EasyChair Preprint

№ 12864

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April 1, 2024

SMART LAND REGISTRATION SYSTEM USING BLOCKCHAIN

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ABSTRACT

The traditional land registration system in India, there is a middleman (broker) who connects property buyers and sellers. This broker gathers all the necessary physical documents for the property agreement and ensures that the property is registered with a government office. However, this system has flaws as documents can be lost or tampered with easily, leading to potential fraud. To improve this process, we propose a new system using blockchain technology, specifically Hyperledger. Instead of relying on physical documents and intermediaries, we suggest using smart contracts. These contracts are like digital agreements that are highly secure and transparent. They eliminate the risk of document loss or tampering and reduce the chances of corruption or fraud during property transactions. In simple terms, our blockchain-based land registration system offers a safer and more efficient way to buy and sell property by using digital contracts that ensure transparency and security.

KEYWORDS : SHA, HTTPS, POW, SQL, DeFi, NFT

1.1 INTRODUCTION

1] What is Blockchain -

Blockchain is a distributed ledger technology that underlies cryptocurrencies like Bitcoin but has many other potential applications beyond digital currencies. At its core, a blockchain is a decentralized and secure digital database that records transactions across multiple computers in a way that ensures the integrity and immutability of the data.

1.1 Centralized Blockchain - In this type of Blockchain, control stays with the central authority. Third parties are involved; they are more prone to hacks and data leaks. The maintenance fees are high; the users are people within the network. There are many web services which includes YouTube, a mobile app store, banking accounts regulated in a central network, and data transactions that happen through third-party authority.

1.2 Decentralized Blockchain - In this type of Blockchain, control stays within the user itself. There is no centralized organization in the network. There is no participation of other third parties. All the users have access to the system. This type of Blockchain is less prone to hacks, and their only one point for a single failure. Anyone can access the network, which is difficult to use and involves fewer maintenance fees.

1.3 Distributed Blockchain - A distributed network is very identical to a decentralized network because it does not require centralized organization. It is used to describe geographically distributed networks. The particular operations by which a network votes and builds conclusions is dependent on the network's consensus mechanism. They have high speed, scalability, enhanced transparency and extreme tolerance.

1.3.1 Public Blockchain - The first type of Blockchain is public Blockchain. This is the Blockchain where cryptocurrencies like bitcoin developed and helped make hype in distributed ledger technology. This pulls out the problems with centralization, including less security and liquidity. A public blockchain is open to everyone. A person with good internet and hardware can participate in this. It is a type of decentralized blockchain .

1.3.2 Private Blockchain - In the public Blockchain, only selected nodes can participate in the process, making the process more secure, and these blockchains are not decentralized. This is a closed network, and only authorized users can access it. Less number of users are allowed to use these networks within organizations.

1.3.3 Hybrid Blockchain - It is the combination of both public and private Blockchain, where the company manages some parts, and the other is visible to everyone. Both permission-based and permissionless systems are used. Here users can access the data by using a smart contract.

2] Current Land Registration System:

The land registration system in India involves a combination of manual and computerized processes, with some variations in procedures between states and union territories. It's important to note that these processes may have evolved or changed since then, as the Indian government has been working on digitization and modernization efforts in various sectors, including land registration.

Below is a general overview of the land registration system in India:

Sub-Registrar Offices: Land registration in India is typically done through Sub-Registrar Offices, which are government offices responsible for maintaining records related to property transactions. Each Sub-Registrar Office covers a specific jurisdiction.

Documents Required: To register a property, buyers and sellers are required to provide various documents, including sale deed, property documents, identity and address proofs, PAN card, and passport-sized photographs.

Stamp Duty and Registration Fees: Property transactions also involve the payment of stamp duty and registration fees. These charges vary from state to state and are calculated based on the property's value or the transaction amount. Payment of these fees is mandatory for legal validity.

