Bitland-A Decentralized Commercial Real Estate Platform

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***Abstract*—Real estate has always been a significant investment sector, but it has a high barrier to entry. Bitland Project aims to use blockchain technology in the real estate market, which could have an impact on market inefficiencies. Bitland is a platform that uses smart contracts to provide services for selling fractional ownership, registering real estate in the property registration and investors to buy the commercial property. This paper discusses existing blockchain application use cases in the real estate market. The study discusses current problems and roadblocks that must be overcome before blockchain technology can completely mature in this business.The goal is to create a blockchain-based digital real estate network for the management of investment properties and to handle the distribution of real estate smart contracts.**

***Index Terms*—Blockchain, Smart Contracts, Token, Ledger, Ethereum, Transactions, Investing, Initial Coin Offering, CRE**

I. Introduction

Real estate investment is regarded as one of the safest investment possibilities. It gives investors with security and acts as an inflation hedge (money inflation). It's also a tangible asset that's great for portfolio diversification because it's non-volatile and effectively risk-free over time. Rather than being limited to experts, everyone can invest in real estate.

The real estate market is one of the world's major assets that people hold. However, doing business with this asset class is not only difficult, but also costly, opaque, and inefficient. Above all, Real Estate Investments are much more out of reach for the average person. Institutional investors and ultra-high-net-worth people dominate these types of investments. Ordinary individuals are unable to profit from rising real estate market returns due to this restricted access. The value of a real estate asset typically serves as a safety net for property owners in the event of unexpected circumstances. It is not, however, liquid money. Owners of real estate must either sell their equity or use a financial vehicle to achieve their equity release in order to access the money imprisoned in it. Aside from these disadvantages, the Commercial Real Estate (CRE) industry has been reluctant to reinvent its key business procedures. Commercial brokers and other middlemen are currently battling outdated technology, data sharing mechanisms, inefficient cash flow management, and real-time performance statistics, among other issues. Tenants, owners, and investors suffer as a result of these flaws, which result to collusion and negative consequences.

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Blockchain technology has been heralded as one of the most important technological breakthroughs in the last decade. It has the potential to revolutionise a variety of societal challenges, including financial systems, healthcare, e-government, and many more. Blockchain technology, which incorporates smart contracts and tokenization characteristics, is the most recent technology in the world . Smart contracts and tokenization make it very simple for consumers while also ensuring valid data security. The real estate business, like many others, is plagued by high transaction fees, a lack of transparency, fraud, and the implications of a middleman, such as undue influence and fees. Supporting technology can leverage blockchain to help real estate investors overcome obstacles. Property titles are currently frequently based on paper, which leaves room for errors and fraud. [5]

Smart contracts, which imply that work is completed and audited automatically without the use of middlemen.Smart contracts use codes as principles, and two parties agree on a transaction based on their substance. Blockchain and smart contracts give a new set of tools and framework for creating a new generation of markets in which supply and demand are equipped with safe commercial transactions, as well as a variety of commercial laws, and without the need for a central mediator. Even when there is no trust between the seller and the buyer, or any other participants in the network, Blockchain can be utilised for asset management [1].

II. Problem Statement

The real estate asset necessitates more involved and lengthy transaction processes as well as considerable cash commitments. Everyone is concerned about how to keep real estate transactions secure if they continue to be conducted digitally. To elaborate on some disadvantages the traditional real estate market faces:

- Transfer of Ownership : Legal ownership is demonstrated through legal documents that proves the new investor's ownership rights and this process is carried out in multiple tedious steps.

