

# Towards Adopting a Blockchain-based Real Estate Transaction in Federal Capital Territory (Abuja)

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## Abstract

*Real estate transaction in Abuja is one of the most lucrative businesses in the capital city. As a result, it has attracted a lot of people into the industry that are neither the buyer, the seller, nor the governing body. These three entities are the principal parties in any property transaction. The satiety of many people has produced an encumbrance in the sector, whereby it causes unnecessary spending and time-wastage for the primary participants, susceptibility to fraud and expensive documentation and verification procedures. This paper presents a novel blockchain framework to provide a shift in how the real estate transaction process is carried out. The proposed blockchain technology uses the concept of smart contract for transaction execution. We firstly describe the conventional way property transaction is carried out in FCT and reviewed the problems marring the system. We then proposed the blockchain implementation methodology. We finally analysed and discussed the benefits this change will bring to the industry.*

**Keywords:** Blockchain, Smart contract, Real estate, Security, FCT, AGIS

## INTRODUCTION

Since the inception of the Federal Capital Territory (FCT) Act in decree number 6 of 1976, The FCT administration has total ownership of all lands and properties across the geographical area after fair compensations of any encumbrances in the accordance with the provision of the Act [1]. It was after that in the late 1990s that the government started the privatisation and selling of properties and lands to private individuals. This in turn, gave birth to the commercialisation of real estate in Abuja.

## Abuja Geographical Information Systems

In 2003, to cater for real estate management, the Abuja Geographical Information Systems (AGIS) was established to provide a comprehensive and computerised geospatial data and land registry information for the Federal Capital Territory [2], [3]. For every piece of land or property, AGIS issues a statutory Certificate of Occupancy (C of O) once, and then registers a Deed of Assignment to indicate the transfer of title in a developed portion of land. The C of O is the primary proof of ownership. It is

common for a land or property registry information at AGIS to contain a C of O and as many Deeds of Assignment depending on how many times the land has been assigned to subsequent owners who register their title at AGIS [4].

### **Real estate transaction in Abuja**

The process of property transaction in the capital city generally follows a step-by-step procedure [5] [6].

- a. Property advertisement: The owner of the property first indicates his willingness to sell either through online and offline adverts or by the use of property agents. The owner also presents the asking price of the property.
- b. Buyer declaration of interest: A prospective buyer views the property advert and contacts the seller or his agent to arrange a physical inspection. This step is crucial in order to see the physical condition of the asset for any deviations from what was advertised. The prospective buyer will also determine the exact location, neighbourhood and size of the property in this stage. If the buyer feels he wants to go forward with the transaction, the party will then negotiate and agree on property price.
- c. Lawyer acquisition: The next step is for the buyer to engage the services of a real estate lawyer. In accordance to Legal Practitioners Act, they are the only professionals authorised to draft instruments for the transfer of title to land for a fee [6]. The seller presents the property documents which comprises of

the original C of O alone if the seller is the primary owner of the property directly from AGIS or a C of O and a Deed of Assignment containing all the ownership chain from the primary owner to the current owner.

- d. Legal search: The lawyer will conduct a legal search of these document at AGIS to confirm whether the documents are genuine and the property is registered in the AGIS database with the ownership chain in place, and all due ground rents cleared.
- e. Execution of Deed of Assignment: Where the result of the search indicates that the title is valid and the property unencumbered, lawyer can proceed to draft documents to transfer title. In practice, a new deed of assignment and sale of property agreement is prepared and signed by both parties in the presence of 2 witnesses [5], [6]. This is then registered with AGIS to document the legal transfer of the property. Payment is usually made at this stage.

### **Issues with the current system**

At almost all stages of property transaction above, fees are incurred by either the buyer or the seller. The owner, if he uses the services of a real estate agent, he incurs payment, which is usually a percentage of the property sale price. The buyer also has to pay expensive lawyer fees, legal search fee, agent fees (if he used one), and other micro-transactions along the steps.

