# Blockchain Technology usage in Real Estate for transition to smart economy

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### Abstract

The core technology behind Bitcoin is blockchain, which is a digital ledger composed of entries known as blocks that are connected in a specific order referred to as a chain. As various markets experience technological innovations, blockchain stands out as the most probable technology to be adopted. Numerous sectors, especially real estate, require a solution that enhances market efficiency, security, and transparency, as asset exchanges in this field often involve many intermediaries, an uneven distribution of information, and a lack of accountability. These issues lead to costly, fraud-sensitive, and cumbersome transactions within the real estate market. Blockchain technologies are emerging across various sectors, including financial services, reputation systems, corporate governance, human resources, and, amid other things, the Internet of Things (IoT). This paper offers a thorough exploration of the application of blockchain technology in the real estate sector as a means of transitioning to a smart economy. We provided three approaches on how the use of blockchain technology can solve real estate problem. The three approaches are distributed ledger with per-to-peer, smart contract and asset tokenization. Keywords: **Blockchain, bitcoin, asymmetry of information, vulnerable, smart contract, peer-to-peer,** 

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### 1. Introduction

A blockchain is an ever-expanding collection of records, or blocks, that are encrypted and linked together. Each block is linked to the one before it by its expiration date and transaction metadata (Leopard, 2020). A blockchain is a decentralized and distributed digital ledger that records transactions across many computers in such a way that the registered transactions cannot be altered retroactively. It works like a chain of blocks, where each block contains a list of transactions. Blockchain technology has been mostly employed in recent years to develop cryptocurrencies, or digital currencies, for banking and e-commerce. Bitcoin was the original cryptocurrency (Chen et al., 2020). Peer-to-peer (P2P) networks provide the basis of its entirely decentralized distributed system (Feld et al., 2016). Blockchain is an alternative data format for storing modifications that functions similarly to a database. Blockchain uses a decentralized peer-to-peer method to perform database transactions. One of the primary functions of the blockchain system is the generation of digital ledgers.

A ledger is an inventory used in the financial industry to document financial transactions.

Every transaction on the blockchain is digitally signed as a means of confirming its legitimacy, and ledgers are kept and shared by several parties. These blockchain-based distributed ledgers do not allow for the deletion or alteration of entries after they are entered (Silberschatz et al., 2011). A conventional database diary is comparable to this. Blockchain can provide analytical capabilities and guarantee safe data storage in distributed business applications (Aznar et al., 2012). Furthermore, you don't have to fully trust one party. Take, for instance, a company that sells real estate to another company using fictitious possession certificates or that sells the same property to several individuals. Blockchain innovation can help confirm and identify the identity of real estate owners. Blockchain's security prevents the same real estate property from being sold to another party because past sales records are publicly accessible within the blockchain data structure (Silberschatz et al., 2011).

Property that includes land, buildings, and natural resources like crops (like lumber), minerals, water, and wildlife is referred to as real estate. It includes immovable property of this kind, any stake in it, and, more broadly, structures or dwellings in general (James, 2019). It can be classified into many categories, including: residential real estate, commercial real estate, industrial real estate, and land. Real estate can be considered as a physical asset or a financial investment, and it plays a significant role in the economy, influencing job creation, wealth production, and economic progress. There are numerous important social and economic uses for real estate. Residential Function; offers places for families and individuals to live. It is frequently a vital resource for accumulating wealth, ensuring personal safety, and fostering community growth. Economic function; because it offers locations for companies and industries, real estate plays a crucial role in the economy. Additionally, it boosts the manufacturing and construction industries, creating jobs and promoting expansion. Investment function; one significant investment vehicle is real estate. For both capital growth and revenue generation (from rents), a lot of individuals and organizations engage in real estate. Commercial function: Provides areas like offices, shops, and factories to facilitate business operations. Economic activity, employment, and trade are all significantly influenced by commercial properties. Development function; urban development is based on real estate. It is a major force behind community development, urban planning, and infrastructure.

Despite being a vital component of the economy, real estate is complicated, inefficient, and occasionally inaccessible due to a number of issues. High transaction costs, a lack of transparency, problems with liquidity, and other obstacles are some of the primary issues. Broker commissions, which typically range from 2 to 6% of the sale price of the property, are one example of the high costs associated with real estate transactions that can be stressful for both buyers and sellers. For major transactions, these commissions can add up to significant amounts. Closing costs, which can increase a transaction's overall cost by two to five percent, may include title searches, inspections, legal services, and administrative fees. Real estate taxes can result in substantial recurring expenses, particularly when purchasing or moving a property.

