purchasers on land on notice as to existing claims on land only if they conduct search in the registry as part of due diligence (Ahiakwo Grace Abraham, 2024).

**Challenges in Land Registration in Nigeria**

Land registration types with their different uniqueness, yet is not without challenges and/or limitations. Several authors have documented the limitations of the various types of land registration, the predominant land registration system in Nigeria today is based on the land instruments registration Laws, which are enacted individually by each state of the federation. (Imhanobe, 2007). These laws provide a framework for registering title documents but do not facilitate the registration of actual property titles. Registration is typically optional, and many rights remain unregistered. Verifying and evaluating the documents needed to validate ownership claims can be a complex, costly and time-consuming process, which on several occasion lead to disputes. not register title to a property. Registration is often not compulsory and, as a general rule, many rights are not registered. (Simpson, 1979; Dale & McLaughlin, 1999).

Nigeria faces significant challenges in land administration due to issues within its institutional, legal, and spatial frameworks, leading to a large number of unregistered land rights. Additionally, bureaucratic inefficiencies in accessing land administration services hinder effective governance. (Birner & Austen , 2011). There is a lengthy procedure of land registration system in Nigeria –the World Bank (2017) ranked Nigeria's economy as 169 among 190 countries based on the ease of registering land. It takes an average of 12 steps and 70 days to complete registration, costing 10.5% of the property value. Perhaps unsurprisingly, less than 3% of Nigerian land is registered in a formal land register (Adeniyi, Oniemola, & Badru, 2018).

In Nigeria, urban land access is a highly sensitive issue, with land rights often lacking security. This is evident in the challenges associated with obtaining information for land transactions and the government's inefficiency in issuing formal land title documents. (Federal Ministry of Housing and Urban Development, 2006). (Nwuba & Nuhu, 2018) highlights that urban land buyers often struggle to verify the authenticity of land titles before acquisition. Access to secure urban land tenure, particularly for low- and middle-income households, has become a critical aspect of governance. Land registration is identified as a key approach to ensuring the security of land rights.

(Thontteh & Omirin, 2015) research on land registration reforms in Lagos State assessed the effectiveness of the Electronic Document Management System (EDMS) in land registration. The findings revealed that the EDMS enhanced land registration by improving tenure security, boosting public confidence in transactions, centralizing file storage, and reducing the waiting time for land information. However, it failed to address land disputes, increase application processing rates, or boost government revenue. Additionally, title registration still takes over 120 days to complete. Challenges affecting land registration in the state include high registration costs, insufficient technical skills, unqualified staff, excessive land charges, an unclear legal framework, and institutional inefficiencies.

(Nwuba & Nuhu, 2018) identified in their study, that ignorance among landowners about the need for registration, making many unaware of its importance. Affordability is another significant issue, with the costs of obtaining registration being too high for many, particularly low-income individuals. The process itself is lengthy and cumbersome, often involving delays and inefficiencies that discourage participation. Corruption within the system also presents a barrier, as unofficial payments are commonly required to expedite processes. Inadequate human capital further complicates matters, with a shortage of skilled personnel leading to inefficiencies in handling registrations. Incomplete documentation submitted by applicants causes further delays, and resistance to change from both land registration staff and the public hinders the implementation of reforms. Many applicants lack the legal knowledge or understanding needed to accurately complete land documentation forms. When such improperly completed documents are publicly recorded and stored, they can mislead others. Innocent buyers may unknowingly purchase land based on inaccurate records or search results, leading to financial losses. Therefore, it is essential to provide assistance to applicants with limited legal expertise to ensure the correct completion of land registration forms especially in some states that employ Geographical Information System in Land registration (Abraham & Amadi, 2024). The digitization of records addresses some challenges of paper-based systems but still carries the risk of a single point of failure due to centralized record storage. (Khalid, Iqbal, Hussain, & Ullah, 2022), even a digital record holds no advantage over a paper-based one in the absence of a reliable custodian (Mansoor, Ali, Mateen, Kaleem, & Nazir, 2024). Additionally, the reliance on customary land tenure systems, where landowners believe their rights are secure without formal registration, prevents many from engaging with the formal process. Challenges such as multiple sales, unofficial charges, lack of transparency, and bureaucratic hurdles are prevalent in Systems of land management in developing nations. (Ameyaw & de Vries, 2021).