Due to the lucrateness of the business, which a transaction is usually tens to hundreds of millions of Naira, it has attracted many individuals to the business, and not all with good intentions [7]. It is common to hear stories of property fraud in the capital city, in which the victim will be led to believe he is dealing with the owner of the property until he parts his money will he realise he has been scammed. Most at times, prospective buyers, especially coming from other parts of the country do not know the legal process of property transfer in Abuja. In most Nigerian states, real estate transactions do not go through the government body regulating the process. The only participants are the buyer, seller, and witnesses, who will all sign on the purchase agreement document. What the owner might have to also prove he owns the property a purchase agreement from the previous owner. While this process is easy and fast, it is extremely prone to fraud as there might be a different person registered as the owner of the property in the land registry office that have not been officially updated.

In the existing AGIS registry system, the process of verification is lengthy. It includes physical visits, a lot of paper work and man-power effort, collaboration with the revenue department for service payments, etc. There is a lack of cohesiveness and structured process that frustrates service seekers that they sometimes have to opt to bribery of staff in order to get the verification done in a timely manner [8].

## **BACKGROUND OF BLOCKCHAIN AND SMART CONTRACT APPLICATION IN REAL ESTATE**

Blockchain technology is a decentralised and distributed digital ledger that records transactions across a network of computers. It uses cryptography to secure and verify transactions as well as to control the creation of new units of a particular cryptocurrency. The first blockchain was created in 2008 as the technology behind the cryptocurrency, Bitcoin, by an individual or group of individuals using the pseudonym Satoshi Nakamoto [9].

Smart contracts are self-executing contracts with the terms of the agreement written directly into lines of code. They were first proposed by Nick Szabo in 1994 as a way to facilitate, verify, and enforce the negotiation or performance of a contract. On a blockchain network, smart contracts allow for the automation of digital asset management and can be used for a wide range of applications such as supply chain management, financial services, and real estate [10].

Blockchain technology and smart contracts have the potential to revolutionize the real estate industry by increasing transparency, security, and automation. One of the major areas of focus is the use of the technology to improve the transparency and efficiency of real estate transactions. For example, a study by [11] proposed a blockchain-based platform for the management of real estate assets, which could increase transparency, reduce transaction costs and improve the efficiency of real estate transactions. Similarly, a study by [12] suggested

that blockchain technology could be used to create a tamper-proof land registry system, which could reduce corruption and fraud in the real estate industry. Moreover, [13] proposed using blockchain technology to create a secure and transparent land registry system in developing countries, which can reduce fraud and corruption. Finally, [14] proposed a blockchain-based system for property ownership transfer and management in developing countries, which can increase transparency and reduce fraud.

Another area of focus is the use of smart contracts to automate and streamline the process of buying and selling real estate. A study by [15] proposed a smart contract-based platform for the sale and purchase of real estate, which could automate the negotiation and execution of real estate transactions. Another study by [16] suggested that smart contracts could be used to automate the management and maintenance of real estate assets, which could reduce costs and improve efficiency.

A third area of focus is the use of blockchain technology and smart contracts to improve the security and privacy of real estate transactions. A study by [17] proposed a blockchain-based platform for the secure sharing of sensitive information, such as property ownership records, which could protect the privacy of real estate transactions. Similarly, a study by [18] suggested that blockchain technology could be used to secure the electronic transfer of land ownership, which could reduce the risk of fraud and errors.

A final area of focus is the blockchain for real estate implementation strategy. [19] proposed the use of Ethereum blockchain with smart contract using the solidity programming language to manage land registry and transfer between owner and buyer.

Overall, the literature suggests that blockchain technology and smart contracts have the potential to revolutionize the real estate industry by increasing transparency, efficiency, security, and privacy. In conclusion, the application of blockchain technology and smart contracts in real estate has been an active research area in recent years. The studies reviewed here suggest that blockchain technology can be used to improve various aspects of the real estate industry, such as property ownership and transfer, property management, and supply chain management. These studies also suggest that the integration of smart contracts with blockchain technology can automate several processes, increase transparency and reduce intermediaries, which can lead to a more efficient and cost-effective way of managing the real estate industry. However, more research is needed to fully understand the potential benefits and challenges of using blockchain technology and smart contracts in the real estate industry.

