

PROFESSIONAL TRAINING REPORT - II

entitled

SMART CONTRACT BASED REAL-ESTATE IN BLCOKCHAIN TECHNOLOGY

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Computer Science and Engineering with
specialization in Blockchain technology

by

TANIKELLA HARI GAYATRI [Reg.no: 41613019]
G. LAKSHMI NARASIMHA REDDY[Reg.no: 41613007]
BODDU MANOJ KUMAR[Reg.no: 41613005]



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF COMPUTING

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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MAY 2024



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BONAFIDE CERTIFICATE

This is to certify that this Professional Training Report is the bonafide work of **Ms.Tanikella Hari Gayatri (Reg.no:41613019)** who carried out the project entitled **"SMART CONTRACT BASED REAL-ESTATE IN BLOCKCHAIN TECHNOLOGY"** under my supervision from January 2024 to May 2024.

Internal Guide

Ms.LEKSHMI S RAVEENDRAN M.Tech.,

Head of the Department

Dr. S. VIGNESHWARI, M.E., Ph.D.,

Submitted for Viva voce Examination held on 7/5/24

Internal Examiner

External Examiner

DECLARATION

I, **TANIKELLA HARI GAYATRI** (Reg.no:41613019), hereby declare that the Professional Training Report-II entitled "**SMART CONTRACT BASED REAL-ESTATE**" done by me under the guidance of **Ms.Lekshmi S Raveendran M.Tech.**, is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Computer Science and Engineering with specialization in Blockchain Technology.

DATE: 07/05/24

PLACE: Chennai

T. Gayatri
SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to **Board of Management of SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr. T.Sasikala M.E., Ph.D., Dean**, School of Computing, **Dr. S.Vigneshwari M.E., Ph.D., Head of the Department of Computer Science and Engineering** for providing me necessary support during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Internal Guide **Ms.Lekshmi S Raveendran M.Tech.**, for her valuable guidance, suggestions and constant encouragement which paved way for the successful completion of my phase-2 Professional Training.

I wish to express my thanks to all Teaching and Non-teaching staff members of the **Department of Computer Science and Engineering** who were helpful in many ways for the completion of the project.

COURSE CERTIFICATE



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Blockchain and its Applications

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Coordinator, NPTEL
IIT Kharagpur



Indian Institute of Technology Kharagpur



Roll No: NPTEL24CS15S953507159

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Date enrolled 2024-01-24

Email tramu1665@gmail.com

Name Tanikella Hari Gayatri

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Week 2 : Assignment 2:	-
Week 3 : Assignment 3:	-
Week 4 : Assignment 4:	80.0
Week 5 : Assignment 5:	100.0
Week 6 : Assignment 6:	71.0
Week 7 : Assignment 7:	100.0
Week 8 : Assignment 8:	-

ABSTRACT

Real estate management in various regions of the world has often been characterized by a lack of expertise, a time-consuming and opaque transaction process, and the involvement of multiple intermediaries. However, the emergence of blockchain technology offers a solution by enabling decentralized, transparent, and secure transactions without the need for intermediaries. This research paper examines the application of blockchain in transforming real estate transactions, with a particular focus on eliminating the involvement of third parties and utilizing the functionalities of an immutable ledger and smart contracts. By allowing direct interaction between parties involved in real estate transactions, this system significantly reduces transaction costs and processing times. Additionally, this system incorporates tokenization, whereby real estate assets are divided into digital tokens, enabling fractional ownership and increasing market liquidity. Our focus in this paper is to discuss the obstacles and reservations associated with incorporating blockchain technology in the real estate sector, particularly the issues of interoperability and scalability. These challenges are overcome by the effective utilization of blockchain, which eliminates the need for third-party involvement and ensures secure transactions through the implementation of smart contracts in real estate transactions worldwide.

In addition to addressing challenges such as interoperability and scalability, the adoption of blockchain technology in real estate transactions also presents opportunities for enhanced transparency and security. By leveraging blockchain's decentralized nature and cryptographic principles, sensitive data such as property records, titles, and ownership histories can be securely stored and accessed by authorized parties only. This not only reduces the risk of fraud and manipulation but also facilitates due diligence processes, thereby increasing trust and confidence among stakeholders. Moreover, the transparency offered by blockchain can attract a broader pool of investors, including those who may have been deterred by concerns about opacity and inefficiency in traditional real estate markets. As a result, the integration of blockchain stands poised to revolutionize the real estate industry, paving the way for more efficient, accessible, and inclusive property transactions on a global scale.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

For a considerable amount of time, the realm of real estate has been plagued with difficulties, ranging from obscure dealings to burdensome paperwork, often leaving those involved in a state of inefficiency and uncertainty. However, the emergence of blockchain technology has introduced a new era filled with possibilities, vowing to disrupt conventional norms and reshape the landscape of real estate transactions. By harnessing the inherent qualities of blockchain, such as transparency, immutability, security, and efficiency, the real estate industry is on the cusp of a transformative revolution. At its core, blockchain technology operates as a decentralized ledger system, where transactions are securely and immutably recorded across a network of computers. Each transaction, referred to as a "block," is intricately linked to the preceding one, creating a chronological chain that cannot be retroactively altered without the consensus of network participants.

This fundamental principle of immutability instills trust and transparency into the system, mitigating the risk of fraud and manipulation that has plagued traditional real estate transactions. One of the key challenges in the real estate sector has been the lack of transparency, with opaque processes often leaving buyers, sellers, and intermediaries in the dark regarding the true state of transactions. By integrating blockchain technology, all folks included get live-time entry to a clear and tarp-proofed ledger, where each transformation or upgrade is recorded and seen by every stakeholder. This enhanced transparency not only fosters trust and confidence but also streamlines the due diligence process, reducing the potential for disputes and discrepancies. Blockchains enables automating processes via clever contracts, which are self-executing agreements programmed with predetermined rules and conditions. These intelligent contracts are mostly composed in dialects like Solidity, enabling smooth execution of property transactions, removing the necessity for middlemen and cutting down on related costs and postponements. For instance, property sales can be facilitated entirely through smart contracts, with terms and conditions automatically enforced upon fulfillment of predefined triggers, such as payment verification or title transfer.

The utilization of blockchain technology in the real estate sector brings about a multitude of benefits, including heightened security measures that protect sensitive information using cryptographic techniques and distributed storage methods. Conventional real estate transactions are often fraught with risks such as data breaches, identity theft, and fraudulent activities. However, by leveraging blockchain technology, not only is transparency, security, and efficiency improved, but the potential for democratizing access to real estate investments is also unlocked. This means that fractional ownership becomes a possibility, and traditionally illiquid assets can now be traded and sold with ease, thanks to the tokenization process. By dividing real estate assets into digital tokens, investors are granted unparalleled flexibility and liquidity, as these tokens can be exchanged on blockchain-powered platforms. In summary, the integration of blockchain technology into the real estate industry signifies a transformative shift towards a more transparent, secure, and efficient ecosystem. By harnessing the power of decentralized ledger systems and smart contracts, stakeholders can streamline transactions, mitigate risks, and unlock new opportunities for innovation and growth. As we embark on this transformative journey, the possibilities are limitless, and the future of real estate has never looked brighter.

In addition to the myriad benefits already outlined, the adoption of blockchain technology in real estate transactions holds the potential to revolutionize property management and ownership verification processes. Traditionally, verifying ownership rights and property titles has been a cumbersome and time-consuming endeavor, often requiring extensive paperwork and reliance on centralized authorities. However, with blockchain, the entire lifecycle of a property, from initial purchase to subsequent transfers of ownership, can be seamlessly recorded and validated on a transparent and tamper-proof ledger. This not only streamlines property management processes but also reduces the likelihood of disputes arising from unclear or disputed ownership claims. Moreover, blockchain technology enables the integration of additional data sources, such as property surveys, inspections, and maintenance records, into a unified and accessible platform. This holistic approach to property management not only enhances efficiency but also empowers stakeholders with comprehensive insights into the condition and history of the properties they own or wish to acquire. As blockchain continues to mature and gain widespread adoption in the real estate sector,

the possibilities for innovation and optimization are boundless, paving the way for a future where property transactions are secure, transparent, and accessible to all.

BACKGROUND

Problems in the current system:

In the current system, the buyer first pays the seller and then pays the customs tax to the state, which can be done online. They then need to make an appointment at the local civil registry office and bring all documents and proof of payment there. After this process, the buyer must also change the owner information in the city records. Electricity and water panels also have user points that need to be changed manually.

Since home buyers cannot access real information, the system lacks transparency and information fraud is increasing. This is because the information is not publicly available and it is not possible to know how much property someone owns since the information is decentralized. The government has recently addressed this problem, but the lack of real information in the public is still a problem that needs to be solved. This process takes around 10 to 15 days and needs to be completed quickly in this fast-paced world. Data transfer is a very important issue. In case of data in a regular or centralized office, data loss during a disaster is another problem. Many of the non-essential tasks can be done with technology. In this case, you need to bring the death certificate of the relevant person to the land registry office in order to manage the real estate transfer, which requires many procedures and is quite difficult. There is no way to change the tool that needs to be done. Even if a certificate is placed on the device, it is not possible for others to know about it.

CHAPTER 2

LITERATURE REVIEW

2.1 SURVEY

1 Real Estate Management System based on Blockchain, 16 March 2021

This article proposes implementing a blockchain-based real estate management system in India to streamline the title deed registration process. By storing transactions on a secure blockchain, it promises transparency, security, and efficiency across all property management departments. This centralized yet decentralized approach aims to address existing inefficiencies in the property management system.

2 Land Record Management using Hyperledger Fabric and IPFS, 30 December 2019

This document proposes utilizing permissioned blockchains like Hyperledger Fabric to enhance transparency and prevent fraud in land registration systems. By verifying all transactions and leveraging tamper-proof credentials, it aims to streamline data storage and management while ensuring accuracy and security.

3 The Real Estate Transaction Trace System Model Based on Ethereum Blockchain Platform, 26 April 2022

The proposed Real Estate Transaction Trace (RETT) system model, based on Blockchain technology, aims to revolutionize real estate transactions in Vietnam by enhancing transparency, reducing intermediary fees, and increasing mutual trust among participants.

4 BlockChain to Prevent Fraudulent Activities: Buying and Selling Property Using Blockchain, 09 June 2020

Blockchain technology offers a solution to the security and transparency challenges in real estate transactions by enabling digital deeds stored immutably on a decentralized ledger, ensuring ownership integrity and mitigating risks associated with physical document loss or tampering.

5 A secured land registration framework on Blockchain, 27 April 2020

This paper advocates for a Blockchain-based system to securely manage land ownership records, mitigating disputes and fraud by creating immutable digital tokens representing physical assets, thereby improving transparency and efficiency

6 Smart Contract Definition for Land Registry in Blockchain, 12 June 2020

This paper advocates for implementing Blockchain technology to streamline the land registry management process in India, addressing issues of fraud, inefficiency, and lack of transparency through the use of smart contracts.

7 A Private Blockchain Implementation Using Multichain Open Source Platform, 20 April 2020

This paper explores the application of private blockchain technology, implemented with Multichain, to enhance transparency and efficiency in agrifood industries, particularly in areas such as food tracking, product lifecycle management, and counterfeit prevention.

8 An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends, 11 September 2017

This paper offers a broad examination of blockchain technology, covering its architecture, consensus algorithms, technical challenges, recent advancements, and potential future trends across various fields, aiming to address scalability and security issues.