**Blockchain Technology: Concepts and Structure**

Blockchain technology is by far the most effective solution for data management challenges in unreliable systems. All data operations were managed by the blockchain layer, which also made it simple to identify any instances of data misuse. Several blockchains that solve storage and data-sharing issues were proposed in the literature (Majigi et. al 2023).

Don and Alex Tapscott famously define blockchain as an "incorruptible digital ledger of economic transactions, capable of recording not only financial exchanges but virtually anything of value". (Bahga, & Madisetti,, 2016). Blockchain is an incredibly trustworthy method for recording data, utilizing distributed ledger technology (DLT) where transaction records, known as blocks, are shared across a network of computers. Each block contains a unique identifier and links to the data of the previous block. Operating through peer-to-peer nodes, blockchain creates a decentralized and resilient system. This makes it particularly well-suited for registering and managing long-term data, such as land records. (Krishnapriya & Sarath, 2020).

Blockchain functions as a shared dispersed record, where each node in the network retains an identical copy of the ledger. Transactions are organized into "blocks," illustrated in Figure. 1, with each block containing a unique cryptographic hash, the timestamp of the preceding block, and the transaction data. The cryptographic hash is irreversible,

preventing the extraction of original data, and its length remains consistent regardless of the input size. For example, the SHA-256 algorithm consistently generates a 256-bit hash. (Nazir & Kaleem, 2022).

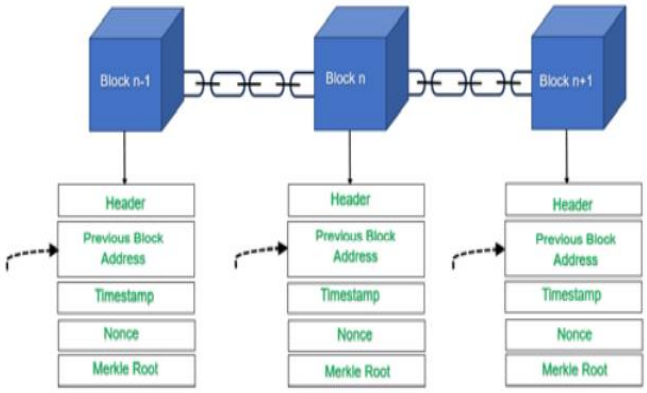


Figure 1: Visual representation of a components of blockchain

A normal blockchain has three significant parts, they incorporate; Dispersed Record, Smart Contacts, and Distributed Applications. In conveyed Record, it utilizes disseminated computerized record innovation (DLT), while Brilliant Contacts give a method for communicating exchanges put away in the Dispersed Record, the utilization of shrewd agreements in the land vault assumes an essential part in approving the viability of blockchain innovation. By utilizing brilliant agreements, buyers can trust the realness and uniqueness of the land being procured, while Smart contacts can give verification of their legitimate possession, limiting the probability of future debates and dispersed applications that are assembled for end clients (Taherdoost, 2023), (Rawat, Chaudhary, & Doku, 2021).

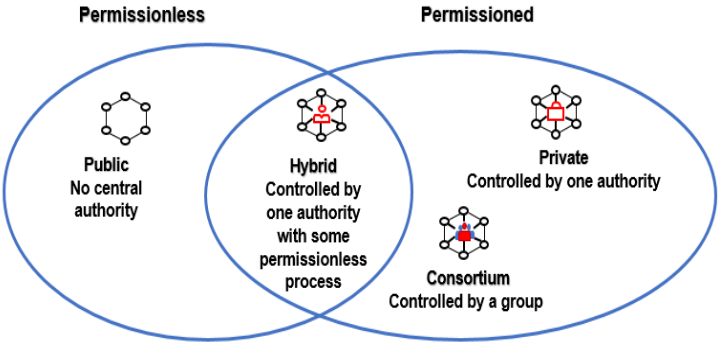


Figure 2: Types of Blockchain

In Figure 2, a permissioned blockchain limits access to only approved users who have the rights to use the network and access the stored data (Vos, 2016). Such blockchains find application in environments focusing on significant level security, where a solitary association ordinarily holds control and activities unified administration over the framework (Nakamoto, 2008.) .