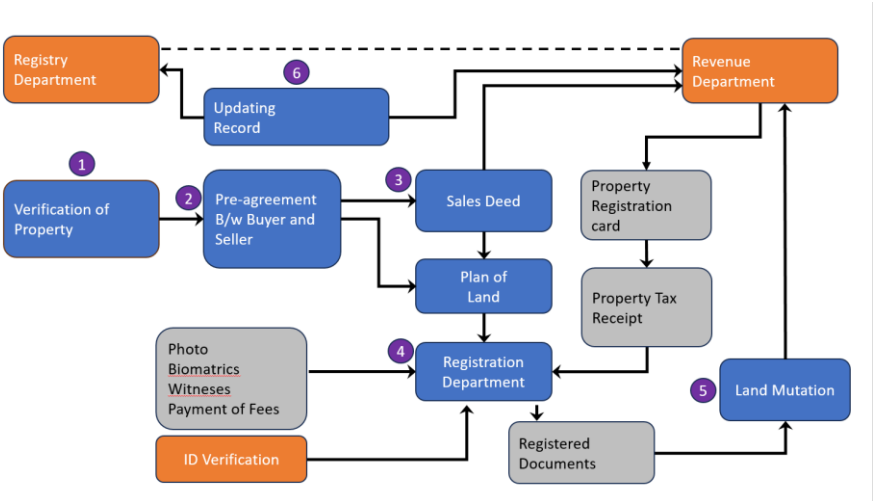

FIGURE 1.1 Traditional Land Registration in India

3] Land Registration using Blockchain :

Land registration using blockchain technology is a concept that has gained attention for its potential to enhance the efficiency, transparency, and security of land-related transactions. Implementing blockchain in land registration can address some of the common challenges associated with traditional systems, such as fraudulent land titles, disputes, and cumbersome paperwork. Here's how blockchain can be applied to land registration:

Immutable and Secure Records: Blockchain's fundamental feature is its immutability. Once data is recorded on a blockchain, it becomes extremely difficult to alter or delete without consensus from the network. This can significantly reduce the risk of fraudulent land titles or tampering with ownership records.

Transparency: Blockchain is a transparent and decentralized ledger. All authorized parties can view the land registry and transaction history, promoting trust and reducing the potential for corruption.

Smart Contracts: Smart contracts, self-executing agreements with predefined rules and conditions, can automate the land registration process. When certain criteria are met, such as payment verification, ownership transfer can occur automatically, reducing the need for intermediaries.

Reduced Paperwork: Traditional land registration involves extensive paperwork and manual verification processes. With blockchain, much of this paperwork can be replaced with digital records, streamlining the registration process and reducing administrative costs.

Ownership Traceability: Blockchain's transaction history allows for easy tracing of ownership back to the original source, eliminating disputes over land ownership.

Cross-Border Transactions: Blockchain can facilitate cross-border land transactions by providing a standardized and accessible record of ownership and title. This is particularly useful in areas with complex land ownership histories.

Improved Security: Blockchain employs advanced cryptographic techniques to secure data. Unauthorized access to land records becomes much more challenging, reducing the risk of data breaches.

Interoperability: Blockchain can be designed to allow integration with existing land registration systems, making the transition smoother and allowing gradual adoption.

Access Control: Blockchain can provide different levels of access control, ensuring that only authorized parties can view or modify specific records.

While the potential benefits of using blockchain for land registration are clear, several challenges and considerations need to be addressed when implementing such a system:

Legal Framework: Implementing blockchain in land registration requires a supportive legal and regulatory framework. Governments must establish the legality of blockchain-based land titles.

Data Privacy: Ensuring data privacy and protection while maintaining transparency is a delicate balance. Personal information should be appropriately safeguarded.

Infrastructure and Adoption: The transition to a blockchain-based system may require significant infrastructure investment and user training. It also requires widespread adoption among government agencies, land registrars, and property owners.

3.2 LITERATURE SURVEY

According to Ram Kumar Yadav, blockchain land registry administration would modernize the present system while also addressing existing difficulties. They have developed a framework allowing encroached chains to safeguard all property data. In this approach, they just considered the registration. They created a block to house all of these documents and khata ids. A Blockchain-based solution that transforms physical data into immutable records is required to overcome these property issues. These new block assets may now store digitally secured records and provide access to ownership information. In this model, I included the registration certificate, khata id, and a block to hold all of these facts. However, the client must store all of these documents in blocks using a Blockchain system that turns physical data into immutable records. The problem with traditional approaches to land transfer is that, at least for some government agencies, the process is slow and cumbersome, often relying on manual transaction recording by land registry agencies and prone to fraud and corruption.

G. Kusuma developed a safe, fast-moving blockchain that can compete with a centralized payment system in terms of security and throughput is challenging in today's blockchain system. In order to increase system throughput while maintaining a high level of security, sharing is one of the most valuable developing technologies. There are two significant drawbacks to earlier sharding related approaches, though. They did not take advantage of the heterogeneity across validators, which results in inadequate security and throughput for their random-based sharing solution. Secondly, it can be extremely expensive for their system to create an incentive system that encourages cooperation. To describe the heterogeneity among the validators. The advantages are security and throughput for the random-based sharing solution and RepChain, offers a strong incentive to encourage node collaboration. The disadvantages are security and communication problems.