9 IPFS-Blockchain Based Technology for Lease Agreement and Rental System in Real Estate, 15 December 2023

This paper suggests leveraging blockchain technology, particularly through Smart Contracts and the Interplanetary File System, to combat rental and lease scams in India by facilitating secure lease agreements, incorporating utility bills, and ensuring authenticity of property listings and personal identities.

10 Smart Contract Implementation in Real Estate Sector, 20 December 2023

This study investigates implementing smart contracts in Bangladesh's real estate market to enhance accessibility, cost savings, transparency, safety, and efficiency,

offering reliable solutions to common real estate-based problems in developing countries.

11 Towards Fractional NFTs for Joint Ownership and Provenance in Real Estate, 18 December 2023

This paper introduces JOINFT, a blockchain-based solution utilizing fractional non-fungible tokens to enable joint ownership in real estate, enhancing accessibility, affordability, transparency, and trust in transactions.

12 B-Dropshipper: Interoperable Federal Blockchain Approaches For Real Estate Dropshipping, 27 February 2024

This research proposes a Federal blockchain interoperable system for real estate property drop shipping, leveraging smart contracts and Hyperledger Fabric to enhance transparency, security, and efficiency in property transactions.

13 Review of Existing Solutions in the Field of Real Estate and Cadastral Accounting Based on Blockchain Technology, 22 December 2021

This article explores various blockchain-based solutions in real estate and cadastre, such as Ledger Leopard, RealBlocks, SafeChain, Bitfury Group, and others, highlighting their potential to streamline processes and eliminate third-party intermediaries.

14 Land Registry Using Blockchain - A Survey of existing systems and proposing a feasible solution, 30 June 2020

This paper proposes a blockchain-based system for securely storing property papers by leveraging the Inter Planetary File System (IPFS) for document storage and Ethereum blockchain for validation, ensuring a decentralized and tamper-proof ledger for easy data retrieval.

15 Hawk: The blockchain model of cryptography and privacy-preserving smart contracts, 18 August 2016

This paper introduces Hawk, a decentralized smart contract system that ensures transactional privacy by not storing financial transactions openly on the blockchain, utilizing cryptographic protocols like zero-knowledge proofs for secure interactions.

CHAPTER 3

REQUIREMENTS ANALYSIS

3.1 OBJECTIVE OF THE PROJECT

Building a Smart contract based real-estate in blockchain technology using blockchain can be an exciting and innovative project. The objective of such a project can encompass a variety of goals and outcomes.

The objective of this project is to streamline and modernize the real estate transaction process by leveraging blockchain technology. This includes addressing inefficiencies, lack of transparency, and information fraud prevalent in the current system. By implementing blockchain, the project aims to facilitate secure, transparent, and efficient property transactions, reducing processing times, minimizing the need for manual paperwork, and enhancing accessibility to real estate information for all stakeholders. Additionally, the project seeks to improve data management and disaster recovery capabilities, ensuring the integrity and availability of property records even in adverse situations. Ultimately, the objective is to create a more reliable, transparent, and accessible real estate ecosystem that meets the demands of the fast-paced modern world.

Here are some common objectives for developing a Smart contract based real-estate in blockchain technology with blockchain integration:

- Decentralization
- Security
- Transparency
- Smart Contracts
- Cryptocurrency Payments
- Cryptography
- User Privacy
- Immutable Product History
- Tokenization
- Community Engagement

- Scalability
- Interoperability
- Regulatory Compliance
- User Experience
- Sustainability
- Business Model
- Marketing and Adoption

The project aims to foster trust and confidence among stakeholders by establishing a decentralized and tamper-proof system for recording property transactions. By leveraging blockchain's immutable ledger technology, the project seeks to eliminate the risk of fraudulent activities such as title fraud, double spending, and unauthorized alterations to property records. This increased trust in the integrity of real estate transactions is expected to attract more participants to the market, including institutional investors, thereby stimulating growth and liquidity in the real estate sector.

Moreover, the project endeavors to promote financial inclusion and democratize access to real estate investments by leveraging blockchain's fractional ownership capabilities. Through tokenization, the project aims to break down traditional barriers to entry, allowing individuals to invest in fractions of real estate properties and diversify their investment portfolios. This democratization of real estate ownership not only empowers individual investors but also opens up new avenues for crowdfunding and peer-to-peer lending platforms, driving innovation and expanding opportunities for wealth creation in the real estate market.

The project's focus on promoting financial inclusion aligns with broader efforts to address socioeconomic disparities and promote economic empowerment. By democratizing access to real estate investments, particularly for individuals from underserved communities, blockchain technology can play a pivotal role in bridging the wealth gap and fostering greater financial inclusion. Moreover, the expansion of crowdfunding and peer-to-peer lending platforms fueled by blockchain-based fractional ownership further democratizes access to capital, enabling entrepreneurs and small businesses to access funding for real estate projects that may have been previously out of reach. This democratization of investment opportunities not only stimulates economic growth but also contributes to more equitable and inclusive socioeconomic development.

3.2 REQUIREMENTS

3.2.1 *HARDWARE REQUIREMENTS*

To support the implementation of blockchain technology in real estate transactions, essential hardware includes computing devices such as desktops or laptops, dedicated servers for hosting blockchain nodes, networking infrastructure like routers and switches, and security measures such as firewalls and antivirus software. Additionally, backup and disaster recovery systems are crucial for ensuring continuous operation and data integrity, while scalable storage solutions are necessary to accommodate the growing volume of blockchain data.

This below list down the details on technology and framework used for development of the Smart contract based real-estate in blockchain technology using blockchain:

- Hardhat (Development Framework)
- Ethers.js (Blockchain Interaction)
- React.js (Frontend Framework)
- JavaScript (React & Testing)

3.2.2 SOFTWARE REQUIREMENTS

In addition to hardware infrastructure, the successful implementation of blockchain technology in real estate transactions necessitates specialized software tools. These include the Solidity compiler for writing and deploying smart contracts, Ganache for local blockchain development and testing, and the Truffle suite for smart contract development, testing, and deployment. Integrated development environments (IDEs) such as Visual Studio Code (VS Code) provide a user-friendly interface for coding and debugging smart contracts, while browser extensions like MetaMask enable seamless interaction with Ethereum-based decentralized applications (DApps) and test networks. These software tools play a crucial role in facilitating the development and deployment of blockchain-powered solutions for real estate transactions, ensuring efficiency, security, and interoperability across various platforms and networks.

The below list are the details on technology used for development of the Smart contract based real-estate in blockchain technology using blockchain:

- Solidity Comp
- Ganache
- Truffle Suit
- Visual Studio Code
- MetaMask

CHAPTER 4

DESIGN DESCRIPTION OF PROPOSED PROJECT

4.1 PROPOSED METHODOLOGY

The real estate world taking advantage of blockchain tech aims to change classic habits by bringing in a decentralized, see-through, and efficient structure for property dealings. Within this blockchain-powered scheme, middlemen like real estate middlemen, brokers, and centralized storages are exchanged by a scattered network of nodes, aiding peer-to-peer dealings without the requirement for third-party engagement. Smart pacts, scripted in Solidity or some alternative programming languages, have a significant function in automating and enforcing deals between purchasers and vendors. Property ownership records are securely and immutably stashed on the blockchain, ensuring some sort of transparency and preventing potential tampering or fraud, maybe. Each transaction gets recorded as a block on the blockchain, linked cryptographically to past blocks, producing a somewhat transparent and auditable record of ownership history, they say. To kick off a real estate transaction, buyers and sellers interact directly through the blockchain network, somehow abolishing the need for intermediaries, which seems interesting. Buyers can supposedly hunt for properties listed on the blockchain, check out detailed data like property specs, pictures, and transaction history, and magically submit purchase offers directly to sellers.

Once an offer of purchase has been accepted, the conditions of the deal are encoded within a smart agreement and put out on the blockchain. Funds are transferred into escrow accounts controlled by the smart contract, ensuring security and mitigating the risk of non-payment or fraud. By utilizing blockchain technology, the transaction process becomes a transparent and trustworthy experience for all parties involved. Real-time access to transaction status and updates is provided, ensuring that everyone is kept informed. Smart contracts play a crucial role in enforcing contractual terms, automatically releasing funds to the seller once the transaction is successfully completed or refunding the buyer in the event of a breach. Furthermore, the transfer of ownership occurs upon completion of the transaction, with the details securely recorded on the blockchain. The decentralized nature of the blockchain

network guarantees that ownership records are accessible to all participants and cannot be tampered with without consensus from the network. In summary, the implementation of blockchain in the real estate industry offers a multitude of benefits, including enhanced transparency, immutability, security, and efficiency compared to traditional practices. By leveraging blockchain technology and smart contracts, stakeholders in the real estate industry can streamline transactions, reduce costs, and minimize the risk of fraud, ultimately creating a more accessible and inclusive real estate market.