Mortgage costs; the process of financing real estate is costly since borrowers frequently have to pay fees for mortgage origination, insurance, and interest payments (Miller, N., & Weber, J. 2020). In the real estate industry, transparency is the availability of information about property conditions, prices, ownership, and transaction history that is easy to understand, trustworthy, and easily accessible. Some markets' lack of transparency can lead to a number of problems, including Information that is asymmetrical. Sellers, brokers, or agents frequently possess greater knowledge about the market value and conditions of a property than buyers do. Unexpected financial constraints for buyers and sellers may result from transaction fees and expenditures that are not completely disclosed up front. Fraud risk; Property ownership records in some jurisdictions might not be accurate or transparent, which could lead to fraudulent transactions or disputes (Mossavar-Rahmani, D. 2013). Real estate is frequently referred to as an illiquid asset since it is challenging to swiftly turn it into cash without suffering a significant loss in value. Issues with liquidity occur because of slow sales cycles; since real estate deals usually take months to finish, it may be challenging for sellers to get cash fast when they need it. High capital requirements; many consumers find real estate less accessible due to the substantial upfront costs associated with buying a house, including down payments, financing, and legal fees. Market conditions: a decline in demand for real estate during recessions or downturns may result in a delayed sales process and possibly lower prices (Glaeser, E. L., & Gyourko, J.2003). Legally, 'real' refers to land property, as opposed to personal property, and 'estate' refers to a person's 'interest' in the land property (Funk and Wagnalls, 2018). Real estate differs from personal property, which is not permanently tied to the land (or comes

is not permanently tied to the land (or comes with the land), such as vehicles, boats, jewels, furniture, equipment, farm machinery, and farm animals. In Nigeria, persons, business entities, nonprofit organizations, trustees, or any other type of legal entity may transfer, own, or purchase real estate.

1.1 Problem Associated with Real Estate Management Real estate industry is a complicated system that requires more effective techniques to address its startling amount of challenges, including high transaction costs, a lack of transparency, liquidity issues, and so on (Vivian Aranha, 2023).

High transaction cost: The involvement of brokers, legal professionals, and financial institutions in real estate sector increases the transaction costs. The various third parties needed to finish a real estate transaction are listed in Fig. 1.1 each party's advertisement entails a fee, increasing the total cost of the transaction (Veuger and Nijland, 2019); additionally, it decreases the transaction process, leaving the negotiating parties with more time to spend (Saull and Baum, 2019).



### Fig 1.1 third parties in real estate

Lack of Transparency: Traditional real estate transactions involve multiple intermediaries, increasing the risk of fraud, corruption, and lack of trust. Due to the enormous value of its assets, the real estate industry is susceptible to fraud. They primarily manifest as identity theft, unauthorized title changes, and impersonation (Mashatan and Roberts, 2018).

Liquidity Issues: Liquidity refers to how fast and easily an asset can be changed into cash without materially altering its value. Because real estate assets are so illiquid in comparison to other asset classes like stocks and bonds, liquidity issues arise. The inclusion of several middlemen causes longer settlement periods for transactions, rendering properties illiquid assets (Deloitte, 2017).

#### 2. Literature Review 2.1 A distributed ledger

Distributed means that the ledger is not stored in one central location that can be hacked or manipulated. Instead, it is spread out across multiple computers (nodes) around the world.

Figure 2.1 illustrates how the blockchain's nodes retrieve data. All nodes can access the ledger's information, and they all share the same data (Deloitte, 2017). According to the World Bank (2009), the equitable distribution of data in a ledger distributed removes information asymmetry, which can significantly reduce real estate fraud. Fair access to information can reduce the risks of mimicry in real estate (Mashatan and Roberts, 2018). The experts also pointed out that the bidding process lacks transparency, giving sellers a competitive advantage at the expense of buyers. Mashatan and Roberts argued that since there is only one way for bidders to obtain information in the bidding process-through the sellers-sellers may only divulge information if they think it will benefit them and also suggested that storing bidding information in an independent location would enhance fairness and transparency. (Corluka and Lindh, 2017) have noted that absence of fairness in the real estate market impedes investor decision-making, resulting in an increase in speculative activity. As a result, the utilization of a distributed database for property information may enable investors to make better selections (Gkonis, P. K. 2019).



Fig 2.1 ledger across multiple nodes.

