

Adoption of a Nationwide Real Estate Blockchain for E-Governance

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Abstract: *Although real estate is the most prominent investment vehicle in the world, it often relies on inefficient and antiquated methods for conducting business and keeping records. Real estate is known for its illiquidity, lack of transparency, transaction inefficiency, and fraudulent activities. Recently, however, technology has begun to remold the dynamics of this asset class. Specifically, blockchain technology has the potential to help the system overcome several obstacles in the real estate sector. Blockchain has already proven to solve the illiquidity problem through tokenization but a large possibility for applications of blockchain in real estate remains unexplored. This study aims to explore how blockchain technology with the help of smart contracts, could be adopted by the government to facilitate the process of real estate investment.*

Keywords: Blockchain, Real Estate, Smart Contract, Tokenization, Illiquidity

1. Introduction

1.1 Real estate

Real estate is one of the safest options for investing. It provides security to investors and is a hedge against monetary inflation. It is not only excellent for portfolio diversification but also non-volatile and essentially risk-free over a long period, generating stable fixed income. Real estate investment is available to anyone with enough capital as opposed to for experts only investment vehicles such as stocks, bonds, mutual funds, etc.

Consequently, real estate has been the most beloved and largest asset class in the world [1]. The total value of world real estate reached \$217 trillion in 2015 and is worth nearly 2.7 times the global GDP excluding the vast amount of undeveloped land around the globe [2]. The entire market capitalization of all the listed companies worldwide is a mere \$68.654 trillion, as of 2018 [3].

However, the way business with this asset class is carried out is not just complicated, but also burgeoned with hidden costs [4], a number of regulations [5], costly middlemen, and a lack of transparency [6]. As real estate is a capital intensive investment with high entry fees, it is mostly dominated by institutional investors. This restricts access and prevents common people to profit from growing returns, therefore, making it an illiquid asset class [7]. Liquidity, affordability, and transaction efficiency are the categories in which real estate struggles to be an excellent investment vehicle.

In addition to these drawbacks, the commercial real estate industry has been slow and problematic to innovate its core business processes and is known for its resistance to change. The extensive manual review and verification of financial and legal documents are prone to error and fraudulent activities [8]. Any party participating in a real estate transaction might be capable of engaging in a fraudulent

scheme of some sort [9].

1.2 The land registration system

The land registration system has two subsystems. The land register provides information about the owner of certain property and on what document is that ownership based upon. Cadastre provides information about property address, land use, nature, details about construction buildings, and land taxation value [10].

Around the world, the majority of these two subsystems are kept separate, consequently resulting in inconsistency [11]. For example, if the owner of a property is deceased, the process of establishing inheritance could take several years leaving the land administration system in an incorrect state. Issues regarding the incorrectness of the system are of great importance because they introduce unreliability. It is also important to note that in legal affairs, the data stored in the system are always presumed to be in the correct state. Due to this, the process of registering a real estate transaction in the land administration system could take a long time, up to six months for example in Sweden [12].

Inconsistency leads to “double spending” i.e. properties being sold twice to different individuals. Properties have been mortgaged to banks by the former owner/s because new owner/s did not go through with registering real estate transfer of ownership in the land administration system [13].

1.3 Blockchain

Blockchain is a decentralized ledger technology that employs cryptography to ensure data integrity. A consensus has to be reached to add blocks of data into the blockchain. The blocks are linked chronologically using a cryptographic hash function to guarantee the immutability of the ledger and a time stamping server. This ledger is distributed to all the participating nodes and every node has the same copy of

the ledger maintaining consistency with all the nodes. It is secure by design with high byzantine fault tolerance [14].

Blockchains can either be public or private. Public blockchains are permission-less where anyone can read and write and private blockchains are permissioned which allows the definition of different permissions on different nodes on the network. There can be different permissions for different operations on the blockchain. A smart contract is a computer protocol intended to digitally facilitate, verify, or enforce the negotiation or allow the performance of credible transactions without third parties Blockchain with smart contracts has enabled the capability of building business logic and business process mechanism into the chain. e.g. Ethereum.