4.1.1 Ideation Map/System Architecture

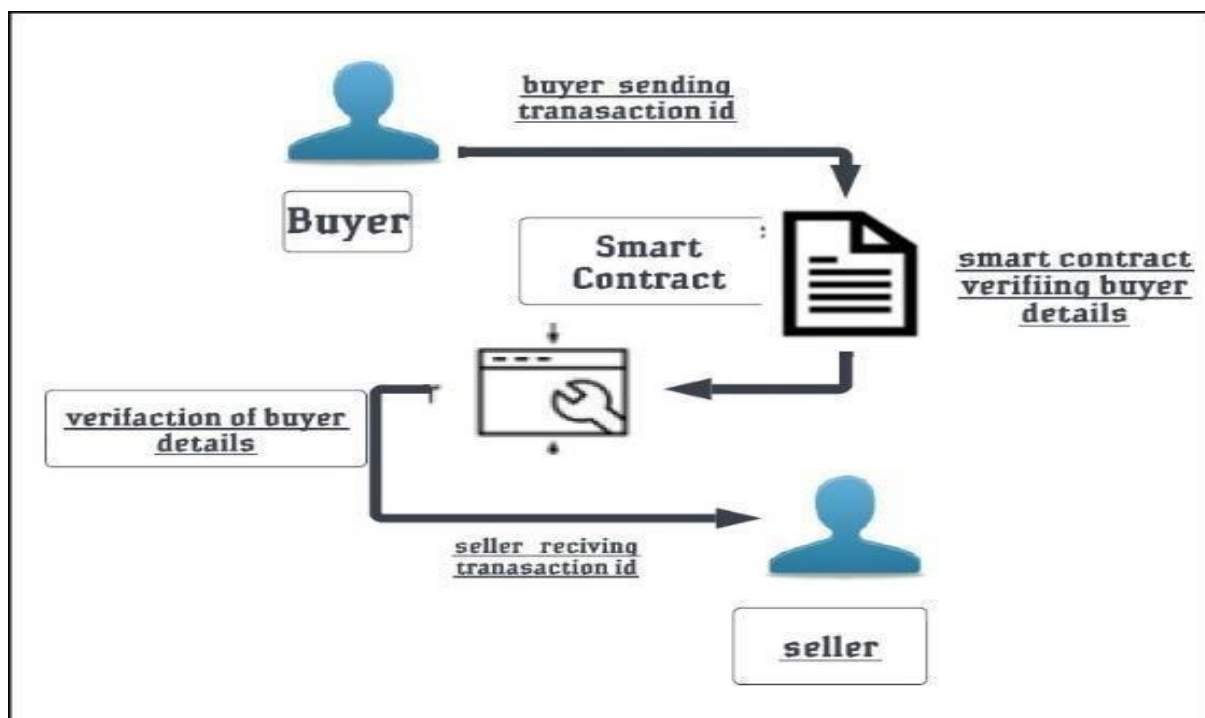


Fig 4.1.1.1: buyer process in smart contract

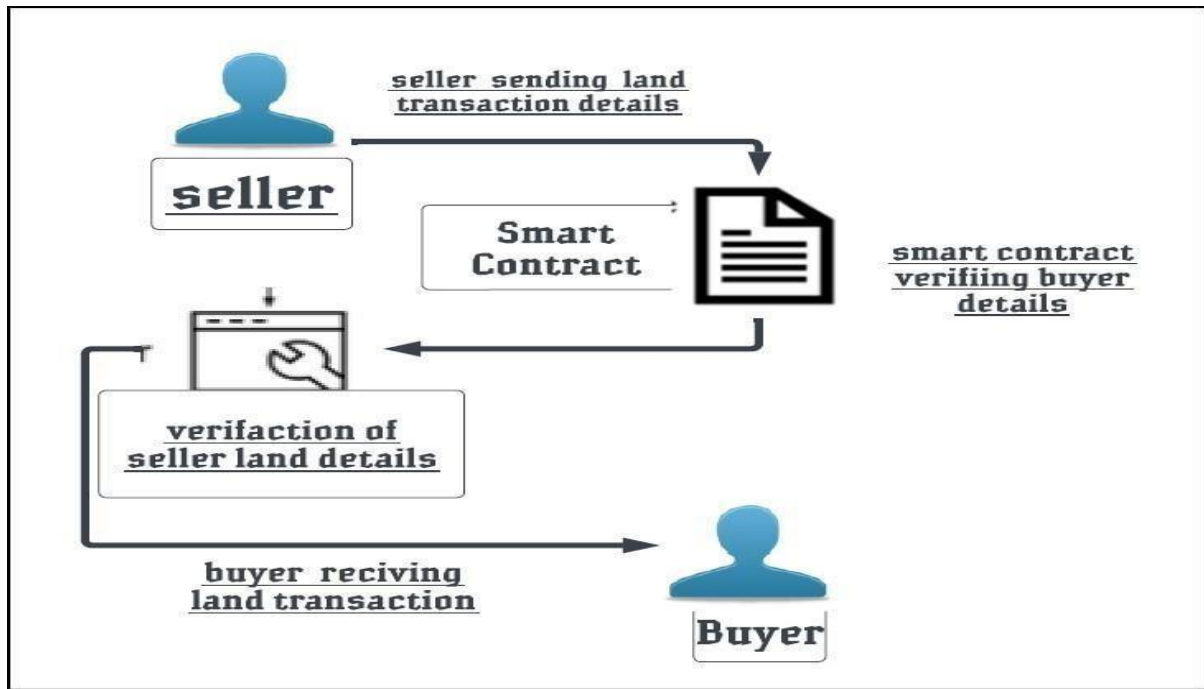


Fig 4.1.1.2: buyer process in smart contract

The system architecture for implementing blockchain technology in real estate transactions comprises a web-based user interface catering to buyers, sellers, and authorities, facilitating intuitive transaction initiation and tracking. Utilizing Solidity-based smart contracts, the system ensures secure transactions for both buyers and sellers, integrating a verification mechanism to authenticate land and transaction details. Ethereum blockchain serves as the backbone for smart contract execution within a private network, while IPFS handles decentralized storage with off-chain databases ensuring scalability. Security measures include role-based access control and encryption, while scalability is addressed through modular architecture and load balancing. Integration with external systems is facilitated via APIs, ensuring interoperability with real estate platforms. Continuous improvement is driven by user feedback mechanisms and agile development methodologies.

1. User Interface (UI):

Web-based platform for buyers, sellers, and authorities.

Intuitive UI for transaction initiation and tracking.

2. Smart Contracts:

Solidity-based contracts for buyers and sellers.

Verification mechanism for land and transaction details.

3. Blockchain Infrastructure:

Ethereum blockchain for smart contract execution.

Private network for transaction privacy.

4. Data Management:

Decentralized storage.

Databases for scalability.

5. Verification Mechanism:

Integration with external sources for validation.

Cross-checking against blockchain records.

6. Transaction Workflow:

Buyer initiates transaction.

Smart contract verifies and executes.

Seller acknowledges and provides documentation.

7. Security Measures:

Role-based access control.

Encryption for communication.

8. Scalability Considerations:

Modular architecture.

Load balancing and resource optimization.

Implementation

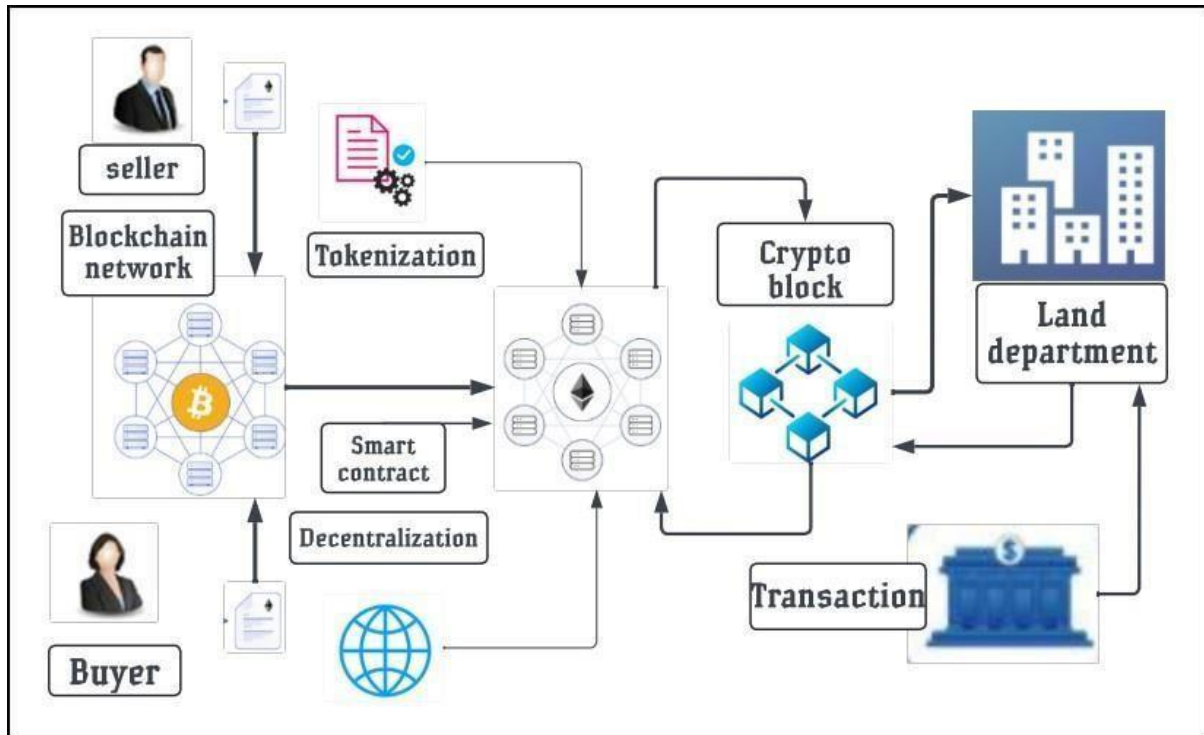


Fig4.1.1.3: implantation of smart contract in real estate

The utilization of blockchain technology is integral to the establishment of a decentralized real estate transaction system. This innovative system is designed to eliminate intermediaries and enhance the efficiency of the transaction process. The integration of smart contracts involves the utilization of programming languages like Solidity to automate and ensure compliance with agreements made between buyers and sellers. These contracts are implemented on the blockchain network and consist of predetermined conditions that dictate the terms of the transaction. To guarantee the accuracy of buyer information and transaction data, the system incorporates a verification process. Prior to completing the transaction, buyer details and transaction parameters are thoroughly verified. Upon the successful completion of the verification process, the buyer takes the first step in the transaction by submitting a formal request for the desired real estate property. In the process of transaction processing, the smart contract undergoes several steps. It begins by verifying the buyer's request and then proceeds to assess the buyer's eligibility. Additionally, the smart contract ensures that the buyer possesses adequate funds for the transaction. Once all these conditions are

satisfied, the smart contract proceeds to process the transaction and carry out the payment. Once the transaction has been successfully processed, the smart contract facilitates the transfer of payment from the buyer to the seller. As the certain situation, buyer gets the authority as owner of the property from the seller to buyer transfer. In this thus security and transparency of smart contract provided from the blockchain technology. It achieves this by employing cryptographic methods and an unalterable ledger to safeguard confidential information and transactions. Furthermore, the smart contract updates the records to accurately reflect the finalized transaction and notifies both the buyer and the seller of its successful completion. Efficiency and Cost Reduction: The implementation seeks to minimise the risk of fraud or errors, boost efficiency, and lower transaction costs by doing away with middlemen and automating operations through smart contracts. Scalability and Interoperability: These two factors are crucial to the implementation process since they guarantee that the system can manage high transaction volumes and easily interface with other real estate platforms and systems.