The time required for background checks and due diligence is further decreased by using a distributed ledger (Torres and Brann, 2019). Veuger and Nijland (2019) discovered that information retrieval is delayed when data is stored in separate databases. Therefore, one possible solution to this issue is to store data in a safe public area that is accessible to all members. Four types of blockchain systems can be distinguished:

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Public Blockchain: This is the primary type of Blockchain technology that is both accessible and decentralized. Based on validation, the primarily validated individual receives transaction rewards, and two types of Proof-ofwork and Proof-of-stake models are used (the Public Blockchain is also a non-restrictive public ledger system that does not require any kind of authorization, and anyone who has access can be authorized to obtain the data or part of the blockchain). This type of Blockchain additionally offers authority for previous and current record verification. It can also be used to mine and trade cryptocurrencies (Kumar and Mallick, 2018; Lin, Huang, and Fang, 2020; Williams, 2019). In this sector, the most common blockchains are Bitcoin and Litecoin. It is mostly secure if tight security rules and practices are followed. However, failing to adhere to security measures may pose a risk. Some instances of this form of Blockchain are Bitcoin, Ethereum, and Litecoin.

Private Blockchains: These are controlled and not open; nonetheless, such blockchains do provide access features. The blockchain allows transactions with the system administrator's approval (Jirgensons and Kapenieks, 2018; Radanović and Likić, 2018). Private Blockchain solutions produce these systems with the following characteristics: Full of privacy, great efficiency, quicker transactions, increased scalability, and speediness. This form of blockchain operates solely on sealed systems and networks, and it is generally utilized in organizations and enterprises where only a select few persons may participate.

Hybrid Blockchains: It combines public and private blockchains, and in order to accomplish more ambitious goals, greater control is needed. Although not open, hybrid blockchain has integrity, transparency, and security and may be used with both regulated and decentralized systems. Compared to standard blockchains, it has a number of benefits. One of the main advantages of hybrid blockchains, which combine a private permission-based and a public permission-less system, is thought to be adaptability. Because of the maximum advantages of ledger records, users can access certain parts of a blockchain system while the

remainder can be recorded or safeguarded. Due to its flexibility, people can easily join hybrid blockchains as private ones. This type of blockchain enhances the security and transparency of the network (Omar and Jayaraman 2021; Yang 2017).

# 2.2 Smart Economy

Smart Economy is an economy that combines sophisticated technologies like blockchain, big data, artificial intelligence (AI), and the Internet of Things (IoT), and automation to boost productivity, creativity, and sustainability. It integrates digital transformation with economic activities to improve efficiency. competitiveness, and overall quality of life. The essence of smart economy includes the following: digital transformation, innovation sustainability, efficiency driven. and productivity, data driven, connectivity and integration, and inclusive growth. Smart economy is crucial for economic resilience, competitiveness, and sustainable development in the digital era. Blockchain technology can be utilized to reduce the existing challenges in the real estate industry using distributed ledger with peer-to-peer. smart contract. and asset tokenization. A smart economy combines digital technologies, automation, and data-driven decision-making to improve resource allocation, economic efficiency, and governance (Schwab, 2017). Blockchain technology is a key enabler of the smart economy, improving transparency, efficiency across various security, and industries, including real estate (Kokina et al., 2017). A smart economy is a technology-driven economic model that utilizes AI, IoT, blockchain, and big data analytics to boost productivity, governance, and sustainability (Brynjolfsson, and McAfee, 2017). It exists in various forms, such as the digital-driven economy and China's digital economy initiative, where AI-powered real estate pricing models optimize housing markets (Li et al, 2021). A smart economy focuses on using advanced technologies like artificial intelligence (AI) and the Internet of Things (IoT), Blockchain, Big Data, and automation to optimize resources, improve decision-making, and foster a more resilient and sustainable economic environment (Forrester Research, 2020). The shift to a smart

economy is part of a wider trend toward digital transformation across various sectors, and its significance is rising as businesses and governments increasingly embrace digital tools and data-driven approaches to foster growth and tackle global challenges (Schwab, 2017).

# 2.2.1 Role of Blockchain Technology in a Smart Economy

Blockchain innovation is instrumental in enabling the transaction to a smart economy. It offers several advantages that align with the principles of efficiency, transparency, and decentralization. Blockchai's role in the smart economy can be highlighted through its application in various industries, particularly in real estate.

Decentralized and Secure Transaction: blockchain eliminates the need for intermediaries in financial transactions. Which reduces costs and accelerates the process. In real estate, blockchain ensures transparent and secure property transactions by generating immutable digital records of ownership, thereby reducing the risk of fraud. (Zohar, 2019). Smart contracts backed by blockchain automate several parts of real estate transactions, making them faster, more efficient, and less prone to human error.

**Tokenization of Assets:** Property tokenization is one of the most important applications of blockchain technology in real estate. Blockchain enables fractional ownership by converting real estate into digital tokens, enabling small investors to take part in real estate markets. The democratization of investing in real estate brings greater liquidity to traditionally illiquid markets, thereby enhancing the accessibility of real estate as an asset class. (Pereira & Silva, 2018).