Ch. Rupa developed one of the most significant problems with a blockchain system is consensus since, in a decentralized system, consensus is a procedure that is required to come to an agreement between a set of dispersed nodes that do not trust one another. This article examines the effects. The advantages include these are utilized in vehicular ad hoc networks (VANETs).The disadvantages are block propagation time has a massive effect on the blockchain security and its time consuming.

M. N. M. Bhutta, et.al [8] proposed A Survey on Blockchain Technology. This study gives a thorough review of Blockchain technology's evolution. Along with comparing frameworks, classifying consensus methods currently being employed in the Blockchain, it also gives comparative analyses of these topics. Finally, this study elaborates on important future prospects and open research problems that could be investigated by scientists to push this subject even further. The advantages are gives comparative analyses of classifying consensus methods and analyzing security threats and elaborates cutting-edge use cases, and open research problems. The disadvantages are orderexecute architecture such as sequential execution.

W. Lin, et.al proposed use of the Blockchain Technology in Agricultural Systems. In this work In-depth explanations are provided for the technical components, including as data structures, cryptographic techniques, and consensus procedures. In order to illustrate how to apply blockchain techniques, the current agricultural blockchain applications are grouped and examined. This work explored the potential solutions that are made to address the major issues in many future agricultural systems. The advantages are explored the attempts and potential solutions being made to address the major issues in many future agricultural systems. The disadvantages are conventional blockchain systems have a slow on-chain speed.

3.3 SYSTEM ARCHITECTURE

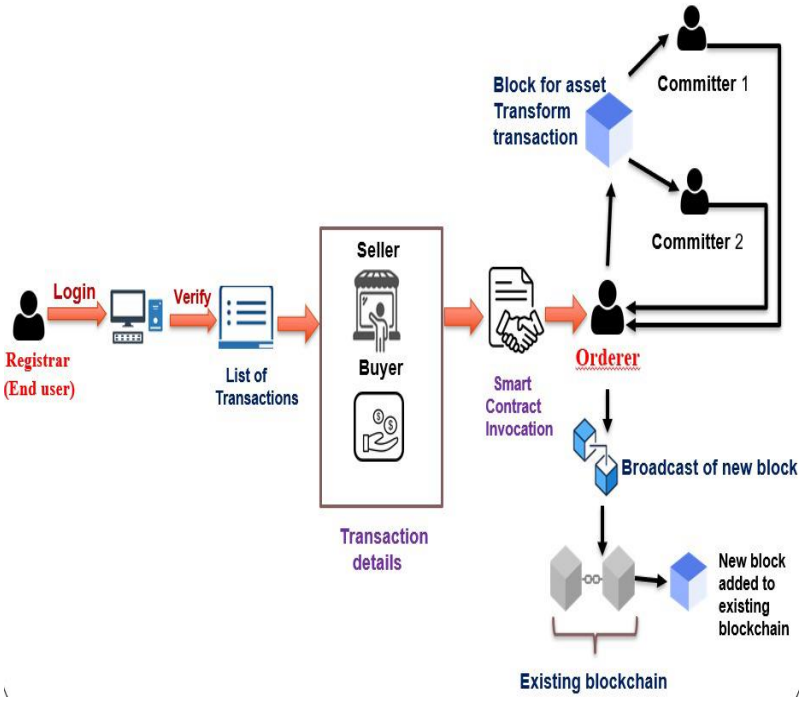

FIGURE 1.2 System Architecture

We propose a solution that takes advantage of the concept smart contracts, which are self-consensus code contained within, Blockchain technology.

All parties involved in the land registration process must according to. This eliminates the need for third parties and Streamline the registration process. Smart contracts are deployed using distributed servers such as public Ethereum Blockchain server. Due to decentralization, there is no entity manage these contracts; instead they are scattered through a common database shared by multiple systems. As a result, they need to have control over the information. In other words, it's almost impossible to hack.

Let's say a hacker requires some data to attack a block of Blockchain or a smart contract block where the data is kept. To obtain this data, you must first gain access to more than half of the nodes. Smart contracts execute invisibly and without requiring any intervention. Ethereum is used in addition to smart contracts because of transaction information must be stored securely. Therefore, these documents are is also registered in the Ethereum block along with smart contract. This information is also kept on distributed media

The server, ensures the security of the transaction. Create Smart contracts are based on Ethereum's solid programming language used.