This study fills the gap by answering the question of how adopting a nationwide blockchain, layered with smart contracts can solve the problems with the administration system and also increase liquidity, minimize transaction costs and make real estate more affordable.

The paper is organized as follows: after this Introduction in Section I, research objectives are presented in Section 2, State-of-the-Art, Literature Review, and Opportunities are explained in Section 3, while in Section 4, the Blockchain-based Real Estate Ecosystem is presented. In Section 5, Limitations are described with a mention of future work that can be carried out to expand upon the research done. The paper is concluded in Section 6.

2. Research Objectives

The purpose of this study is to explore how blockchain technology could be adopted into the government to ease up the process of investing and also purchasing real estate. Thus, the objectives of this research are as follows:

- To analyze modern real estate transactions that were facilitated using blockchain technology
- To conceptualize an ideal real estate transaction ecosystem
- To explore a blockchain-based solution to tackle the challenges of real estate processes

3. State-of-the-Art, Literature Review, and Opportunities

Blockchain is still a nascent technology but its levels of security, speed, and transparency have made it an attractive option to facilitate ledger-based processes, including real estate transactions [15]. In this regard, several works are being done to tackle the challenges that real estate poses.

A condominium in New York was bought using bitcoin [16]. The above transaction did not involve the buyer converting bitcoin into U.S. dollars to make the purchase. Even though the developer says that the transaction was seamless, "broker representing the seller" was required. The entire process was conventional except that instead of fiat currency, bitcoins were accepted.

In one deal [17], it took about six months for the seller to find a crypto buyer for his Miami mansion. Because of the state-wide limitations, the deal was recorded in dollars. The title company, attorneys, and agents were paid in dollars, as well. Real estate deals like the above increase the liquidity of bitcoin and other cryptocurrencies, however, it does not ease up the process of purchasing real estate. There was no deal in which credit was involved. The buyer is required to have the entire amount during the process of purchase.

Since the 1960s, real estate investment trust (REIT) has been the way to solve real estate's liquidity problems. REIT is a company that owns, and in most cases operates income-producing real estate. REITs can be publicly traded on major exchanges, publicly registered but non-listed, or private. It allows all investors to invest in large-scale, diversified portfolios of income-producing real estate in the same way they typically invest in other asset classes. REITs solve the capital intensive problem and high entry fees [18]. However, due to the soaring expensive setup of REITs [1] and high expense ratios [19], they do not solve the high transaction cost problem.

Asset-backed tokens have also emerged as an alternative to REITs. A security token offering (STO)/Tokenized IPO is a type of public offering in which tokenized digital securities, known as security tokens, are sold in cryptocurrency exchanges. Tokens can be used to trade real financial assets such as equities and fixed income, and use a blockchain virtual ledger system to store and validate token transactions [20].

Tokens tied to real estate assets provide investors with the ability to own fractions of properties. Fractionalization is when unrelated parties can share in the ownership of a tangible asset. Each token can represent a defined fraction of the total available investment in a single property or basket of properties. As securities, they would need to operate under securities laws and the administration of these tokens can be managed by a smart contract on a blockchain [21]. Tokens are issued on the public open blockchain to provide secure and immutable proof of purchase free of third parties like banks and notaries, and related costs.

Blockchain-based companies like ATLANT, Alt.Estate [22] sell securitized tokens and also have their security token exchange to trade [23]. Buying asset-based tokens require no institutional brokerage paid. It also solves the complications of purchasing property across borders involves buyers and sellers from different tax and regulatory. The buyer does not have to go through the process involving cumbersome documents such as notarized deeds, proof of identity, etc. Also, it does not require an escrow agent.

In one example [24], a villa worth €6.5 million was sold via a blockchain transaction. Firstly, the ownership of the building was transferred to a joint-stock company called "SAPEB Anna." Then, the ownership of the company was

divided into 10 Ethereum-powered tokens which were distributed among the new owners. In the last step, each of

these tokens was then further broken down into 100,000 units, meaning each token had a face value of € 6.50.