**Transparency and Trust:** Blockchain's inherent transparency provides a decentralized ledger that ensures all transactions are recorded and visible to all parties. This is particularly important in real estate, where property ownership and transaction history can often be unclear or disputed. By utilizing blockchain to maintain an immutable record, real estate markets can minimize fraud and enhance trust

among buyers, sellers, and investors. (Mougayar, 2016).

**Efficiency Regulatory Compliance:** in the context of a smart economy, blockchain's role extends to ensuring compliance with regulations in industries like real estate. Smart contracts, for example, can automatically execute transactions only when all regulatory requirements are met. This helps reduce administrative burdens, minimize legal risks, and ensures full compliance with relevant laws in transactions. (Pereira & Silva, 2018)

## 3.1 A distributed ledger with peer-to-peer.

As previously said, one of the key issues in real estate is a lack of access to information, which fosters fraud and causes excessive latency while performing transactions. Cryptography is used in distributed ledger technology to safeguard and accurately store data. Cryptographic signatures and "keys" can be used to access the data. After being stored, the data can be converted into an unchangeable database; network rules that are incorporated into the database programming code control the ledger. Because distributed ledgers are private, encrypted, and decentralized, they are less susceptible to cybercrime. Targeting every copy on the network at once is necessary for an attack to be successful. Peer-topeer record sharing and updating also speeds up, enhances, and lowers the operation's overall cost. A distributed ledger network maintains a copy of the ledger on every device. We refer to these gadgets as nodes. There can be several nodes in a network. Every version of the ledger is published with the most current transactions, and any modifications, such as moving data from one block to another, are recorded throughout. The transactions are completed, encrypted, and used as the basis for additional transactions if the network determines that the most recent ledger is legitimate. Block chains grow in this manner. It is difficult to change since each block carries encrypted information about the one after it (Nakamoto, S. 2008).



Fig 3.1 Distributed ledger with peer- to -peer

### **3.2 Smart contracts**

When there are more middlemen involved in the transaction process, costs rise and deals take longer to close. Direct transactions between transacting parties can be facilitated by using a smart contract, eliminating the need for a middleman. A block of code that runs when specific predetermined criteria are met is called a smart contract. If every record in our suggested system is kept in a distributed database, smart contracts may work well. For instance, a buyer would initially look at the property's details, such as the size, price, and recent maintenance; since they would be accessible to the public through the database, access should be simple. Ownership of the asset should transfer automatically after the buyer complies with the seller's stipulations. Automation expedites the transaction process and does away with the necessity for a third party. Another useful strategy for quickening the transaction process is the use of smart contracts. The parties to the transaction undergo direct authentication prior to the smart contract being approved.

The system performs authentication using previously recorded information from the participants. This technology significantly decreases delays caused by traditional hand inspection of papers (Karamitsos, I., Papadaki, M., & Al Barghuthi, N. B. 2018).



## Fig 3.2 Smart Contract

## 3.3 Asset Tokenization.

The act of expressing an item's ownership rights as digital tokens and keeping them on a blockchain is known as "digital asset tokenization." Tokens can serve as digital proofs

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of ownership in this context, signifying almost any valuable item, whether it be digital, fungible, or tangible, and non-fungible assets. Owners can preserve custody of their assets because they are stored on the blockchain. The property owner can sell tokens to possible investors and issue them according to the market value of the property. This would make it possible for those who lack the funds to purchase a home on their own to make real estate investments. Additionally, instead of taking out an interest-bearing bank loan, owners may be able to obtain money for the development or extension of their properties through the sale of tokens, as companies issue shares to expand. Therefore, using tokens could effectively alleviate the real estate market's liquidity problem (Larion, A. 2022).



### Fig 3.3 asset tokenization

### 4. Conclusion

In this study, we looked at the difficulties that exist in the property market such as high transaction costs, a lack of transparency, and liquidity issues and how blockchain technologies can help to solve them. We postulated that the implementation of a secured distributed ledger, smart contract, or asset tokenization can minimize transaction costs and fraud while boosting transparency, data security, and integrity. The use of these approaches can be effective and can also digitalize the real estate sector thereby transiting real estate sector to smart economy. To facilitate the transition of the **References** 

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real estate sector towards a smart economy through blockchain technology, the following policy recommendations are supposed, centered around the adoption of distributed ledger technology (DLT), smart contracts, and asset tokenization: Establish a regulatory framework for blockchain integration in real estate, create a national real estate blockchain registry, promote smart contracts for automated and secure transactions, enable tokenization of real estate public-private collaboration assets, and innovation incentives. Blockchain technology as a whole is very important for smart economy especially for a developing country like Nigeria.

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