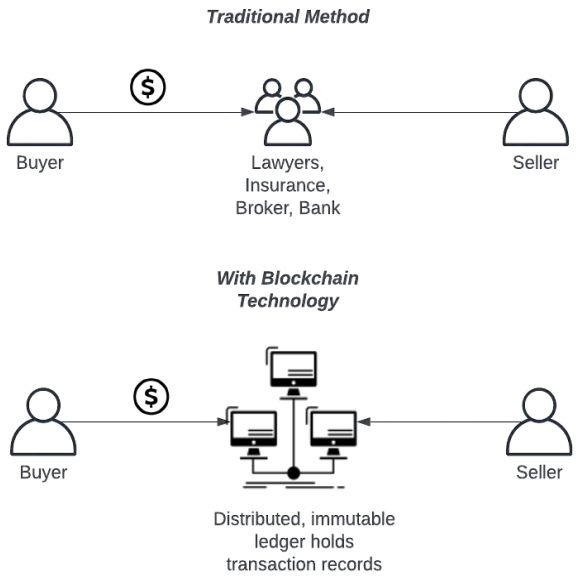

Fig. 1. Comparison of Traditional and Blockchain based Real estate market

- Lack of Transparency : The transfer of ownership lacks transparency and with the involvement of middlemen there could be extra hidden charges unknown to the buyer. Blockchain Technology will help mitigate this issue.
- The Entry Barrier for Small Investors : The real estate investment market has always been confined to the big capitalists or tycoons, restricting the market reach. With the introduction of Tokenization, all kinds of people would be able to invest as there can be multiple investors for the same property sharing ownership.
- High Transaction Cost : The involvement of middlemen and bank increases the amount to pay. Eliminating the intermediaries may result in reduction in cost effectively.

III. Related Work

Ioannis Karamitsos et al. (2016) described the work process and functionalities of each use case that were useful for existing real estate issues and proposed a solution for secure paperless transactions for better asset management in a smart city. With his architecture, smart contracts enable a distributed, decentralised ledger of each transaction and all assets between buyer and seller [2].

Konsatantinos Christidis (2017) wrote a paper on the blockchain work process and smart contracts. It discussed the advantages and disadvantages of implementing this technology [3].

A paper published by 'Gupta A' briefs about how tokenization of real estate is beneficial to the society and how smart contracts' sturdiness can facilitate the transfer of tokens and the equitable distribution of profits among investors. This paper outlines Ethereum blockchain-based options for improving the efficiency of the current Real Estate investing sector [4].

I Ketut Gunawan,Ninda Lutfiani,Qurotul Aini,Fitria Marwati Suryaman,Abas Sunarya(2021) have discussed how smart contract innovation and tokenization in blockchain technology can be used to improve payment transaction processes in universities. Smart contracts and tokenization can replace third - party as transaction data security guards, with all Blockchain users paying attention and maintaining the integrity of the entire process and activity. [11]

Aditya Asgaonkar, Bhaskar Krishnamachari(2018)discusses how the buying and selling of digital commodities between people who don't know or trust each other is a fundamental issue in e-commerce. Despite the rise of blockchain protocols as a means of delivering payments without trusted third parties, the critical issue of transferring a digital item for payment has received significantly less attention. The Buyer and Seller's Dilemma is addressed, and a solution is provided in the form of a dual-deposit escrow trade protocol that can be implemented using a blockchain-based smart contract that makes use of double-sided payment deposits as well as basic cryptographic primitives. [12]

Max Zheng and Philipp Sandner(2022) wrote a paper on asset tokenization in europe ,This paper investigates an innovation that has the potential to address key issues with the real estate industry. Two key possibilities have emerged as a result of the development of blockchain technology as well as the concept of tokenization: first, the fractionalization of property or claims; and secondly, the digital representation of asset ownership. [13]

Martí Haynes, Eric David(2022) discussed their project of a software application to provide a solution by using tokenization and blockchain technology to democratise access to the real estate industry. [14]

Ferrara, Giuseppe, et al.(2022) briefs about asset tokenization adopted in blockchain platforms and how this work presents an architecture to support physical assets tokenization for digital markets. [15]

We have discussed current systems in related work on the significance of blockchain technology [3] and how we utilise it to remove third parties from transactions and have transparency in buying and selling as well as the ownership of digital assets in the blockchain ledger [11], [12], [13]. The Bitland platform is a comparable case study that employs smart contracts to carry out transactions in order to do eliminate with third parties and maintain asset ownership to its real estate properties.