The SHA256 hashing method is used to generate unique identifiers.

The hash value for each block stores all transactions information and smart contracts.

1. Hash codes/values/digest are the values we get when we apply hash functions/algorithms to our original data. Original data + Hash Function → Hash value/digest These hashes become irreversible so these hashes can be used for integrity checks.

2. The length of the original message can be 264 bits (for SHA-1 and SHA-256) and we get a Hash digest of 256 bits (in the SHA-256 Algorithm).

3. Larger summary/hash value suggests more compute at the cost of speed and space. Generally we will for the longest summary of dynamo safety, but there must be one the definitive balance between speed and security.

4. Even if we pass back the original data hash value to hash function, it does not provide the original data. This yields one value different from the original data and the first hash value.

Brief project overview diagram for the proposed project :

The method is presented below:

Project architecture includes many components are implemented as independent modules. We apply one client-server architecture, where the server is Ethereum blockchain-based server. The client application is deployed as a web application connected to Blockchain backend.

Various transactions involve Blockchain

1. Register a seller/buyer user account.

2. Verify the user account by the verifier (administrator).

3. Register the seller's land/property.

4. Verification of land/property by inspector/agent.

5. Request to buy land and assets from the buyer.

6. Approval of Buyer's request by Seller.

7. Payment upon request approved by the buyer.

Register Users and Put Land for Sale -

Creating a system for registering users and listing land for sale typically involves database management, user authentication, and a user-friendly interface. While I can't provide you with the entire code for such a system, I can outline the key steps and technologies you'd need to develop it. You can use a programming language and framework of your choice for implementation.

Here's a high-level overview of how you might build a user registration and land listing system:

1. Set Up the Development Environment:

Choose a programming language (e.g., Python, JavaScript, Ruby) and a web framework (e.g., Django, Ruby on Rails, Node.js) to build your web application. Set up a database system (e.g., MySQL, PostgreSQL,

MongoDB) to store user data and land listings. Create a version control system (e.g., Git) repository for your project.

2. User Registration:

Develop a user registration form that collects user information (e.g., name, email, password). Implement user authentication using libraries or frameworks that provide secure authentication mechanisms. Store user data securely in the database after hashing and salting passwords.

3. User Login:

Create a login form that allows registered users to log in securely. Implement session management to keep users logged in across different pages.

4. User Profile:

Develop a user profile page where users can view and edit their personal information. Implement authorization to ensure users can only edit their own profiles.

5. Land Listing Creation:

Create a form for users to list their land for sale. This form should collect information about the land (e.g., location, size, price, description). Store land listing data in the database.

6. Land Listing Display:

Design a page where users can view a list of land listings that are currently available for sale. Implement search and filter options to help users find land listings that match their criteria.

7. Land Listing Details:

Develop a detailed view page for each land listing, providing more information about the property. Include a contact form or button to allow interested buyers to reach out to the seller.

8. User Authentication for Listing and Editing:

Ensure that only authenticated users can create, edit, or delete their land listings. Implement authorization checks to prevent users from modifying or deleting listings that don't belong to them.

9. Security Considerations:

Implement security best practices to protect user data and the integrity of the system. Use HTTPS to secure data transmission. Sanitize and validate user inputs to prevent SQL injection and cross-site scripting (XSS) attacks.

10. Testing and Deployment:

Write unit and integration tests to ensure the functionality and security of your application. Deploy your web application on a web server, cloud platform, or hosting service.

11. Continuous Maintenance:

Regularly update and maintain your application to address security vulnerabilities and provide ongoing support to users.

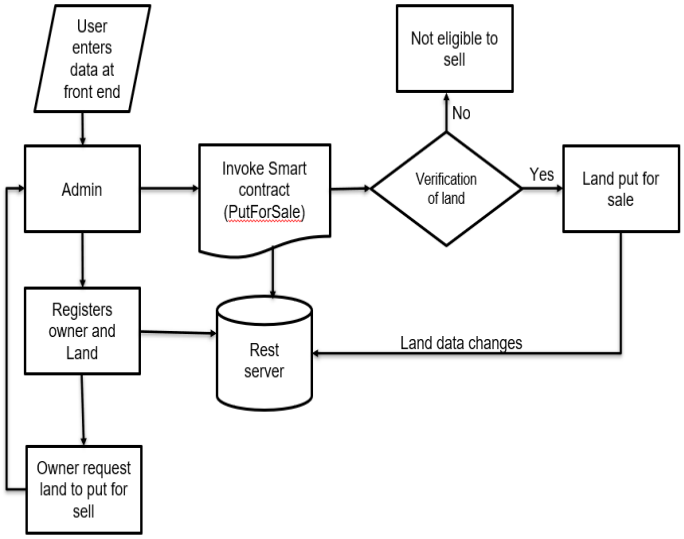

FIGURE 1.3 Register Users and Put Land for Sale

Change owner of Land -

Changing the owner of land in a land registration system using blockchain technology involves several steps. Here's a high-level overview of how this process could work:

User Authentication:

Users involved in the land transfer process, including the current owner (seller) and the new owner (buyer), must authenticate themselves through the blockchain system. This authentication can be done using secure login methods.

Verification of Ownership:

The current owner (seller) initiates the process by submitting a request to transfer ownership of the land. This request should include details about the land parcel, such as its unique identifier, legal description, and any relevant documents.

Smart Contract Execution:

A smart contract is created to facilitate the transfer of ownership. The smart contract code should include conditions and rules for executing the transfer. These conditions may include verifying that the current owner is the legitimate owner and that the land is not encumbered by any legal disputes or liens.

Verification of Funds:

In most cases, the buyer needs to provide proof of funds or payment for the land. This can be done within the smart contract, where the funds are held in escrow until the transfer is completed.

Government or Authority Verification:

Depending on the jurisdiction, a government authority or land registry may need to verify and approve the ownership transfer. This verification process can be integrated into the blockchain system, ensuring transparency and reducing the potential for fraud.

Transaction Confirmation:

Once all conditions, including verification of funds and government approvals, are met, the smart contract automatically executes the ownership transfer. This involves updating the blockchain's ledger to reflect the new owner's details.

Digital Signatures and Timestamps:

Digital signatures from both parties (seller and buyer) are used to confirm the transaction. These signatures are securely recorded on the blockchain. Additionally, a timestamp is added to indicate the exact date and time of the transaction.

Recording the Transfer:

The blockchain ledger is updated to reflect the change in ownership. This record is immutable, providing a clear and permanent history of the land's ownership.

Notification to Relevant Parties:

Automated notifications can be sent to all relevant parties, including the seller, buyer, government authorities, and any other stakeholders, confirming the successful transfer of ownership.

Secure Storage of Documents:

All relevant documents, such as the land title, sale agreement, and transfer documents, can be securely stored on the blockchain. These documents can be accessed and verified by authorized parties at any time.

Final Confirmation and Settlement:

The final step involves confirming that the land's ownership has officially transferred to the new owner and that the agreed-upon payment has been settled. Funds held in escrow are released to the seller.

Post-Transfer Updates:

After the ownership transfer, the land registry or government authority updates their records to reflect the new owner. This information should align with the blockchain's ledger for consistency.

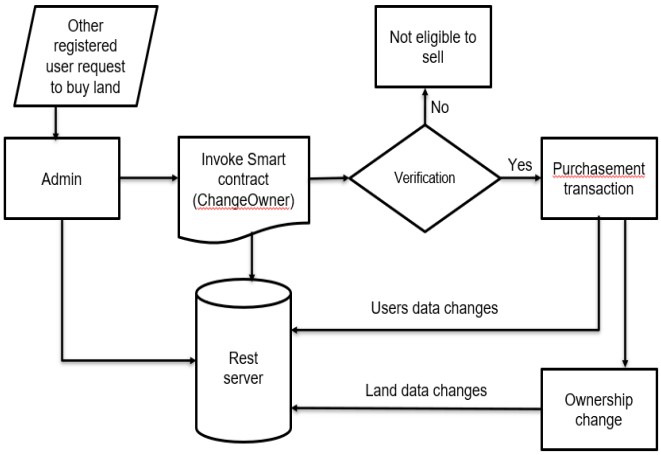

FIGURE 1.4 Change Owner of Land

3.4 TECHNOLOGY USED

1. Ethereum

Ethereum is a groundbreaking blockchain platform that has transformed the landscape of decentralized applications and smart contracts since its inception in 2015. Unlike its predecessor, Bitcoin, Ethereum is designed as a versatile, programmable blockchain that allows developers to create complex, self-executing contracts known as smart contracts. These smart contracts enable the automation of various processes and transactions without the need for intermediaries, enhancing efficiency and reducing the risk of fraud. Ethereum's native cryptocurrency, Ether (ETH), serves both as a digital currency and as a means of facilitating transactions and computational work within the network. Ethereum also introduced the concept of decentralized applications (DApps), which run on its blockchain and are not controlled by a central authority. Over the years, Ethereum has undergone significant upgrades, including the transition from a proof-of-work (PoW) to a proof-of-stake (PoS) consensus mechanism to improve scalability and sustainability. Its open-source nature and active developer community have fostered innovation, leading to the rise of decentralized finance (DeFi) applications, non-fungible tokens (NFTs), and interoperability solutions, making Ethereum a central hub for blockchain innovation and adoption.