Permissionless blockchain: In Permission-less blockchain, organizations will be available to all members. Blockchain utilized in Bitcoin is permissionless (Nakamoto, 2008.). The Agreement convention utilized in permissionless blockchain is poof of work. The poof of work makes the permissionless blockchain delayed as all members should reach to agreement to go with a choice. A hybrid blockchain combines public and private features, enabling the handling of both public and private data and transactions. It is particularly useful in situations where some information needs to remain confidential while other details must be publicly accessible. Then again, a consortium blockchain is managed by a set of organizations or entities that collectively oversee a permissioned blockchain. This model ensures shared responsibility among the participating organizations for maintaining and governing the blockchain.

**Global Applications of Blockchain in Land Registration**

There are various difficulties and gaps in overseeing data around land regisration that prompted debasement and conflicts, for example, information centralization, absence of open information, unfortunate data sharing and mediators. These difficulties bring about questions which redirect restricted government assets from the legal executive (Shuaib, Alam, Khan, & Daud, 2020) and adversely impact the economy (Thamrin, Harahap, Khoirunisa, Faturahman, & Zelina, 2021). For instance, compromised land freedoms are the primary justification behind worldwide destitution, unfairness, political weakness and social distress and savagery (Nguyen, Dao,, & Do, 2020). Efforts to digitize land registration often involve layering digital technologies onto traditional systems. However, this approach has not eliminated issues such as record tampering, the creation of multiple sale certificates, and other human errors in data recording. (Aquib, Dhomeja, Dahri, & Malkani, 2020). Governments have the opportunity to implement blockchain technology (BT) to develop land registration systems that are reliable, efficient, and free from corruption. (Shang & Price, 2019).

The United Arab Emirates (UAE) has implemented a comprehensive blockchain strategy for Dubai, positioning it

as the first city to be fully powered by blockchain. This initiative aims to transform various sectors by enhancing efficiency, transparency, and security. It claims that "Adopting Blockchain technology Dubai stands to unlock 5.5 billion dirhams in savings annually in document processing alone — equal to the one Burj Khalifa's worth of value every year (Dubai, 2022). The current and the improved blockchain based process for real estate transactions in Sweden could have the property title registration process time reduced from 4 months to few days (Land Registry 2016). The blockchain based land registry in Sweden has the transactions open sourced that can be verified by anyone (Land Registry 2016). A successful approach for the blockchain based system adoption must be supported by the IT readiness and political will of the organizations for the emerging technologies (Benbunan-Fich & Castellanos, 2018), (Veuger, 2020). By adopting a blockchain-based land registration system, a developing country can have many benefits, such as, increased liquidity, lower risk, and reduced costs, making property investment more attractive. This can foster economic activity as incontestable land titles allow for investments through mortgages, industrial, and agricultural loans. The findings underscore the negative role that corruption in land records plays in terms of country's development and growth (Mansoor, Ali, Mateen, Kaleem, & Nazir, 2024).

**Application of Blockchain in Nigeria's Land Registration**

The potential application of blockchain in Nigeria's land registration system is compelling, as it can enhance transparency, reduce fraud, and streamline bureaucratic processes. Nigeria, like many countries with land administration challenges, faces issues such as disputes over land ownership, inefficient record-keeping systems, and prevalent fraudulent practices. Blockchain, a decentralized ledger technology, offers an innovative approach to address these challenges by providing a secure, transparent, and tamper-proof system for recording land ownership and transactions.

**Benefits of effective land registration in Nigeria.**

According to review done by Markus Seifert and Hartmut Mueller (2019) suggested the following benefits over the process according to today's version of the land register, which of course not different from the Nigerian setting.

i. It is feasible and realistic to cut the overall process's time drastically. Blockchain has slashed the process from months to days in test operations in nations like India. For simple cases, Sweden's blockchain-based land registry system reports processing times of a few hours. To ascertain the precise time in your situation, look at: the particular blockchain system being utilized. The type of procedure (e.g., transfer of ownership vs. first-time registration), local laws and rules.
ii. Much of the data for carrying out the process is already included in the blockchain-based land registry.
iii. Digital signatures provide a higher level of security than manual document filling (risk of errors and fraud decreases).
iv. All actors can digitally store their documents, data and documents cannot be lost due to decentralized data management.
v. Increased transparency, no "black box feeling". A transparent land registration process eliminates the perception of hidden operations ("black box feeling") where stakeholders are unsure how decisions are made or records are handled. By offering clear visibility into the process and making data accessible to all authorized parties, such systems foster trust among property owners, buyers, and regulatory bodies.