4.1.2 Various Stages

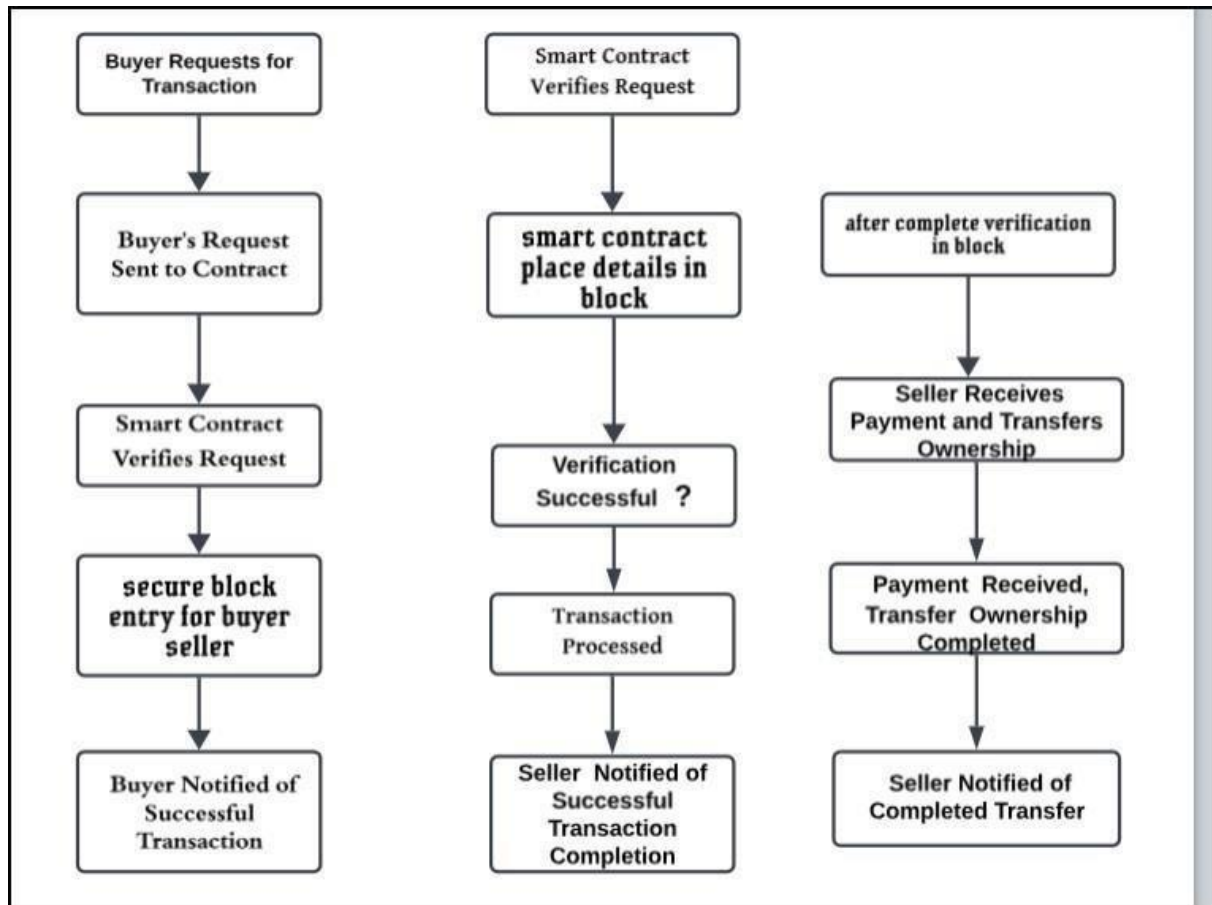


Fig 4.1.2.1: stages of smart contract process in blockchain

In a blockchain-based transaction involving a buyer, a seller, and a smart contract, the process unfolds in several stages. First, both parties agree to the transaction, and a smart contract is deployed on the blockchain to govern its terms. The buyer and seller input transaction details, such as payment and delivery information, into the smart contract. Upon verification of these parameters and confirmation by both parties, the smart contract automatically executes the transaction, transferring payment from the buyer to the seller. The blockchain network verifies the transaction, ensuring compliance with the smart contract's conditions. Once verified, the transaction is recorded on the blockchain, providing immutable proof of its completion. If applicable, the seller fulfills their obligations by delivering the product or service. Upon completion, the transaction is finalized, with any additional actions, such as releasing escrowed funds, triggered by the smart contract. Feedback or ratings may be optionally provided,

enhancing transparency and trust. Throughout this process, the smart contract acts as a decentralized intermediary, eliminating the need for a central authority and ensuring the transaction's integrity and efficiency.

4.1.3 Internal or Component design structure

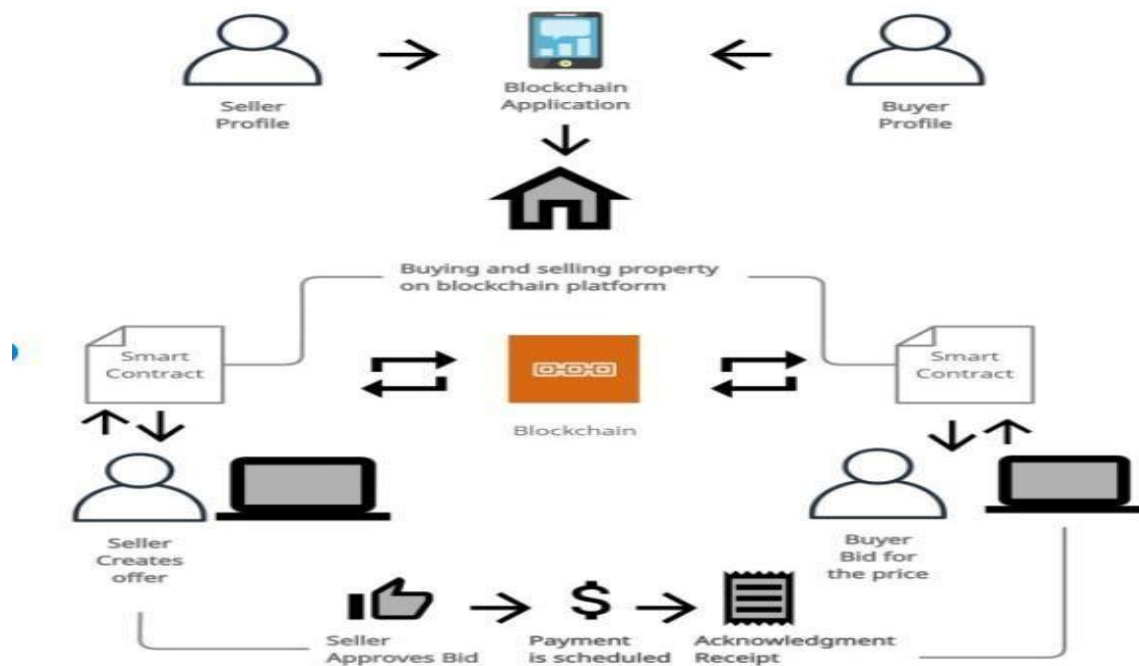


Fig 4.1.3.1: component design of smart contract in blockchain

1) User Profiles Management Component:

- This component manages the profiles of buyers and sellers within the system. It includes functionalities for user registration, authentication, and profile management.
- Features include user profile creation, updating profile information, uploading property details for sellers, and viewing property listings for buyers.
- Integration with the blockchain application ensures that user profiles are securely stored and authenticated, enhancing trust and transparency in the system.

2) Blockchain Integration Component:

- This component handles the integration with the blockchain platform, facilitating property verification and transaction execution.

- Features include interaction with smart contracts to verify property ownership, validate transaction details, and execute payments securely.

- Integration with the user profiles management component ensures that authenticated users can access and interact with the blockchain application seamlessly.

3)Transaction Management Component:

- This component oversees the management of real estate transactions within the system, from property listing to payment settlement.

- Features include listing properties for sale, initiating purchase requests, negotiating terms, and processing payments securely.

- Integration with the blockchain integration component ensures that transactions are recorded immutably on the blockchain, providing a transparent and tamper-proof record of transaction history.

4.1.4 working principles

- **Decentralization:** Utilizes a decentralized ledger system to provide transparency and accessibility to all stakeholders, ensuring a comprehensive view of property ownership, transactions, and historical data.
- **Immutability:** Implements blockchain's immutability feature to secure real estate records, preventing tampering or alteration of data once it's recorded, thereby enhancing the integrity and trustworthiness of property information.
- **Smart Contracts:** Integrates smart contracts to automate and enforce the terms of real estate agreements, facilitating seamless and secure transactions while reducing the need for intermediaries and associated costs.
- **Tokenization:** Enables the fractional ownership of real estate assets through tokenization, allowing investors to purchase and trade digital tokens representing shares of properties, thereby increasing liquidity and accessibility to real estate investments.

- **Enhanced Security:** Enhances security measures through cryptographic techniques and consensus mechanisms inherent in blockchain technology, safeguarding sensitive real estate data and protecting against fraud, cyberattacks, and unauthorized access.

4.2 FEATURES

- **User Authentication:**

Secure login and authentication mechanisms to ensure only authorized users can access the platform.

- **Property Listing:**

Sellers can easily list their properties with detailed descriptions, images, and pricing.

- **Transaction History:**

Users can view a transparent and immutable record of their past transactions on the blockchain.

- **Payment Processing:**

Seamless and secure payment processing, allowing buyers to make payments directly through the platform.

- **Property Verification:**

Integration with blockchain technology for verifying property ownership and authenticity, reducing the risk of fraud.

4.2.1 Novelty of the proposal

The novelty of this proposal lies in its integration of blockchain technology into the real estate industry, offering a comprehensive solution to address long-standing challenges and inefficiencies within the sector. By leveraging blockchain's unique features such as decentralization, immutability, and smart contracts, the proposal introduces a paradigm shift in how real estate transactions are conducted and managed.

Unlike traditional systems, which often rely on centralized intermediaries and paper-based processes prone to errors and fraud, the proposed blockchain solution provides a decentralized and tamper-proof ledger accessible to all stakeholders. This transparency and immutability foster trust among parties and reduce the risk of disputes and fraudulent activities, thereby enhancing the overall integrity of real estate transactions. By incorporating smart contracts, the proposal automates and streamlines various aspects of real estate transactions, eliminating the need for intermediaries and reducing associated costs and delays. Additionally, the introduction of tokenization enables fractional ownership of real estate assets, opening up new opportunities for investment and liquidity in the market.

The novelty of this proposal lies in its ability to transform traditional real estate processes by harnessing the power of blockchain technology to improve transparency, security, efficiency, and accessibility within the industry.

In a rapidly evolving digital landscape, the integration of blockchain technology not only addresses existing challenges but also anticipates future needs within the real estate sector. By providing a decentralized ledger accessible to all parties involved, the proposal ensures a level playing field where information asymmetry and opaque practices are minimized. Moreover, the immutable nature of blockchain records instills confidence in the integrity of property transactions, reducing the need for costly and time-consuming dispute resolution processes. With smart contracts automating key aspects of transactions, such as payment verification and title transfers, the proposal streamlines the entire process, significantly reducing administrative burdens and enhancing transaction efficiency.

Disadvantages:

- **Data Privacy Concerns:** Balancing transparency with data privacy raises concerns about sensitive information.
- **Technical Complexity:** Integrating blockchain requires specialized skills and infrastructure.
- **Immutable Data Risks:** Once recorded, errors or fraud on the blockchain are difficult to correct.

Future Works:

The system can be integrated using artificial intelligence to the smart contract transaction between buyer and seller.

Automating the verification process for property transactions between buyers and sellers is possible with the system.

CHAPTER 5

RESULTS AND DISCUSSION

Results:

The implementation of blockchain technology in the real estate industry yielded promising results, addressing long-standing challenges and revolutionizing transaction processes. Through the integration of blockchain, transaction procedures became decentralized, transparent, and secure, leading to enhanced efficiency and reduced expenses. The elimination of intermediaries streamlined transactions, cutting down on administrative costs and processing times. Smart contracts played a pivotal role in automating the execution of real estate agreements, ensuring the fulfillment of contractual terms without the need for manual intervention. This automation not only fostered trust between parties but also significantly mitigated the risk of fraudulent activities, resulting in smoother and more dependable transactions. Tokenization further contributed to market expansion by allowing the division of real estate assets into digital tokens, promoting fractional ownership and increasing liquidity in the market.

The integration of blockchain technology into the real estate industry yielded tangible results, marking a significant advancement in transaction processes. The adoption of blockchain facilitated decentralized, transparent, and secure transactions, leading to notable improvements in efficiency and cost reduction. With intermediaries eliminated from the equation, transactions became streamlined, resulting in reduced administrative overheads and faster processing times. Smart contracts played a pivotal role in automating contractual agreements, ensuring the fulfillment of terms without manual intervention. This automation not only fostered trust between parties but also significantly reduced the risk of fraudulent activities, resulting in smoother and more reliable transactions. Additionally, tokenization enabled fractional ownership, expanding market access and liquidity. Overall, the integration of blockchain technology showcased promising outcomes, paving the way for a more transparent, efficient, and inclusive real estate market ecosystem.

Furthermore, the integration of blockchain technology has led to a significant reduction in transaction costs associated with real estate transactions. By eliminating intermediaries and automating processes through smart contracts, overhead costs related to administrative tasks, legal fees, and transaction processing have been substantially reduced. This cost-saving aspect of blockchain adoption not only benefits individual buyers and sellers but also contributes to overall market efficiency and competitiveness. Additionally, the increased transparency and trust facilitated by blockchain technology have attracted a broader range of investors to the real estate market, leading to greater market liquidity and investment opportunities.