IV. The Pros and Cons of Real Estate Investment

Real estate Investment Platforms allow investors to fund big projects widening the market of investments. This being one of the several options to opt, there exists a variety of others which may be better than this. The table below compares different investment options available to people and substantiates how valuable this idea would be in today's world. According to our

2021 study, the following are some of the finest investment possibilities in India that provide high returns. [12]

TABLE I
INVESTMENT POSSIBILITIES IN INDIA

Investment Options	Risks	Avg Returns
Direct Equity	High	NA
Mutual Funds	Low-High	35%
Public Provident Fund	Nil	7.10%
Bank Fixed Deposits	Nil	6%
Real Estate	Medium	10% - 15%

The pros of RE Investment could be as follows:

- Portfolio Diversification
- Accessibilty
- Geographic Diversification
- Passive Investment Vehicle
- Small Investment Size

The cons of RE Investment could be as follows:

- Lower Relative Returns
- Lack of Control

V. BITLAND PROPOSED SYSTEM

Fig. 2. System design of bitland platform

The system design of the Bitland platform is depicted in Figure 2. First, both investors and sellers must register on the Bitland platform. Furthermore, the seller applies for real estate sale on the market place by listing the property details that are publicly available, such as the Property name, Address, Image, Interior sq. ft., rent per token, Construction Year, Description, Token Price in ETH. Thus, a smart contract is created. The market is integrated with systems to ensure the authenticity of users which is done by operational team of the business, and it is listed for sale on the marketplace after admin approval. Each property listing has its own token with its own token price. Registered investors from all over the world can now purchase through fully-compliant, fractional, tokenized ownership enabled by blockchain technology. The Buyer invests by purchasing a specific number of tokens for a specific property listed on the marketplace. Once the buyer makes transaction, the token is provided to the buyer which is reflected in assets of the metamask wallet. Payouts would be credited to the investors based on the smart contract's terms and conditions. All data will be recorded on the blockchain and can be analyzed later [6].

The basic idea is to replace the middlemen in real estate investment market with blockchain technology which will enable everyone regardless of their status to invest in the platform and get good returns. The end goal is to provide investors good returns on their investments.

Real estate usually generates income by the way of appreciation i.e. the increase in the value of a real estate property after some time. Another way is giving property on rent. The investors invest for enhancement and development of the property which they get back after a period of time with timely rent payments from tenants.

Talking from financial aspect, Rental Yield is directly proportional to Return on Investment (ROI). So, it's critical that the property being invested in is an income generating property. The rental yield of such properties is high therefore ROI being good. In India, Residential Properties are very expensive and the rental yields are quite low. Hence, we can say houses are super inflated from an ROI perspective. Commercial Properties give better returns as there is no massive inflation in such real estates. Therefore, it only makes sense to invest in CRE (Commercial Real Estate).

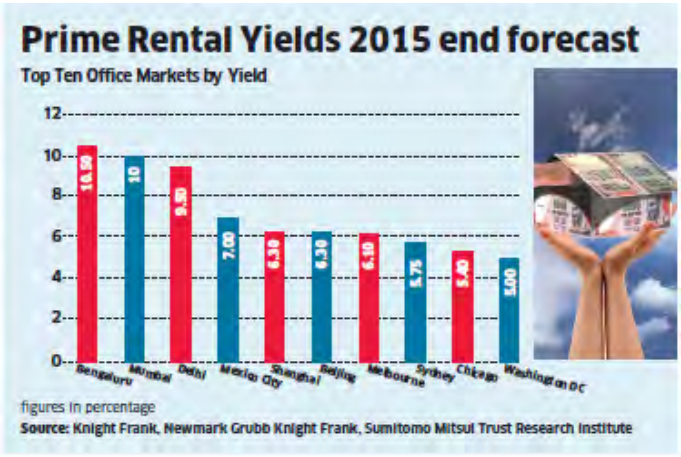

Fig. 3. Top Rental Yields from Commercial Properties

The figure above examines Rental Yields from the year 2015 in CRE. Bangalore, Mumbai and Delhi being the top most cities giving good amount of yield. [10]