2. PoW(Proof of Work) Algorithm

Proof of Work (PoW) is a consensus algorithm used in blockchain networks to secure and validate transactions. In PoW, participants in the network, known as miners, compete to solve complex mathematical puzzles. These puzzles require significant computational power to solve, and the first miner to find the correct solution broadcasts it to the network. This process is known as "mining." Once a solution is found and verified, a new block of transactions is added to the blockchain, and the miner is rewarded with a predetermined amount of cryptocurrency, such as Bitcoin. PoW relies on the principle of economic incentives and computational effort.

Miners invest in specialized hardware, known as mining rigs, and compete to solve puzzles because they have a chance to earn rewards. The computational power required to solve these puzzles acts as a deterrent against malicious actors attempting to manipulate the blockchain. Additionally, the decentralized nature of PoW ensures that no single entity has control over the network, enhancing its security and censorship resistance.

3. SHA Algorithm

The SHA (Secure Hash Algorithm) is a family of cryptographic hash functions designed to take an input (or message) and produce a fixed-length output, known as a hash value or digest. These hash functions are widely used in various security applications, including data integrity verification, password storage, and digital signatures. SHA-1, SHA-256, and SHA-3 are some well-known members of this family.

SHA algorithms operate by applying a series of mathematical operations to the input data. The resulting hash value is unique for each unique input, and even a minor change in the input data significantly alters the hash output. This property is crucial for detecting any alterations or tampering with data.

One of the most widely used SHA variants, SHA-256, produces a 256-bit (32-byte) hash value. It takes an input of any length and processes it into this fixed-length output. This output is typically represented as a hexadecimal number.

SHA algorithms are designed to be one-way functions, meaning it should be computationally infeasible to reverse the process and derive the original input from the hash value. Additionally, they should be resistant to collision attacks, where two different inputs produce the same hash value.

PROPOSED SYSTEM APPLICATIONS

1. Blockchain ensures that land ownership records are tamper-proof, reducing fraud and disputes over property rights.

-This statement is generally accurate. Blockchain's immutability and decentralized nature can make it difficult for anyone to tamper with land ownership records once they are recorded on the blockchain. This can help reduce fraud and disputes because parties can trust the integrity of the recorded data.

2. Smart contracts can automate processes like property transfers, reducing paperwork and time.

-Yes, smart contracts can automate various processes, including property transfers. These self-executing contracts can automatically execute actions when predefined conditions are met, such as transferring ownership when payment is received. This can indeed reduce paperwork, streamline transactions, and save time.

3. Streamlining processes and reducing the need for intermediaries can lower administrative costs.

-Reducing the need for intermediaries through blockchain and smart contracts can potentially lower administrative costs. Eliminating intermediaries like title companies or escrow agents can lead to cost savings. However, it's important to note that the extent of cost savings depends on various factors, including the complexity of the real estate market and regulatory considerations.

4. Governments can use blockchain for efficient tax collection and property valuation.

-Blockchain technology can be used by governments to improve tax collection and property valuation processes. By having transparent and tamper-proof property records on a blockchain, governments can more accurately assess property values and collect taxes. This can lead to increased efficiency and reduced tax evasion.

Overall, these statements highlight some of the potential advantages of implementing blockchain technology in the real estate and property management sector. However, it's essential to consider the challenges and regulatory aspects associated with the adoption of blockchain in this context, as well as the need for appropriate infrastructure and standards to ensure its effective implementation.

3.5 CONCLUSION

Blockchain is one of the most secure ways of storing data without it being changed. It is a distributed ledger that is open to anyone and once data is put into it, it is very difficult to change or meddle with it. Using this property of blockchain we want to put it to use into one of the most fraudulent systems in India, the Land Registration System. Our system uses blockchain with the employment of hyperledger. This gives rise to a system that is more evolved and features all the activities like buying and selling in an efficient and reliable way. Blockchain technology made this system secure and faster.

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