#### **METHODOLOGY FOR BLOCKCHAIN IMPLEMENTATION IN AGIS**

For the adoption of blockchain in real estate transaction in FCT, we propose the use of a federated blockchain distributed network in AGIS, which has the following characteristics in terms of security, efficiency and

consensus mechanisms as tabulated in Table 1 below.

Property	Characteristics
Consensus Mechanism	Light PoW
Identity	Leader node set
Anonymity	Identified users
Protocol efficiency	Trusted
Energy consumption	High efficiency
Immutability	Low energy
Ownership Management	Collusion attacks
Transaction approval	Semi-centralised
	Permissioned nodes
	Order of milliseconds

**Table 1:** Characteristics of the Federated Blockchain [20]

The federated blockchain characteristics enables the efficient setup of the blockchain distributed network. The infrastructure will be solely owned by AGIS in our proposal. They will be responsible for management of users and setting up the leader block. As a distributed ledger, several nodes have to participate in the network. These nodes will be the surveyor's office, revenue office, and owners, which will all have copies of the distributed ledger.

For prospective buyers to be introduced into the system, we propose a separate channel of registration. This can either be through a mobile app or website, and the validation of a user will occur through the upload of a valid government-issued ID. Once a user registers on the system and is verified, the system will associate him with a public (Buyer ID) and private key. The public key will be his Owner ID in the event that he purchases a property.

By the use of a federated blockchain, AGIS will gain a highly efficient system with light proof-of-work consensus. This will greatly speed up transactions and reduce energy consumption.

### Creation of genesis block

The genesis block is the first block in a blockchain network. AGIS will create a genesis block for each property record under its jurisdiction and after a valid transfer to a new owner, a block will be added to on top of the genesis block with details of the new owner.

The first block will be generated at the point where AGIS is about to transfer the property title to the first owner. This means the owner has fulfilled all legal requirements in obtaining a property like verification, payment, etc. The components of the genesis block will contain a Property ID, Owner ID, Payment ID and a Smart Sale Contract (to be seen later).

The Property ID will be generated from the combination of the surveyor documentation, which include physical address, building plan, size and dimensions. The Owner ID will be the public key of the owner, and the Payment ID will be the verification of all the statutory payments required to be transferred to AGIS in acquiring a property. Once all the requirements are in place, the block will be generated and broadcasted in the property

blockchain network. Figure 1 below shows the creation of the genesis block

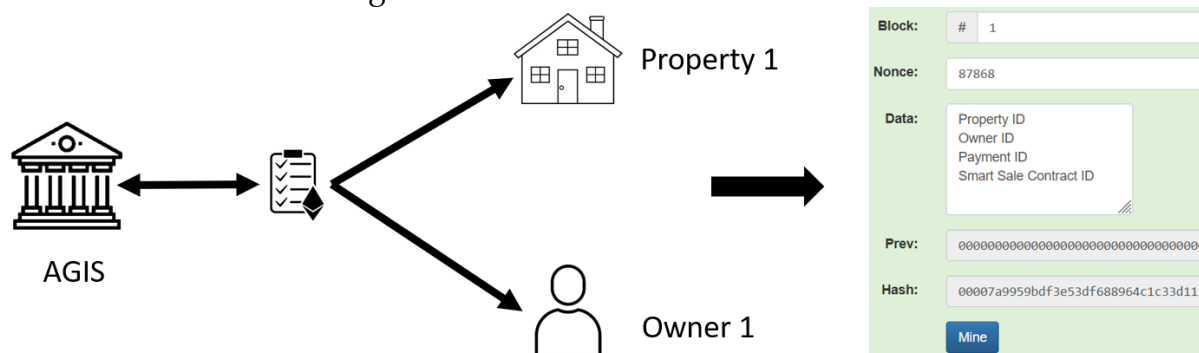


Figure 1: Creation of Genesis Block

### Smart sale contract

To be included in the genesis block is the smart contract that will be initiated at the point the first owner wants to sell the property. The owner will broadcast the sale of his property and the asking price. This will go into the list of available properties for sale in the mobile/web app and prospective buyers will be notified of its availability. A prospective buyer can then initiate a pre-sale agreement process when he indicates interest in a published property.