To articulate the idea better, in Fig. 4 suppose a seller owns an asset he needs investment in for the purpose of developing it and putting on rent with the help of real estate management company. Also, the Investor can only invest Rs. 5000. In this scenario, the seller can easily tokenize his property and put it up for sale in market. There could be multiple tokens for the same property indicating multiple fractional ownership available. The investor can invest considering the amount is quite low and returns to be good. Other tokens can be sold to other institutional Investors.

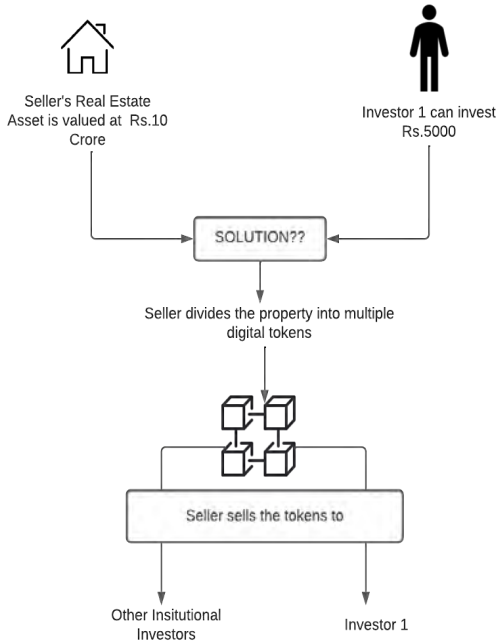

Fig. 4. The process by which investors purchase tokens to invest in fractional ownership.

VI. Implementation

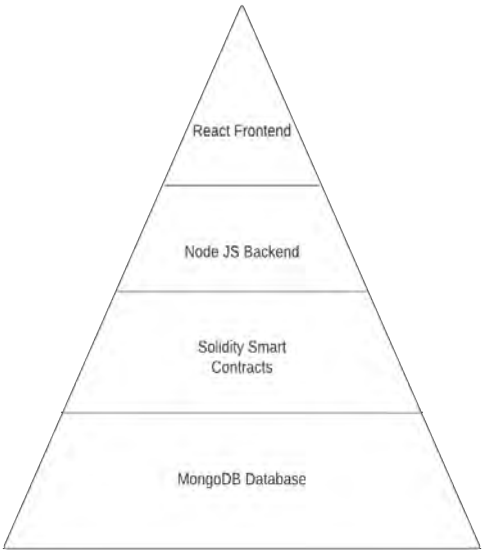

Fig. 5. Technology Stack

Fig. 5 shows the main technologies used in the development of the project. React for frontend is easy to use and modular. It is remarkably flexible. Node JS as backend and MongoDB as database are used. MongoDB is built to scale up quickly and offers faster query processing. Ethereum may be used in a variety of ways thanks to Solidity. It's used to build smart contracts on a variety of blockchain systems.

A. Registration

Investment buyers and sellers must first register on frontend user portal. They link their metamask wallet, as soon as connection is established, transactions can take place. Database used here is for managerial and authentication purpose only. Fig. 6 demonstrates the working of backend.