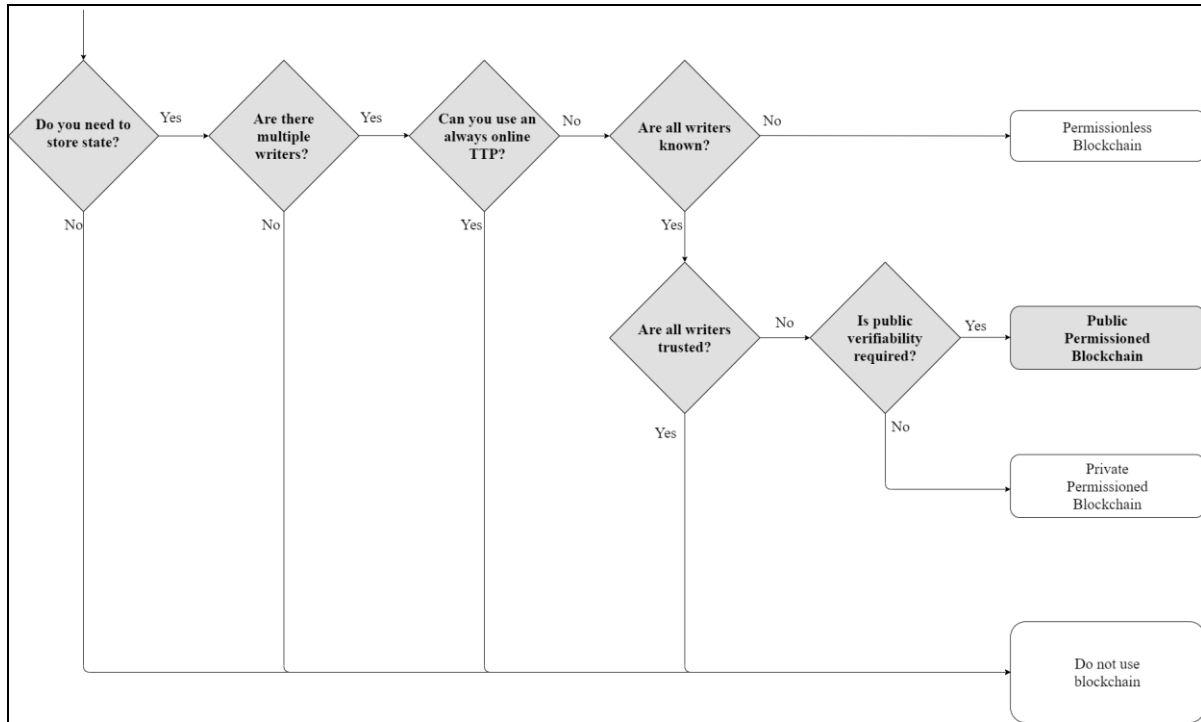


Figure 1: Flow chart to determine whether a blockchain is the appropriate technical solution to solve a problem. The decision path is highlighted

In another instance [25], the first property tokenized by RealT on Ethereum is owned by 107 different individuals from 33 different countries. The exact identities of the owners are not known as the tokens are based on Ethereum. Kleros [26] is a decentralized application built on Ethereum. It works as a third party to arbitrate disputes. It also offers escrow services to ease up the transaction for an optimal price.

Clearly using a blockchain system in the real estate sector has many upsides. However, in countries like Algeria, India, and Nepal, cryptocurrencies have been banned and are not considered as legal tender as of 2019 [27]. For example [28] in India, the central bank of India (RBI) had in April 2018 ordered financial institutions to break off all ties with individuals or businesses dealing in virtual currency. As a result, they cannot do any operations involving cryptocurrency including the purchase of security tokens.