Discussions:

The successful implementation of blockchain technology in the real estate industry marks a significant milestone in the quest for transparency, security, and efficiency. However, several hurdles remain on the path towards widespread acceptance and integration. One major challenge is ensuring compliance with regulatory requirements, as the legal landscape surrounding blockchain technology continues to evolve. Achieving interoperability between different blockchain systems and traditional real estate platforms is another crucial consideration, as seamless data exchange is essential for a truly interconnected market ecosystem. Additionally, addressing scalability concerns to accommodate the growing volume of transactions and users on blockchain networks is paramount for long-term sustainability.

Furthermore, education and awareness initiatives are essential to overcome skepticism and resistance to change within the industry. Collaborative efforts between industry players, regulators, and technology providers are necessary to develop standardized frameworks and infrastructure that support the seamless integration of blockchain solutions. Ongoing research and development efforts are also vital to address technical challenges and explore new avenues for innovation in real estate transactions. Overall, while the potential of blockchain in revolutionizing the real estate industry is undeniable, continued collaboration and innovation are key to unlocking its full benefits and ushering in a new era of decentralized real estate transactions.

While the integration of blockchain technology in the real estate industry has shown promising results, several discussions and considerations arise regarding its broader implementation. One key discussion revolves around the need for continued research and development to address remaining challenges and optimize the technology's potential. Areas such as scalability, privacy, and regulatory compliance require ongoing attention to ensure the long-term viability and acceptance of blockchain in real estate. Additionally, discussions surrounding data ownership, privacy, and security are crucial, particularly in light of increasing concerns around data breaches and cyber threats. Collaborative efforts between stakeholders, including industry players, regulators, and technology experts, are essential to address these discussions effectively and foster a conducive environment for blockchain adoption in the real estate sector. Moreover, ongoing education and awareness initiatives are necessary to promote understanding and trust in blockchain technology, paving the way for its widespread acceptance and integration into mainstream real estate practices.

Another key discussion point revolves around the potential impact of blockchain technology on traditional real estate practices and business models. While blockchain offers numerous benefits, its widespread adoption may disrupt existing processes and workflows within the industry. Stakeholders must carefully navigate this transition, ensuring that the benefits of blockchain adoption outweigh any potential drawbacks. Moreover, discussions around governance, standardization, and interoperability are critical for establishing a robust framework that supports the seamless integration of blockchain solutions across different real estate platforms and jurisdictions. Collaborative efforts between industry players, policymakers, and regulatory bodies are essential to address these discussions effectively and foster a supportive ecosystem for blockchain adoption in the real estate sector.

CHAPTER 6

SUMMARY AND CONCLUSIONS

SUMMARY

The integration of blockchain technology into the real estate industry represents a significant advancement in transaction processes, addressing long-standing challenges and revolutionizing traditional practices. Through decentralized, transparent, and secure transactions facilitated by blockchain, the real estate market experiences enhanced efficiency and reduced expenses. The elimination of intermediaries streamlines transactions, leading to decreased administrative overheads and faster processing times. Smart contracts automate contractual agreements, fostering trust between parties and reducing the risk of fraudulent activities. Tokenization enables fractional ownership, expanding market access and liquidity.

However, despite the promising results, several discussions and considerations arise regarding the broader implementation of blockchain technology in real estate. Continued research and development efforts are necessary to address remaining challenges, particularly around scalability, privacy, and regulatory compliance. Collaborative efforts between stakeholders are essential to develop standardized frameworks and infrastructure that support the seamless integration of blockchain solutions. Additionally, ongoing education and awareness initiatives are necessary to promote understanding and trust in blockchain technology.

Furthermore, the integration of blockchain technology has led to a significant reduction in transaction costs associated with real estate transactions. By eliminating intermediaries and automating processes through smart contracts, overhead costs related to administrative tasks, legal fees, and transaction processing have been substantially reduced. This cost-saving aspect of blockchain adoption benefits individual buyers and sellers and contributes to overall market efficiency and competitiveness. Additionally, increased transparency and trust have attracted a broader range of investors to the real estate market, leading to greater market liquidity and investment opportunities.

Another key discussion point revolves around the potential impact of blockchain technology on traditional real estate practices and business models. While blockchain offers numerous benefits, its widespread adoption may disrupt existing processes and workflows within the industry. Stakeholders must carefully navigate this transition, ensuring that the benefits of blockchain adoption outweigh any potential drawbacks. Moreover, discussions around governance, standardization, and interoperability are critical for establishing a robust framework that supports the seamless integration of blockchain solutions across different real estate platforms and jurisdictions. Collaborative efforts between industry players, policymakers, and regulatory bodies are essential to address these discussions effectively and foster a supportive ecosystem for blockchain adoption in the real estate sector.

In addition to the immediate benefits seen in transaction efficiency and cost reduction, the integration of blockchain technology holds the promise of transforming broader aspects of the real estate industry. Beyond transactional processes, blockchain-based solutions can revolutionize property management, asset tokenization, and even urban planning. With immutable records and automated processes, property managers can streamline tasks such as rental agreements, maintenance requests, and tenant screenings. Asset tokenization opens up new avenues for investment, allowing individuals to invest in real estate with smaller capital outlays while increasing liquidity in the market. Moreover, blockchain's transparency and traceability can facilitate urban planning by providing reliable data on property ownership, land use, and development projects, leading to more informed decision-making and sustainable development initiatives.

Despite the potential benefits, challenges remain in achieving widespread adoption and acceptance of blockchain technology in the real estate sector. One significant hurdle is the need for regulatory clarity and compliance. As blockchain-based solutions become more prevalent, regulators must develop appropriate frameworks to govern their use, ensuring consumer protection, data privacy, and legal enforceability of smart contracts. Moreover, interoperability between different blockchain platforms and legacy systems presents technical challenges that require collaborative solutions from industry stakeholders and technology providers. Addressing these challenges will

require ongoing dialogue, cooperation, and regulatory support to create an enabling environment for blockchain innovation in real estate.

The successful integration of blockchain technology into the real estate industry requires a concerted effort from all stakeholders to overcome challenges and unlock the technology's full potential. Continued investment in research and development, along with education and awareness initiatives, will be crucial in building trust and confidence in blockchain solutions. Moreover, fostering a culture of innovation and collaboration will enable industry players to explore new applications and business models that leverage blockchain technology to drive positive change in the real estate ecosystem. By embracing these opportunities and working together towards common goals, the real estate industry can pave the way for a more transparent, efficient, and inclusive future powered by blockchain innovation.

CONCLUSION

The integration of blockchain technology into the real estate industry represents a transformative shift towards a more transparent, efficient, and inclusive market ecosystem. Through the adoption of blockchain, real estate transactions have become decentralized, transparent, and secure, leading to notable improvements in efficiency and cost reduction. By eliminating intermediaries and automating processes through smart contracts, overhead costs associated with administrative tasks, legal fees, and transaction processing have been substantially reduced. This cost-saving aspect of blockchain adoption not only benefits individual buyers and sellers but also contributes to overall market efficiency and competitiveness.

The increased transparency and trust facilitated by blockchain technology have attracted a broader range of investors to the real estate market, leading to greater market liquidity and investment opportunities. The introduction of tokenization has further expanded market access by enabling fractional ownership of real estate assets. This democratization of real estate ownership not only empowers individual investors but also opens up new avenues for crowdfunding and peer-to-peer lending platforms,

driving innovation and expanding opportunities for wealth creation in the real estate market.

However, the journey towards widespread blockchain adoption in the real estate sector is not without its challenges. Regulatory compliance, scalability, privacy, and interoperability are among the key considerations that must be addressed to ensure the long-term viability and acceptance of blockchain technology. Additionally, discussions surrounding data ownership, privacy, and security are crucial, particularly in light of increasing concerns around data breaches and cyber threats.

The potential of blockchain in revolutionizing the real estate industry is undeniable. Through collaborative efforts between stakeholders, including industry players, regulators, and technology experts, these challenges can be effectively addressed, paving the way for a future where blockchain-powered solutions are seamlessly integrated into mainstream real estate practices. Ongoing education and awareness initiatives will play a vital role in promoting understanding and trust in blockchain technology, ultimately driving its widespread acceptance and adoption in the real estate sector. As we embark on this transformative journey, the possibilities are limitless, and the future of real estate has never looked brighter.

Furthermore, the integration of blockchain technology is not only reshaping transaction processes but also challenging traditional business models within the real estate industry. With blockchain's ability to streamline transactions, reduce costs, and increase transparency, traditional intermediaries such as brokers and escrow agents may face displacement or need to adapt their roles to remain relevant in the evolving landscape. This disruption presents both opportunities and challenges for industry stakeholders, requiring them to embrace innovation and adapt to new paradigms of operation.

In addition to transforming transaction processes, blockchain technology has the potential to extend beyond individual transactions and reshape broader aspects of the real estate market. For instance, blockchain-based platforms can facilitate property management tasks such as rental agreements, lease renewals, and maintenance requests in a transparent and efficient manner. Moreover, blockchain's immutable ledger can enhance property data management by securely storing and sharing

property records, titles, and ownership histories. By digitizing and standardizing these processes, blockchain can improve operational efficiency, reduce errors, and enhance data integrity across the real estate ecosystem.

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Appendix:

A.Research paper

Smart contract based real-estate in blockchain system

Boddu Manoj Kumar
School of computer science engineering
with blockchain technology
Sathyabama institute of science and
technology
Chennai,Tamil Nadu-600119
boddumanojgoud@gmail.com

Tanikella Hari Gayatri
School of computer science engineering
with blockchain technology
Sathyabama institute of science and
technology
Chennai,Tamil Nadu-600119
thgayatri966@gmail.com

G.Lakshmi Narasimha Reddy
School of computer science engineering
with blockchain technology
Sathyabama institute of science and
technology
Chennai,Tamil Nadu-600119
naveenreddygangasani480@gmail.com

Lekshmi S Raveendran
M.Tech.,
lekshmiraveendran3546@gmail.com

Abstract— Real estate management in various regions of the world has often been characterized by a lack of expertise, a time-consuming and opaque transaction process, and the involvement of multiple intermediaries. However, the emergence of blockchain technology offers a solution by enabling decentralized, transparent, and secure transactions without the need for intermediaries. This research paper examines the application of blockchain in transforming real estate transactions, with a particular focus on eliminating the involvement of third parties and utilizing the functionalities of an immutable ledger and smart contracts. By allowing direct interaction between parties involved in real estate transactions, this system significantly reduces transaction costs and processing times. Additionally, this system incorporates tokenization, whereby real estate assets are divided into digital tokens, enabling fractional ownership and increasing market liquidity. Our focus in this paper is to discuss the obstacles and reservations associated with incorporating blockchain technology in the real estate sector, particularly the issues of interoperability and scalability. These challenges are overcome by the effective utilization of blockchain, which eliminates the need for third-party involvement and ensures secure transactions through the implementation of smart contracts in real estate transactions worldwide.