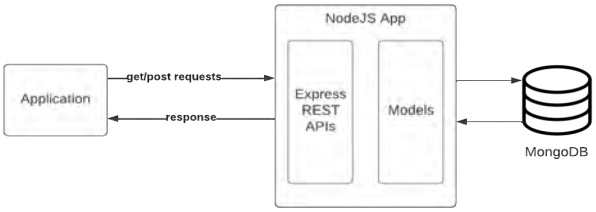

Fig. 6. Backend Design

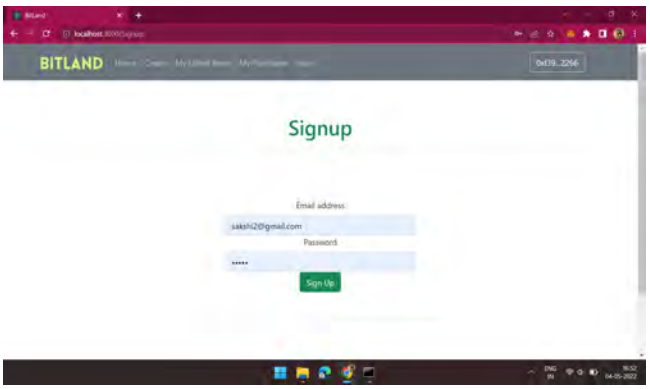

Fig. 7. Frontend - Registration Page

B. User Roles

As a seller and investor, the application would allow the user to register and log in to the user portal. The seller would be able to input token details, which include property details, and create a smart contract. The admin will approve or decline the property based on the legitimacy of the information provided by seller. Once admin approves the listing, it could be viewed in 'Home'. The Investor looks through the properties in the marketplace to purchase tokens. All roles can view their listed, sold, and purchased assets.

Fig 9 shows the listing on the home page on frontend once the seller uploads their CRE details. The admin can approve or reject this listing. The investor/buyer can purchase the token once the listing gets approved.

C. Tokenization

Real Estate Tokenization is a blockchain-based way of offering a fractional ownership of a property to an investor. A property or asset is divided into digital tokens, smaller units

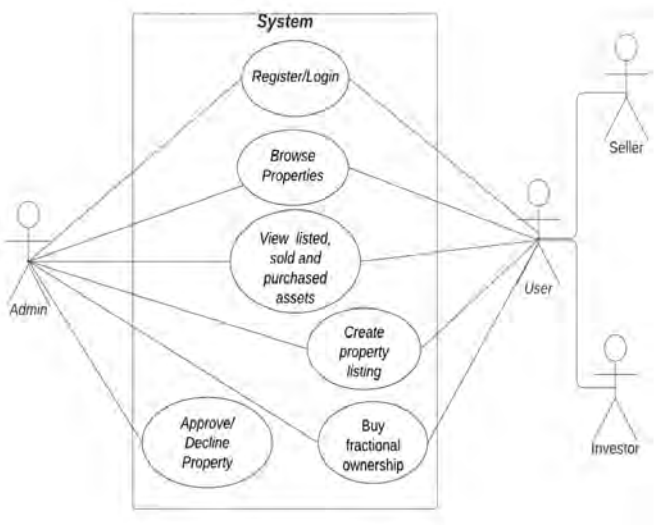

Fig. 8. Use Case Diagram

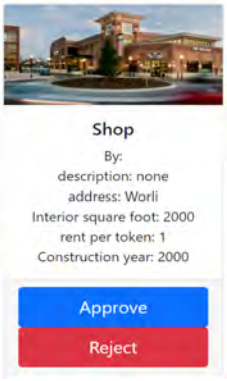

Fig. 9. Listing on Frontend on admin login

of a property that may be acquired by an investor, giving them fractional ownership of the property.

This can be used to generate and administer property documents in the form of smart contracts, in addition to real estate investments. Digital or blockchain tokens are distributed via an initial coin offering in this case (Similar to IPO). The tokens show the ownership of the house. These tokens are stored in crypto wallet which determines the ownership of that property to the wallet holder. By removing many procedures

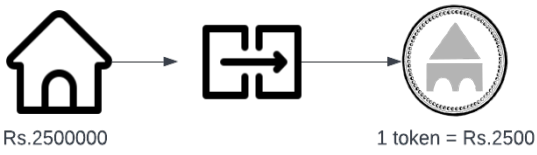

Fig. 10. Real estate property divided into multiple tokens for fractional ownership

and making the assets widely available, tokenization, or the usage of Distributed Ledger Technology, fractionalizes real estate assets, boosts liquidity, and answers significant issues regarding securitization. [7] Benefits of tokenization are:

- Increases liquidity
- More Access to Market
- Transparency and Less Expensive Transactions
- Immutable Proof of Ownership
- Property Management

D. Smart Contracts

Traditional contracts can be replaced with automated smart contracts that record all data connected to payments and transactions on a regular basis without requiring any human participation. In real estate, managing payments and cash flow can be difficult. Payments to renters are made to a variety of stakeholders, including auditors, brokers, banks, and other institutions. This is why real estate firms devote so much time and money to accounting and cash flow management. Smart contracts can also be used for this issue. The parties can sign a smart contract, which contains transaction details as well as other necessary data. Through the use of smart contracts, all parties involved can obtain the essential information from a single source without fear of corruption. These agreements can be used to transfer the ownership of a property from the seller to the buyer. Smart contracts can replace the current manual registry system for taking details because they can complete the entire land sale transaction, saving investors time and money. These contracts improve execution assurance, streamline the process, and save financial costs [7].

Figure 10 illustrates successful transaction for the purchase of fractional ownership. The metamask wallet pop up shows the amount in seller's wallet increased by 2 ETH after transaction. The frontend shows the listed and sold properties by the seller.

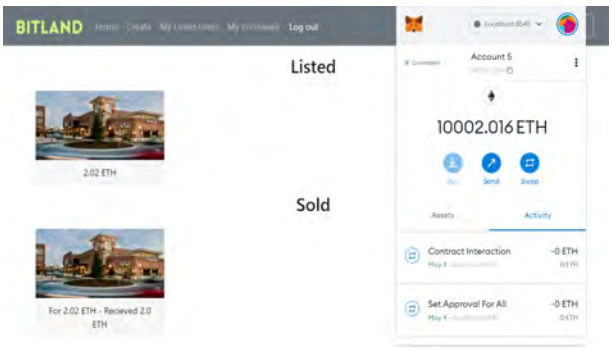

Fig. 11. Frontend - Transaction between buyer and seller

VII. Future scope and challenges

In this paper we have decided to take metamask as our primary wallet for transactions,we can similarly hope to add more crypto wallets such as binance,coinbase etc.Currently, the most difficult aspect of adopting blockchain is the infrastructure required to make the process seamless. Such a large-scale shift is challenging, especially in an industry like real estate, where people are reluctant to change and the sector has been established for decades. Although blockchain has the potential to transform the real estate business, real-world applications are still scarce. If blockchain technology is extensively implemented, it is critical for lawyers to collaborate with engineers.In blockchain, data security is also a concern. The right to access personal data is protected under the General Data Protection Regulation. When data is no longer needed in a process, it should be eliminated. Data saved on a blockchain, on the other hand, cannot be deleted.replaced or removed from ledger In actuality, In reality, there are ways to change data, but this must be communicated to participants. After augmented reality (AR) and virtual reality (VR), the metaverse is a relatively recent notion in real estate technology (VR) "Digital land trading and investing in virtual real estate is throbbing in numbers as millions of investors are open to the concept of the metaverse. Many real estate investors are seeing it as the next prominent step towards the adoption of digitisation in the real estate sector after virtual site tours, online bookings and chatbots," said Nayan Raheja, director, Raheja Developers [8].With upcoming virtual lands in metaverse ,we can bring fractional ownership investments on virtual properties also.

VIII. Conclusion

In most real estate properties, ownership is defined through paper deeds. BitLand is a ground-breaking asset ownership system based on the Ethereum blockchain, with the goal of replacing paper deeds with digital smart contracts. An architecture has been presented that lowers the role of middlemen and increases the value of their shares for both investors and sellers. The module contains a number of features, including the ability for sellers to market a property, create their listing, and give their real estates for fractional ownership, allowing investors to invest in real estate at a lower cost than traditional methods. The convenience of online transactions, as well as the variety of options available, provides a larger user base, allowing investors from all over the world to purchase such assets. Bitland with it's objective to democratise access to real estate investment options which aims both the parties to gain profits.

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