The contents of the smart sale contract are given below:

- Identity:** This stores the identities of the owner and the buyer with legal verifications. This also includes digital signatures.
- Property:** This stores and updates the information related to the property details like ID, physical address, the current owner, etc.
- Agreement:** This store various legal agreements, an inspection report by the surveyor and

prospective buyer, purchase agreements. These will all be digitally signed.

- Payment:** Upon all agreements, this stores payment status for the property from the buyer. When payment has been made, the revenue department will verify the payment before generating a payment ID that will be used in the next block of the blockchain when the property is being transferred. Moreover, payments in this model are now sent to the AGIS revenue office. They will be responsible for all real estate transactions.

It is important to note that once a pre-sale agreement has been entered by the buyer and the seller, and to solve the double-spending problem, the program should put an ENQUEUE LOCK on that title and no new transactions can be initiated until an exit mode of Approve or Decline has been reached. Figure 2 below depicts the execution of a Smart Sale Contract.

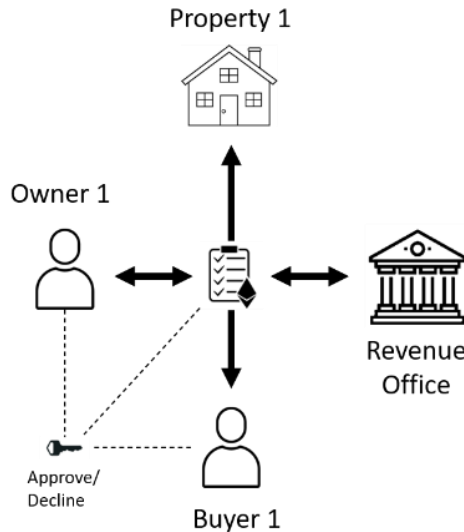


Figure 2: Smart sale contract execution

**New block generation**

Once the sale process is completed and verified, the records will be maintained in a new block in a one owner per block process (See Figure below). The new block will now be broadcasted to all participants in the DLT network to store a copy. The components will be

the same as genesis block including a smart contract logic waiting to be initiated for the generation of subsequent blocks. This process repeats itself for each property transaction. Figure 3 below shows the creation of new block.

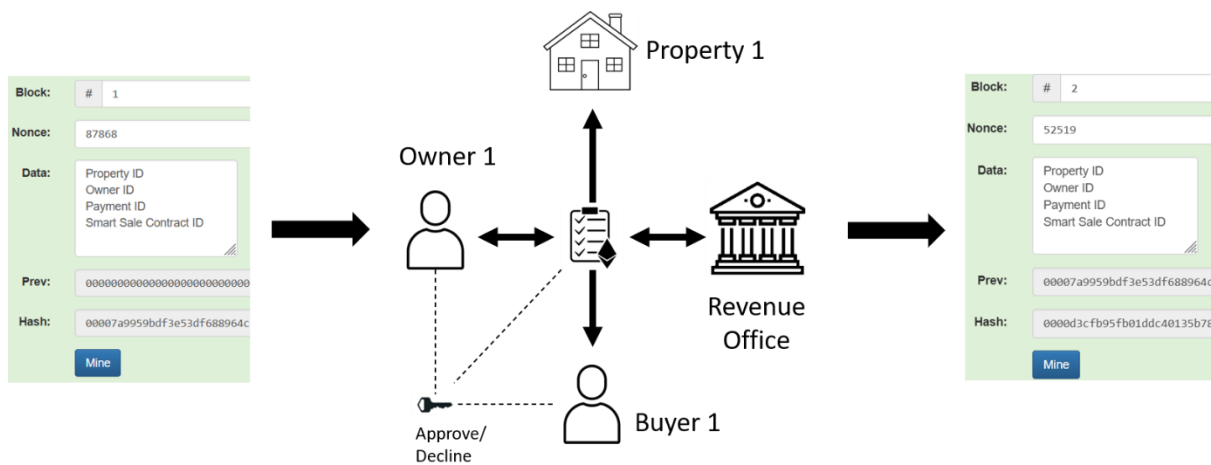


Figure 3: New block generation

**RESULTS AND DISCUSSION**

At the successful implementation of this DLT network, there will be a great shift to how real estate transfer will take place in the capital city. Each property

will have its own blockchain which is all replicated among the various nodes. Figure 4 below depicts our simulation of blockchain from public private key demo on GitHub [21].