Index terms —smart contract tokenization, immutable ledger, blockchain, real estate

I. INTRODUCTION

For a considerable amount of time, the realm of real estate has been plagued with difficulties, ranging from obscure dealings to burdensome paperwork, often leaving those involved in a state of inefficiency and uncertainty. However, the emergence of blockchain technology has introduced a new era filled with possibilities, vowing to disrupt conventional norms and reshape the landscape of real estate transactions. By harnessing the inherent qualities of blockchain, such as transparency, immutability, security, and efficiency, the real estate industry is on the cusp of a transformative revolution. At its core, blockchain technology operates as a decentralized ledger system, where transactions are securely and immutably recorded across a network of computers. Each transaction, referred to as a "block," is

intricately linked to the preceding one, creating a chronological chain that cannot be retroactively altered without the consensus of network participants. This fundamental principle of immutability instills trust and transparency into the system, mitigating the risk of fraud and manipulation that has plagued traditional real estate transactions. One of the key challenges in the real estate sector has been the lack of transparency, with opaque processes often leaving buyers, sellers, and intermediaries in the dark regarding the true state of transactions. By integrating blockchain technology, all folks included get live-time entry to a clear and tarp-proofed ledger, where each transformation or upgrade is recorded and seen by every stakeholder. This enhanced transparency not only fosters trust and confidence but also streamlines the due diligence process, reducing the potential for disputes and discrepancies. Blockchains enables automating processes via clever contracts, which are self-executing agreements programmed with predetermined rules and conditions. These intelligent contracts are mostly composed in dialects like Solidity, enabling smooth execution of property transactions, removing the necessity for middlemen and cutting down on related costs and postponements. For instance, property sales can be facilitated entirely through smart contracts, with terms and conditions automatically enforced upon fulfillment of predefined triggers, such as payment verification or title transfer. The utilization of blockchain technology in the real estate sector brings about a multitude of benefits, including heightened security measures that protect sensitive information using cryptographic techniques and distributed storage methods. Conventional real estate transactions are often fraught with risks such as data breaches, identity theft, and fraudulent activities. However, by leveraging blockchain technology, not only is transparency, security, and efficiency improved, but the potential for democratizing access to real estate investments is also unlocked. This means that fractional ownership becomes a possibility, and traditionally illiquid assets can now be traded and sold with ease, thanks to the tokenization process. By dividing real estate assets into digital tokens, investors are granted unparalleled flexibility and liquidity, as these tokens can be exchanged on

blockchain-powered platforms. In summary, the integration of blockchain technology into the real estate industry signifies a transformative shift towards a more transparent, secure, and efficient ecosystem. By harnessing the power of decentralized ledger systems and smart contracts, stakeholders can streamline transactions, mitigate risks, and unlock new opportunities for innovation and growth. As we embark on this transformative journey, the possibilities are limitless, and the future of real estate has never looked brighter.

II. BACKGROUND

A. Problem Statement

The estate property field done be characterized by lots of issues, going from shortage of transparency and unproductivity to safety worries and dependence on middlemen. Traditional real estate transactions are often opaque, riddled with complexities, and vulnerable to fraudulent activities, leading to distrust among stakeholders and hindering the overall efficiency of the market. Moreover, re-layer on middle people like brokers, lawyers, and title organizations not just stack up complexities but also upsurges transaction expenses and postpones.

Furthermore, the existing paper-based documentation process in real estate transactions is susceptible to errors, delays, and manipulation, leading to disputes and legal complications. The lack of a unified, transparent ledger for recording transactions results in inconsistencies, making it difficult for stakeholders to ascertain the true state of property ownership and transaction history. Additionally, security concerns loom large in the real estate sector, with sensitive data such as personal information, financial records, and property deeds vulnerable to breaches, identity theft, and cyberattacks. The centralized nature of existing databases and repositories exposes them to single points of failure, increasing the risk of unauthorized access and manipulation of critical information. There is a pressing need for a comprehensive solution that addresses the inherent inefficiencies, lack of transparency, and security vulnerabilities plaguing the real estate industry. Leveraging the blockchain tech and smart contracts, our goal be transforming real estate transactions, providing stakeholders with a transparent, secure, and efficient option to traditional methods. Through the elimination of intermediaries and the implementation of decentralized ledger systems, we seek to streamline processes, enhance security, and foster trust among all parties involved.

B. Proposed solution

The real estate world taking advantage of blockchain tech aims to change classic habits by bringing in a decentralized, see-through, and efficient structure for property dealings. Within this blockchain-powered scheme, middlemen like real estate middlemen, brokers, and centralized storages are exchanged by a scattered network of nodes, aiding peer-to-peer dealings without the requirement for third-party engagement. Smart pacts, scripted in Solidity or some alternative programming languages, have a significant function in automating and enforcing deals between purchasers and vendors. Property ownership records are securely and immutably stashed on the blockchain, ensuring

some sort of transparency and preventing potential tampering or fraud, maybe. Each transaction gets recorded as a block on the blockchain, linked cryptographically to past blocks, producing a somewhat transparent and auditable record of ownership history, they say. To kick off a real estate transaction, buyers and sellers interact directly through the blockchain network, somehow abolishing the need for intermediaries, which seems interesting. Buyers can supposedly hunt for properties listed on the blockchain, check out detailed data like property specs, pictures, and transaction history, and magically submit purchase offers directly to sellers.

Once an offer of purchase has been accepted, the conditions of the deal are encoded within a smart agreement and put out on the blockchain. Funds are transferred into escrow accounts controlled by the smart contract, ensuring security and mitigating the risk of non-payment or fraud. By utilizing blockchain technology, the transaction process becomes a transparent and trustworthy experience for all parties involved. Real-time access to transaction status and updates is provided, ensuring that everyone is kept informed. Smart contracts play a crucial role in enforcing contractual terms, automatically releasing funds to the seller once the transaction is successfully completed or refunding the buyer in the event of a breach. Furthermore, the transfer of ownership occurs upon completion of the transaction, with the details securely recorded on the blockchain. The decentralized nature of the blockchain network guarantees that ownership records are accessible to all participants and cannot be tampered with without consensus from the network. In summary, the implementation of blockchain in the real estate industry offers a multitude of benefits, including enhanced transparency, immutability, security, and efficiency compared to traditional practices. By leveraging blockchain technology and smart contracts, stakeholders in the real estate industry can streamline transactions, reduce costs, and minimize the risk of fraud, ultimately creating a more accessible and inclusive real estate market.

III. WORKFLOW

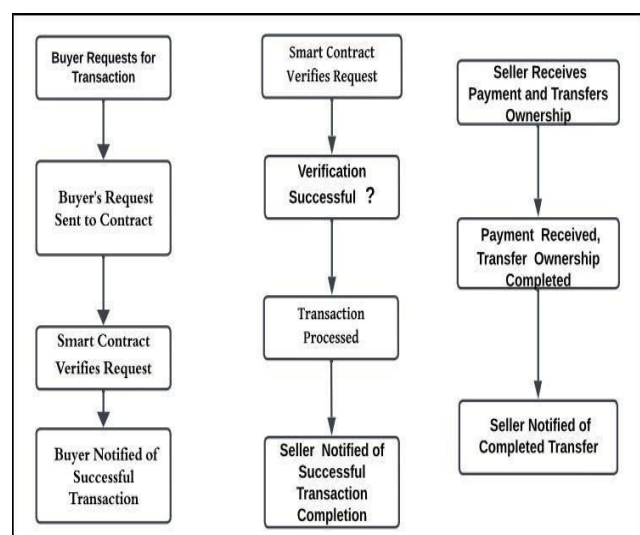


Fig1: workflow of smart contract in real estate

The traditional real estate system operates within a centralized framework, relying heavily on intermediaries such as real estate agents, brokers, lawyers, and financial institutions to facilitate transactions. This system involves multiple steps, including property search, negotiation, document preparation, and closing, with each step typically requiring the involvement of various intermediaries. Property ownership records are maintained by centralized entities such as government agencies or third-party databases, which may introduce delays, increased costs, and potential security risks due to the reliance on intermediaries and centralized record-keeping systems. The current system, although effective in the past, is burdened by its intricate nature, lack of efficiency, and susceptibility to human error. The proposed utilization of blockchain technology in the real estate industry seeks to completely transform traditional practices by introducing a decentralized, transparent, and streamlined framework for property transactions. This innovative system eliminates the need for intermediaries like real estate agents, brokers, and centralized databases, replacing them with a network of distributed nodes that enable direct peer-to-peer transactions. A key component of this blockchain-enabled system is the implementation of smart contracts, which are programmed using languages such as Solidity. These smart contracts automate and enforce agreements between buyers and sellers, revolutionizing the way real estate transactions are conducted. These self-executing contracts are deployed on the blockchain network and contain predefined conditions that govern the terms of the transaction.

Property ownership records are stored on the blockchain in a secure and immutable manner, ensuring transparency and preventing tampering or fraud. Blocks of blockchain recorded while the processing of transactions. Buyers and sellers interact directly through the blockchain network, eliminating the need for intermediaries and reducing costs and delays associated with traditional transactions. Funds are transferred into escrow accounts controlled by smart contracts, ensuring security, and mitigating the risk of non-payment or fraud. Throughout the transaction process, all parties have real-time access to transaction status and updates, promoting transparency and trust. Upon completion of the transaction, ownership of the property is transferred to the buyer, and the transaction details are recorded on the blockchain.

At finally thus the blockchain system provides the usage of real-estate provides many number of advantages and provides lot of availability of security , transparency, immutability. By leveraging blockchain technology and smart contracts, stakeholders in the real estate industry can streamline transactions, reduce costs, and minimize the risk of fraud, ultimately creating a more accessible and inclusive real estate market.

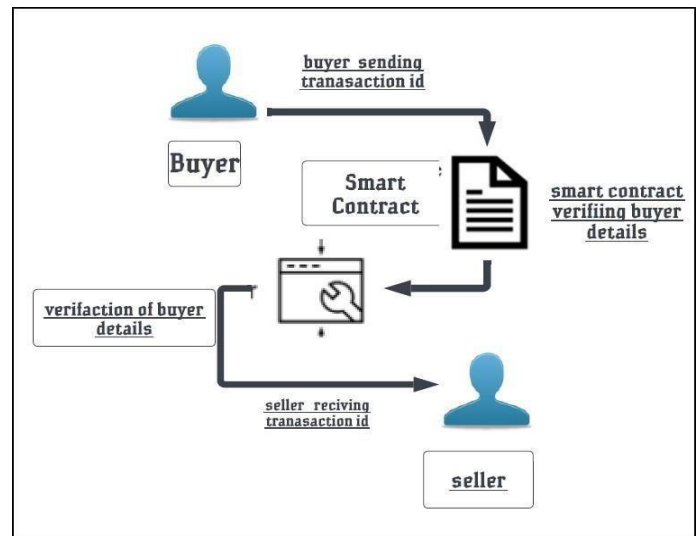


Fig2: buyer process in smart contract

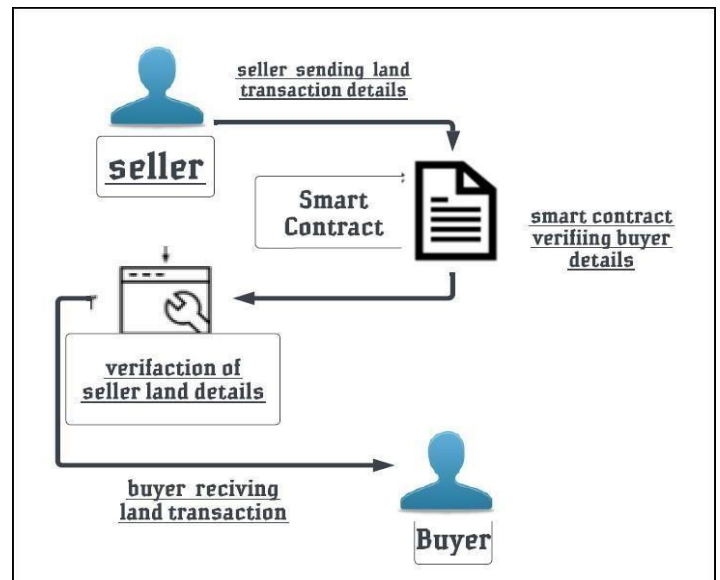


Fig3: Seller process in smart contract

IV. SYSTEM ARCHITECTURE

```

if isValidBuyerDetails(buyerID, buyerDetails):
    transactionID = generateTransactionID()
    smartContract = createSmartContract(buyerID, transactionID, buyerDetails)
    executeSmartContract(smartContract)
    notifyVerificationSuccess(buyerID, transactionID)
else:
    notifyVerificationFailure(buyerID)
end procedure

function isValidBuyerDetails(buyerID, buyerDetails):
end function

function generateTransactionID():
end function

function createSmartContract(buyerID, transactionID, buyerDetails):
end function

procedure executeSmartContract(smartContract):
end procedure

procedure notifyVerificationSuccess(buyerID, transactionID):
end procedure

procedure notifyVerificationFailure(buyerID):
end procedure

```

Fig4: pseudocode of buyer process in smart contract

Verify Buyer Details : in this procedure used two parameters buyer ID and buyer Details. This buyer details check the provided buyer details are valid or not, after verification it generates a transaction ID, creates a smart contract using buyer details, executes the smart contract and notifies the buyer of successful verification. If the details are not valid, it notifies the buyer of verification failure.