4. Blockchain-based real estate ecosystem

4.1 Ideal real estate ecosystem

In a country with an ideal real estate ecosystem, the due diligence will be quick, steadfast, and transparent. The transaction will be efficient, not requiring any physical presence of the parties involved. Conveyance happens from anywhere at any time, not restricted to any geographical location. The registry of titles is reliable and updated on time. Almost no reliance on intermediaries such as an escrow, agents, brokers, etc. The approval of credit by

financial institutions is instant. All the parties involved in the system are trusted. With the provision for fractional ownership to increase liquidity and with little capital, anybody will be able to invest in real estate. Owners can raise capital by tokenizing a part of a property. Unlike today, the overall experience will be seamless.

4.2 Decision-making process

To determine whether a blockchain is the appropriate technical solution to solve a problem, authors of [29] have proposed a flow chart. After assessing the real estate system using Fig.1, permissioned blockchain seems to be suited best. The basis for this decision is explained below.

The title is at the heart of every real estate transaction. A title is a document that shows legal ownership to a property or asset. In countries which use the land recording system, there must always exist a constant chain of title [9]. There are no government officials to make an absolute determination of who owns title to a property or whether the instruments transferring the title are valid. A title deed is the state of a particular real estate. Blockchain is foolproof and transparent by design as the proof of previous owners cannot be changed because of immutability. A concrete chain of title can be established using blockchain. This leads to consistency in the system consequently reducing fraudulent activity like double-spending.

A permissioned blockchain provides a proper governance structure as they maintain an access control layer to allow certain actions to be performed only by certain identifiable

participants. Only permissioned nodes can write into the blockchain. In the current world, there are different requirements by each country regarding the administration of land infrastructures because of differences in social culture, the legal system, cultural values, economic conditions, and the circumstances of institutions and administrations [30]. Hence, the system has to be nationalized.

4.3 Overview

All the parties in a real estate ecosystem can be individual nodes interacting with the blockchain. Nodes are known participants in the system unlike in Bitcoin where the parties are anonymous. Buyers and Sellers are part of the nodes. They can buy/sell property on the blockchain peer with their digital signatures if approved by the permissioned nodes. As this a permissioned blockchain, the amount of information that is transparent to an observer can differ and not every participant needs to have access to every piece of information.

As blockchain is consistent amongst all parties, irregularities can be eliminated which were caused in the land registration system. Blockchain also has a better disaster recovery system as it does not rely on a single centralized data center.

4.4 Applications of smart contracts

Using smart contracts, many third party operations can be replaced. Operations of an escrow agent can be programmed on the blockchain when an individual initiates a real estate transaction. Even notary nodes can be authorized to perform their duties.

Multiple Listing Service (MLS) can be built on the blockchain to provide a marketplace for potential buyers and sellers to meet. Listings can be posted by the seller. This helps in the increase of reach and price discovery of the property. In most of the democratic countries enable citizens of the country to seek information from the government agencies, ministries or departments regarding any subject or case. E.g. (i) Right to Information in India, (ii) Article 35 of the Bill of Rights in the USA. A query system can be programmed on the blockchain and enable information access anywhere.

As seen in state-of-the-art, security tokens have proved to be the game-changer in the industry. Legitimizing tokens as fractional ownership of the real estate without third party securitization changes the entire paradigm of the ecosystem solving major problems of real estate as an investment.

5. Limitations and future works

Before the blockchain-based system could be implemented in real life, different prerequisites would need to be met. The process of transaction in the proposed system would need to be preceded by some legal reforms. The scope of the

solution proposed is limited to a government that has the capacity to build digital signatures and identities of the people. Adapting to this system also poses certain difficulties. Integration of co-ownership, taxation, litigation, community property, etc. has not explored by the provided system. Future work needs to be carried out in these particular fields.

6. Conclusion

This paper aimed to inspect real estate transactions that were enabled through blockchain technology and to propose a solution to overcome the challenges real estate poses. The presented solution captured the overview of a possible near-perfect system. Although it has certain limitations, adopting a blockchain-based ledger system has substantial benefits and paves a way to reach the ideal real estate ecosystem.

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