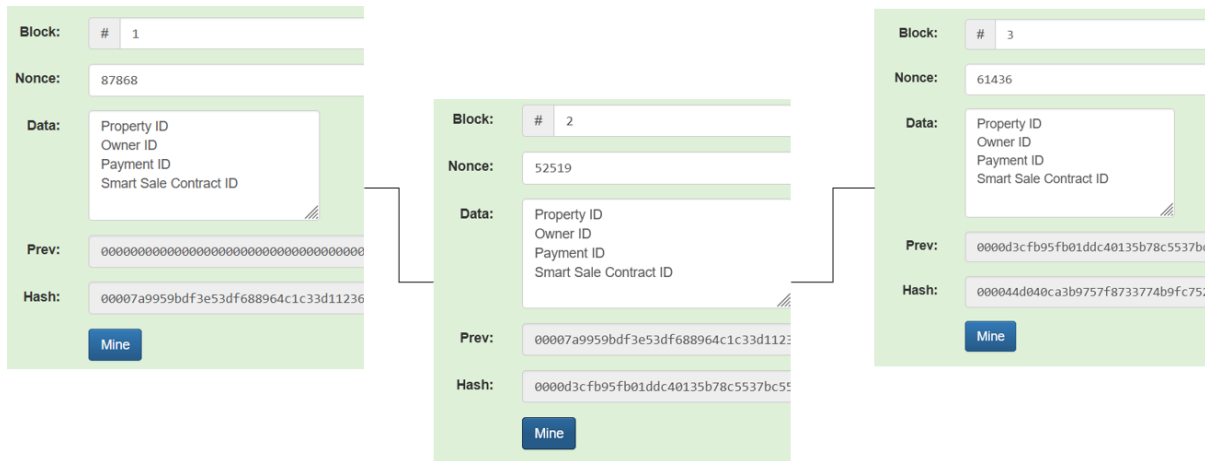


Figure 4: Real estate blockchain network

**Security, reliability and fraud protection**

In terms of security, this blockchain system will offer immutable records which can only be changed through proper authentication. Records are also distributed across the nodes on the network that a loss of one node will not affect the overall system. Moreover, due to authentication methods, fraud will all but disappear as only owners are allowed to publish a sale request. Any person looking to buy will go through the app channel published by AGIS as the de jure mode of property transfer.

**Elimination of middlemen and cost reduction**

The current paper-based property transfer includes a lot of middlemen with their services. Foot agents that advertise the sale on behalf of the owner for a commission, property search personnel that validates the property documents for a fee, lawyers that executes the deed for a percentage, etc. With the implementation of this DLT network, all these services and personnel can be eliminated in order to save cost for both the buyer and the seller.

**Income generation to AGIS**

To ensure proper income flow to AGIS and the charges for maintain the infrastructure, AGIS can implement a 5% levy on total purchase price which will be deducted before transfer to the seller.

**CONCLUSION**

This article reviewed the current procedure and issues plaguing the current Federal Capital Territory real estate transfer system. The current paper-based system is susceptible to various types alterations and misuse from every angle, thereby indirectly increasing the cost of paper resources, storage and security of records. The system is also time-consuming where several parties have to participate in a transaction from verification to the update process. This gives rise to bribery of personnel in order to speed up the process, which in turn, affect other ongoing transactions. These issues affect the overall image of the AGIS and the FCT in terms of land and property administration. This article presents the use of the blockchain technology to curtail these issues and speed up the process while ensuring security and reliability. The system requires less manpower in terms of



operation and therefore more economical. In the future this algorithm can be adapted in the real-world environment by AGIS.

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