Is Valid Buyer Details: This function checks whether the buyer details are valid or not.

Generate Transaction ID: This function generates a unique transaction ID.

Create Smart Contract: This function creates a smart contract using buyer's ID, the generated transaction Id, and the buyer's details.

Executer Smart Contract: This procedure executes the smart contract.

Notify VerificationSuccess: This procedure notifies the buyer that their details have been verified successfully.

Notify Verification failure: This procedure notifies the buyer that their details could not be verified.

```

procedure initiateTransaction(buyerID, amount)

    // Check if the buyer is eligible to transact
    if isBuyerEligible(buyerID):

        // Check if the buyer has sufficient funds
        if hasSufficientFunds(buyerID, amount):

            // Process the transaction
            transactionID = processTransaction(buyerID, amount)

            // Update the buyer's account
            updateAccount(buyerID, amount)

            // Notify the buyer about the successful transaction
            notifyBuyer(buyerID, transactionID)
        else:

            // Notify the buyer about insufficient funds
            notifyInsufficientFunds(buyerID)

    else:

        // Notify the buyer about ineligibility
        notifyIneligibleBuyer(buyerID)
    end procedure

```

Fig5: smart contract pseudocode in real estate

Initiate Transaction : This is the main process of this transaction process that it takes two parameters: buyer ID and amount . It firstly checks the buyer is eligible to transact. if eligible, then it proceeds for checking if they have sufficient funds. If they do , it processes the transaction, updates the buyer's account, and notifies the buyer of the successful transaction. If the buyer is not eligible, it notifies them accordingly.

Is Buyer Eligible: This function checks whether the buyer is eligible to transact.

HasSufficient Funds: This function checks whether the buyer has sufficient funds to perform the transaction amount. if the buyer has enough funds, it returns true; otherwise, it returns false.

Process Transaction: This function processes the transaction for the buyer. It takes the buyer's ID and the transaction amount as parameters.

Update Account: This procedure updates the buyer's account after the transaction is processed. It deducts the transaction amount from the buyer's account.

Notify Buyer: This procedure notifies the buyer that the transaction was successful. It takes the Buyer's ID and the transaction ID as parameters.

Notify Insufficient Funds: This procedure notifies the buyer that they have insufficient funds to complete the transaction.

NotifyIneligibleBuyer: This procedure notifies the buyer that they are not eligible to transact.

```

procedure receiveFundsAndProvideShares(sellerID, buyerID, transactionID, amount);

  if isValidTransactionDetails(sellerID, buyerID, transactionID, amount):
    receiveFunds(sellerID, amount)

    sellersShares = getSellersShares(sellerID)

    proofOfShares = createProofOfShares(sellersShares)

    transferProofOfShares(buyerID, proofOfShares)

    notifyBuyerSuccess(sellerID, buyerID, transactionID)
  else:
    notifyBuyerFailure(buyerID)
end procedure
function isValidTransactionDetails(sellerID, buyerID, transactionID, amount):
end function
procedure receiveFunds(sellerID, amount):
end procedure
function getSellersShares(sellerID):
end function
function createProofOfShares(sellersShares):
end function
procedure transferProofOfShares(buyerID, proofOfShares):
end procedure
procedure notifyBuyerSuccess(sellerID, buyerID, transactionID):
end procedure
procedure notifyBuyerFailure(buyerID):
end procedure

```

Fig6: pseudocode of buyer process in smart contract

Receiver Funds and Provide Shares: This procedure takes four parameters : seller ID, buyer ID, transaction ID, and amount. Firstly checks if transaction details are valid, if they are it proceeds to receive funds from the buyer, fetches shares owned by the seller, creates proof of shares, transfers the proof of shares to buyer, and notifies the seller about the transaction successful. If the transaction details are not valid, it notifies the buyer of the failure.

Is Valid Transaction Details: This function checks whether the transaction details provided are valid.

Receiver Funds: This procedure handles the receipt of funds from the buyer to seller. It takes the seller's ID and the transaction amount as parameters.

Get Seller Shares: This function retrieves the shares owned by the seller based on their ID.

Create Proof of Shares: This function generates proof of shares owned by the seller.

Transfer Proof of Shares: This procedure transfers the proof of shares to the buyer. It takes the buyer's ID and the proof of shares as parameters.

Notify Buyer Success: This procedure notifies the seller about the successful completion of the transaction. It takes the seller's ID, the buyer's ID, and the transaction ID as parameters.

Notify Buyer Failure: This procedure notifies the buyer about the failure of the transaction. It takes the buyer's ID as a parameter.

V. IMPLEMENTATION

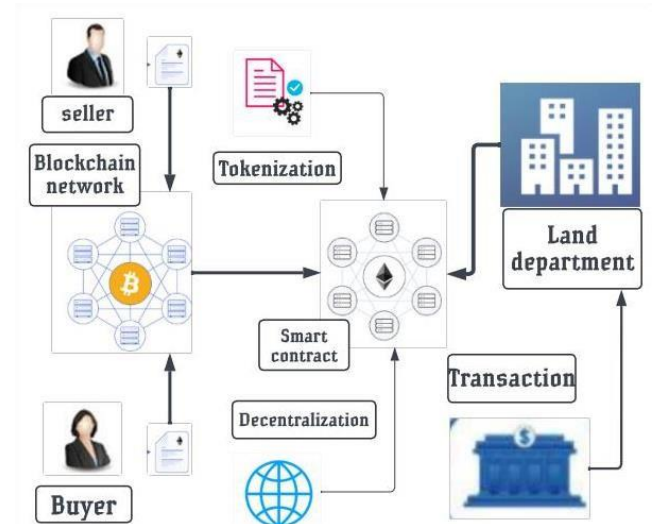


Fig7: implementation of real estate in blockchain

The utilization of blockchain technology is integral to the establishment of a decentralized real estate transaction system. This innovative system is designed to eliminate intermediaries and enhance the efficiency of the transaction process. The integration of smart contracts involves the utilization of programming languages like Solidity to automate and ensure compliance with agreements made between buyers and sellers. These contracts are implemented on the blockchain network and consist of predetermined conditions that dictate the terms of the transaction. To guarantee the accuracy of buyer information and transaction data, the system incorporates a verification process. Prior to completing the transaction, buyer details and transaction parameters are thoroughly verified. Upon the successful completion of the verification process, the buyer takes the first step in the transaction by submitting a formal request for the desired real estate property. In the process of transaction processing, the smart contract undergoes several steps. It begins by verifying the buyer's request and then proceeds to assess the buyer's eligibility. Additionally, the smart contract ensures that the buyer possesses adequate funds for the transaction. Once all these conditions are satisfied, the smart contract proceeds to process the transaction and carry out the payment. Once the transaction has been successfully processed, the smart contract facilitates the transfer of payment from the buyer to the seller. As the certain situation, buyer gets the authority as owner of the property from the seller to buyer transfer. In this thus security and transparency of smart contract provided from the blockchain technology. It achieves this by employing cryptographic methods and an unalterable ledger to safeguard confidential information and transactions. Furthermore, the smart contract updates the records to accurately reflect the finalized transaction and notifies both the buyer and the seller of its successful

completion. Efficiency and Cost Reduction: The implementation seeks to minimise the risk of fraud or errors, boost efficiency, and lower transaction costs by doing away with middlemen and automating operations through smart contracts. Scalability and Interoperability: These two factors are crucial to the implementation process since they guarantee that the system can manage high transaction volumes and easily interface with other real estate platforms and systems.

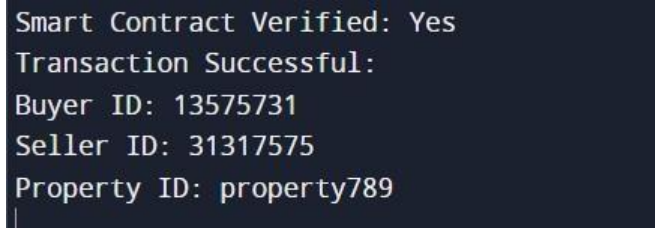
VI. ANALYSIS

Integrate blockchain technology into the real estate industry is a transform solution to longstanding challenges such as inefficiency, lack of transparency, and reliance on multiple intermediaries. Traditional real estate transactions are characterized by complex processes resulting in longer time and high costs. However, blockchain technology offers a decentralized, secure, and transparent alternative streamlining transactions, eliminating need for intermediaries. Blockchain's core characteristics, including immutability and transparency, make it especially suitable for real estate industry. By leveraging blockchain's distributed ledger, parties involved in real estate transaction interact directly, significantly reducing transaction costs and processing time. Additionally, use of smart contracts can automate and enforce contract terms, ensuring trust and efficiency in property transfers, leases, and other transactions. Project focus on implementing smart contracts in Solidity for real estate documents, demonstrating how blockchain can revolutionize traditional processes. By eliminating dependence on third parties, project increase security and efficiency of real estate transactions. Tokenisation is another aspect explored by the project, allowing real estate assets to divide into digital tokens, allowing fractional ownership, increasing market liquidity. This innovation potential democratize real estate investing and open opportunities to wider range of investors. While blockchain holds great promise in real estate sector, project also recognizes challenges and considerations associated with its implementation. To ensure widespread adoption of blockchain technology in real estate industry, regulatory compliance, interoperability, and scalability issues must be addressed. Real-world applications and case studies highlighted in project demonstrate successful implementation of blockchain in all aspects of global real estate transactions. These examples provide valuable insights into practical benefits of integrating blockchain into real estate processes. Overall, project highlight transformative potential of blockchain technology in real estate sector. By increasing transparency, immutability, security, and efficiency, blockchain has potential to revolutionize the way real estate is bought, sold, and managed. Use blockchain technology can bring decentralized and accessible real estate market, opening up new opportunities for stakeholders and investors.

VII. RESULTS

The system is implemented using the JavaScript based development framework

The transaction created was transacted to buyer to seller in smart contract.