**Possible challenges to Blockchain Adoption in Nigeria**

Despite the potential benefits, blockchain implementation in Nigeria's land registration system faces several challenges:

Technical and Infrastructure Limitations: The high cost of establishing and maintaining blockchain infrastructure, along with the need for reliable internet and electricity, poses significant barriers.

***Regulatory and Legal Challenges***

Adapting existing laws and regulations to recognize blockchain records as legally binding could be complex and time-consuming. Nigeria's blockchain regulatory system is still in its early stages, creating uncertainty. In order to keep control over land governance, political actors may attempt to stop or slow down the adoption and implementation by influencing regulatory procedures.

***Data Privacy Concerns***

While blockchain ensures transparency, there are privacy concerns regarding the extent of publicly accessible data on land ownership.

***Political Interest***

Political interest presents a significant challenge to implementing blockchain technology, especially in land registration. Given blockchain's potential to enhance transparency, its adoption may directly conflict with vested political interests that benefit from opacity or control over centralized systems. Blockchain adoption may be resisted by stakeholders or political elites who stand to gain from the convoluted and untrustworthy land registration system. Transparency in land records could put political influence at risk by revealing previous fraudulent transactions or misappropriations. Political elites or stakeholders benefiting from the opaque and corrupt land registration system may resist blockchain adoption. Transparency in land records could expose past fraudulent transactions or misappropriations, threatening vested interests.

***Cultural conflicts***

In many Nigerian communities, land is managed through customary systems rather than formal legal frameworks. Integrating these traditional systems into a blockchain-based system may result in conflicts over ownership definitions and rights recognition.

**Strategic Framework for Implementation**

A potential solution of a blockchain-based land registry comprises of the following components, the functions of which are described in the blockchain-based land register:

Private and Permissioned Blockchain: Only participating actors verify transactions, transactions including hashes are recorded and stored

dApp: dApp is one of the most important components, which does not run directly on the blockchain and includes user interfaces for buyers, sellers, notaries and land registries.

Smart Contract Engine: Smart Contract defines order of transactions, Smart Contracts are only confirmed in the blockchain

External storage: External storage for smart contracts and documents (so that data volume in the blockchain does not get too big)

Electronic land register: Access to metadata in the electronic land registry via API, automated retrieval process remains for the time being.
Registration: Actors register
eSignature API: Actors identify themselves.
Payment API: Automated payment of the purchase price via trust service.

## CONCLUSION

Modernizing Nigeria's land registration system is crucial for ensuring equitable access to land and promoting sustainable development. Blockchain technology offers a promising solution to the system's entrenched inefficiencies, providing a transparent, secure, and decentralized platform for land records management. Its application could reduce registration times, curb fraud, and foster greater trust in land transactions. However, successful implementation requires overcoming challenges such as high infrastructure costs, legal adjustments, and political opposition. A strategic framework emphasizing permissioned blockchains, smart contracts, and robust digital infrastructure is critical. While hurdles remain, the adoption of blockchain in land registration could transform governance, enhance land security, and drive socio-economic growth. By addressing these challenges with innovative solutions, Nigeria stands to significantly improve its land administration framework, unlocking its full potential for national development.

### Recommendations for mitigating the challenges of blockchain implementation

A multi-stakeholder approach is necessary to overcome the obstacles presented by cultural conflicts and political interests when implementing blockchain for land registration in Nigeria. Cooperation from multiple stakeholders is necessary for the successful implementation of BT, but this can be challenging to accomplish (Rinearson, 2019). Building consensus and trust can be facilitated by involving local communities, political leaders, and traditional rulers early in the design and implementation stages. To reduce political meddling and promote transparency in blockchain adoption, a clear and inclusive regulatory framework must be developed. Fairness and equity can also be promoted while upholding community norms by incorporating traditional land tenure systems and local customs into the system to demonstrate cultural sensitivity.
To ensure a wider understanding and application of blockchain technology, investments in education and awareness campaigns are essential for enhancing digital literacy and developing capacity among stakeholders. Before implementing the technology on a large scale, pilot projects in various locations should be carried out to show its advantages and pinpoint any potential problems. Nigeria can successfully use blockchain technology to update its land registration system while resolving political and cultural complexities by encouraging cooperation and inclusivity.

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