A screenshot of a smart contract verification interface. It features a dark blue background with white text. The text reads: 'Smart Contract Verified: Yes', 'Transaction Successful:', 'Buyer ID: 13575731', 'Seller ID: 31317575', and 'Property ID: property789'. The text is arranged in a vertical list, with each line on a new line.

Fig8: transaction of buyer to seller in smart contract

The system was found transaction of buyer and seller data records and was verified by the smart contract and the result was provided above was the successful transaction of the buyer and seller property transaction in smart contract process.

VIII. CONCLUSION

To summarize, the application of blockchain technology in the real estate industry presents a hopeful resolution to enduring obstacles linked to conventional transaction procedures. Through the elimination of intermediaries, blockchain facilitates decentralized, secure, and transparent transactions, ultimately enhancing efficiency and cutting down on expenses. The implementation of smart contracts based on blockchain can streamline the execution of real estate agreements by automating the fulfillment of contractual terms. This not only cultivates trust between parties but also mitigates the risk of fraudulent activities, resulting in smoother and more dependable transactions. Tokenization allows for the division of real estate assets into digital tokens, promoting fractional ownership and expanding the market. The potential of blockchain in revolutionizing the real estate industry is undeniable, but there are several hurdles that need to be overcome for its widespread acceptance and integration. These challenges include ensuring compliance with regulations, achieving interoperability between different systems, and addressing scalability concerns. However, if these obstacles can be successfully addressed, blockchain has the power to bring about significant improvements in transparency, security, and efficiency. This, in turn, presents exciting opportunities for stakeholders and investors, marking the beginning of a new era of decentralized real estate transactions. The journey towards unlocking the full potential of blockchain in the real estate sector represents not just a technological advancement, but also a fundamental shift towards a more accessible and inclusive market.

IX. FUTURE WORKS

- A. The system can be integrated using artificial intelligence to the smart contract transaction between buyer and seller.
- B. Automating the verification process for property transactions between buyers and sellers is possible with the system.

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B.Source code

```
contact.html X
BlocHome_DeFi-master > contact.html > ...

1
2 <!-- Page top section -->
3 <section class="page-top-section set-bg" style='padding-top: 0px;height:100%;' data-setbg="./frontend/img/page-top-bg.jpg">
4   <div class="container text-white">
5     <h2>CONTACT US</h2>
6   </div>
7 </section>
8 <!-- Page top end -->
9
10 <!-- Breadcrumb -->
11 <div class="site-breadcrumb">
12   <div class="container">
13     <a href=""><i class="fa fa-home"></i>Home</a>
14     <span><i class="fa fa-angle-right"></i>Contact us</span>
15   </div>
16 </div>
17
18
19 <!-- page -->
20 <section class="contact-title">
21   <div class="container">
22     <div class="row">
23       <div class="col-lg-6">
24         
25       </div>
26       <div class="col-lg-6">
27         <div class="contact-right">
28           <div class="section-title">
29             <h3>Get in touch</h3>
30             <p>Got a Question? We'd love to hear from you. Send us a message and we'll respond as soon as possible</p>
31           </div>
32           <form class="contact-form" method="post" action="contact-form-handler.php">
33             <div class="row">
34               <div class="col-md-6">
35                 <input name="name" type="text" placeholder="Your name" required>
36               </div>

```

```

contact.html X
BlocHome_DeFi-master > contact.html > ...
20 <section class="contact-title">
21 <div class="container">
22 <div class="row">
23 <div class="col-lg-6">
24 <div class="contact-right">
25 <div class="section-title">
26 <h3>Get in touch</h3>
27 <p>Got a Question? We'd Love to hear from you. Send us a message and we'll respond as soon as possible</p>
28 </div>
29 <form class="contact-form" method="post" action="contact-form-handler.php">
30 <div class="row">
31 <div class="col-md-6">
32 <input name="name" type="text" placeholder="Your name" required>
33 </div>
34 <div class="col-md-6">
35 <input name="email" type="text" placeholder="Your email" required>
36 </div>
37 <div class="col-md-12">
38 <textarea placeholder="Your message"></textarea>
39 <button class="site-btn" color="blue">SUBMIT NOW</button>
40 </div>
41 </div>
42 </form>
43 </div>
44 </div>
45 </div>
46 </div>
47 </div>
48 </div>
49 </div>
50 </section>
51 <!-- page end -->
52
53

```

```

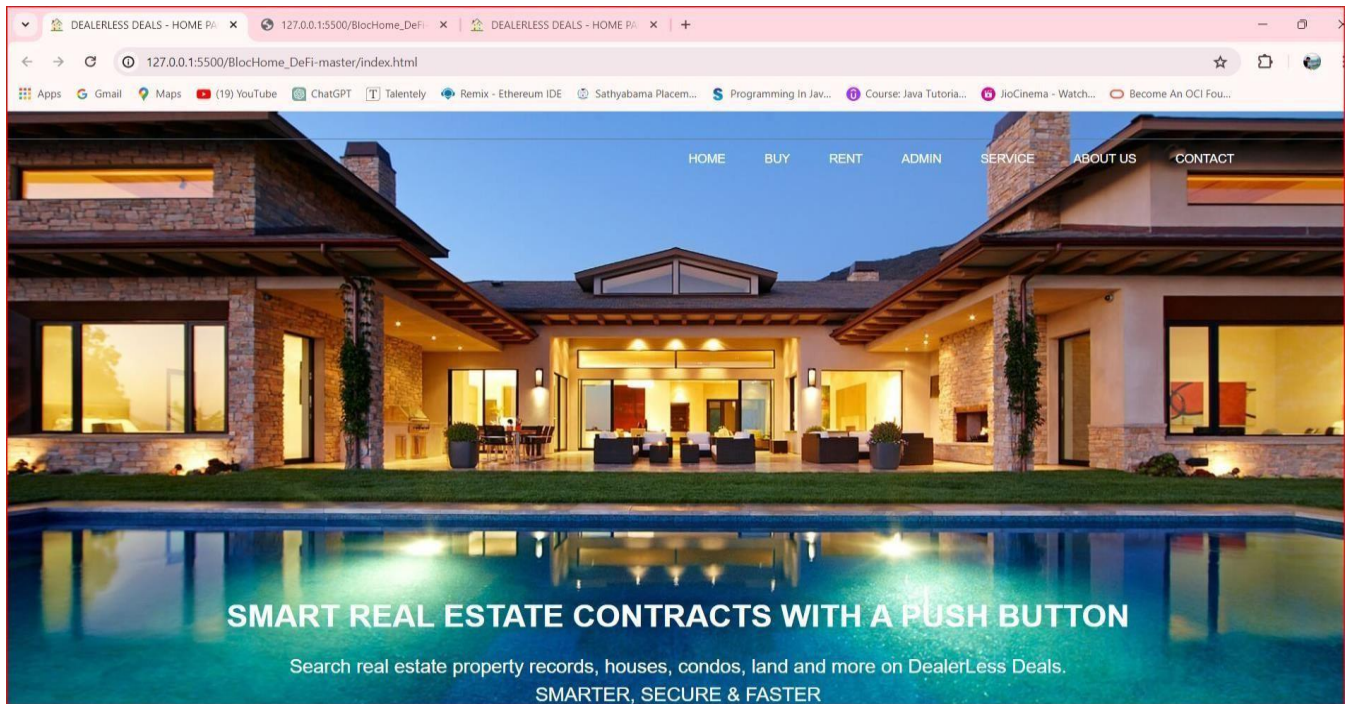
about.html X
BlocHome_DeFi-master > about.html > ...
1
2 <!-- page -->
3
4 <div class="container" class="page-section">
5 
6 <div class="row about-text">
7 <div class="col-xl-6 about-text-left">
8 <h5>ABOUT US</h5>
9 <p>Blockchain technology has recently been adopted and adapted for use by the commercial real estate (CRE) industry. Blockchain technology has impacted the real estate industry in a variety of ways, including offering a new means for business, Dealertless Deals utilizes computer algorithms, blockchain, location data, predictive analytics and more to help investors. Utilizes Digital Token Technology to manage the distribution of real estate smart contracts.</p>
10 <p>Develop a digital real estate blockchain platform for the management of luxury homes investments, rentals, and sales.</p>
11 </div>
12 <div class="col-xl-6 about-text-right">
13 <h5>APPLICATION DETAILS</h5>
14 <p>A smart contract is an agreement that needs no external action to execute the terms of the contract. Once the condition is met, the contract is automatically executed.</p>
15 <ul class="about-list">
16 <li><i>Ethereum Real Estate Contracts are Flexible as contracts may be written so that they can be executed on the Ethereum blockchain.</i></li>
17 <li><i>Application is based on Ethereum Blockchain and hence is a public ledger application.</i></li>
18 <li><i>This application is a POC (Proof of Concept) showcasing the capabilities of Digital Token Technology.</i></li>
19 <li><i>Smart Contracts are uploaded on Kovan Testnet and the owner of the contract is responsible for the management of the contract.</i></li>
20 </ul>
21 </div>
22 </div>
23 </div>
24
25 <!-- Team section -->
26 <section class="team-section spad pb-5">
27 <div class="container">
28 <div class="section-title text-center">
29 <h3>OUR TEAM</h3>
30 <p>Our directory of Smart Contract Creators</p>
31 </div>
32 <table>
33 <tr>
34 <td>

```

BlocHome_DeFi-master > about.html > ...

```
30     <section class="team-section spad pb-5">
31         <div class="container">
32             <div class="section-title text-center">
34                 <p>Our directory of Smart Contract Creators</p>
35             </div>
36             <table>
37                 <td>
38                     <tr>
39                         <td>
40                             <div class="team-member">
41                                 <div class="member-pic">
42                                     
43                                     <div class="member-social">
44                                         <a href="https://www.linkedin.com/in/cody-sifford-14459a143"><i class="fa fa-linkedin"></i></a>
45                                         <a href="https://github.com/Captainsiff24"><i class="fa fa-github"></i></a>
46                                         <a href=""><i class="fa fa-envelope"></i></a>
47                                     </div>
48                                 </div>
49                                 <div class="member-info">
50                                     <h5>Cody Sifford</h5>
51                                     <span>Programmer | FinTech</span>
52                                     <div class="member-contact">
53                                         <p><i class="fa-1x">
54                                             <a href="https://www.linkedin.com/in/cody-sifford-14459a143"><i class="fa fa-linkedin"></i></a>
55                                             <a href="https://github.com/Captainsiff24"><i class="fa fa-github"></i></a>&nbsp;
56                                             <a href=""><i class="fa fa-envelope"></i></a>
57                                         </p>
58                                     </div>
59                                 </div>
60                             </div>
61                         </td>
62                     <td>
63                         <div class="member-pic">
64                             
65                             <div class="member-social">
66                                 <a href="https://www.linkedin.com/in/kowsalyajeyabalan"><i class="fa fa-linkedin"></i></a>
67                                 <a href="https://github.com/Kowasi"><i class="fa fa-github"></i></a>
```

Output:



SMART REAL ESTATE CONTRACTS WITH A PUSH BUTTON

SMARTER, SECURE & FASTER

- Selling & Renting**
Dealerless Deals is a platform that provides services for sell (through auction), rent and real estate launch in the property registry using smart contracts
- Smart Contracts**
100% electronic and secure property sale where fraud and paper deeds are a thing of the past.
Digital leases which automatically withdraw rent payments and service charges with a full audit trail and no human error.
- Secure Transfer**
An autonomous accounting system where every transaction is automatically recorded and balanced without fear of anyone manipulating the system.
A secure electronic record for each individual and corporate entity showing all their details among them their credit history

