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SECURE, TRANSPARENT, AND EFFICIENT: BLOCKCHAIN TECHNOLOGY - TRANSFORMING REAL ESTATE

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Abstract – In this work, we aimed to increase the security in the real estate market with the help of blockchain, Web 3.0 and Hybrid of two Cryptographic Algorithm (Enhanced RSA and AES). property is an important part of investment, and the use of blockchain technology can help improve the implementation of work in this sector as well as its characteristics significantly for a smooth and trusted work flow to achieve a reliable system. Property sales or property transactions can be carried out using the blockchain. By using blockchain, we can make our property sales transactions safer and faster. At the moment, we can develop a private blockchain for property transactions. Individuals or groups interested in conducting property transactions using the blockchain must join or register with the property transaction blockchain. A registered user can only buy or sell property through the blockchain. Blockchain smart contracts aid in the process of purchasing property. Once the buyer and seller have agreed on the terms (property details) and the buyer wants to proceed with the transaction, the property transaction can be done with the help of a smart contract. A smart contract is a computer program that runs automatically when specified conditions are met. So, when a transaction takes place between a buyer and a seller, the contract between them is generated by a smart contract. The smart contract generated in this way can be used as proof.
Keywords – Cryptographic algorithm, Blockchain, Smart contract, Property Selling, RSA & AES.

INTRODUCTION

Blockchain is a distributed database of records or ledgers that documents every digital transaction or event that occurs and is shared between the involved parties. Each transaction on the public ledger is verified and confirmed by the consensus of the majority of system participants. Once information is entered, it cannot be deleted, thus creating a definitive and verifiable record of every transaction that has taken place.

Property deals in the real estate industry are typically time-consuming and can take several months to transfer ownership from one party to another, even with modern technology. Furthermore, the sale of property may come with additional costs. Often, third parties can be involved in real estate transactions, which may help prevent new costs but also requires trust in the third party. Unfortunately, the involvement of a third party in the sale does not guarantee an absence of fraudulent activity, which is prevalent in the real estate industry. Double spending is a common fraudulent activity where a seller can enter into several sales contracts with different buyers with the help of various third parties.

Blockchain technology is a chain of blocks that stores a growing list of records. It represents information and public databases through a block and chain. Blockchain is a decentralized technology originally created to store and secure digital data, but has since been used in various technologies and fields. Blockchain technology can solve many of the problems in the real estate industry by storing all transactions and preventing manipulation. It can also eliminate unnecessary costs associated with intermediaries in the sale, and the contracts involved in the sale are smart contracts.

PROBLEM STATEMENT

The current system for selling and buying property is opaque and slow. Maintaining a large amount of registered property is also difficult and necessitates a larger database because human errors and data tampering are common. The main issue with the current system is that it is not secure or transparent, and selling a property to more people means adding more records, which is important and should maintain accuracy. But old methods are not good enough for data security.

Due to the old method, many frauds are happening in the real estate industry, such as selling without authorization, selling the same unit to multiple buyers, encroachments, and forging of property papers. Developers may not obtain change of land use (CLU) clearance before selling properties, which highlights the importance of verifying CLU or building approval before investing in real estate. The scam of selling the same unit to multiple people often occurs, allowing the owner to escape. Encroachments are common when someone else has illegally gained custody of the property, and government property is also often sold to those who later regret it. Forging of property papers involves creating fake documents with falsified power of attorney and fraudulent signatures, which are then used to perform legal and monetary transactions on the supplied property.

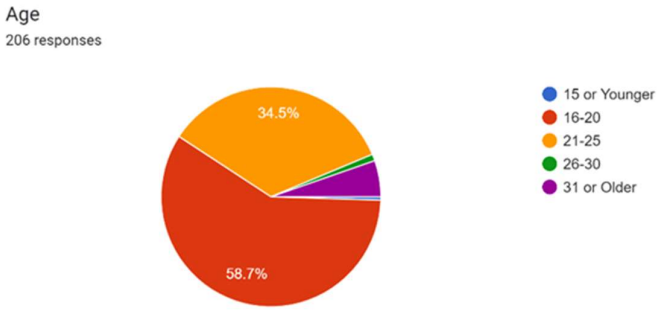
BACKGROUND WORK

The usage of blockchain technology throughout the business of real estate is still in its early stages, and there is a need for more research in this field. Many people who invest in property are still not familiar with the potential benefits of blockchain technology. There is a need to create awareness and educate stakeholders about the potential benefits of blockchain technology through training programs, workshops, and conferences. So before staring we taken a basicSurveyby which we get info that how many people are familiar with blockchain technology.

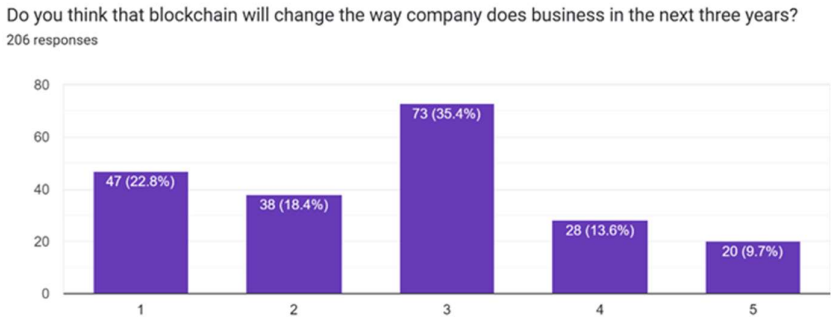
- Blockchain Technology - Blockchain is a public ledger of all future and past transactions, including those related to digital currencies such as Bitcoin and Ethereum. A general ledger is a log containing all financial transactions of an organization. The line of blocks that make up this time-series transaction log is called a blockchain. It keeps growing as miners constantly add new blocks to track all recent transactions. The blockchain is continuously updated with new blocks in a straight and sequential manner.
- Miner: Mining is the process of verifying data transactions to the blockchain's in public and private ledger. A miner in a blockchain network is a node or member of the same network that can confirm transactions based on some agreement.

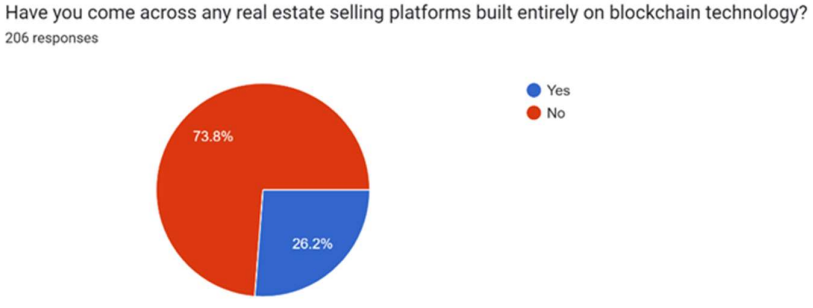
- Smart Contracts: Smart Contracts are computer software designed to follow specific computer protocols to digitally facilitate, validate, or enforce the negotiation or execution of contracts. Without third-party involvement, smart contracts often enable reliable, irreversible, and traceable transactions.
- Attack: "51% Attack on Blockchain" occurs when one miner or a group of miners seek to amass enough resources to control more than 50% of the network's mining power, processing power, or hash rate. Individuals in possession of such mining capacity can prevent further transactions from being confirmed or executed.

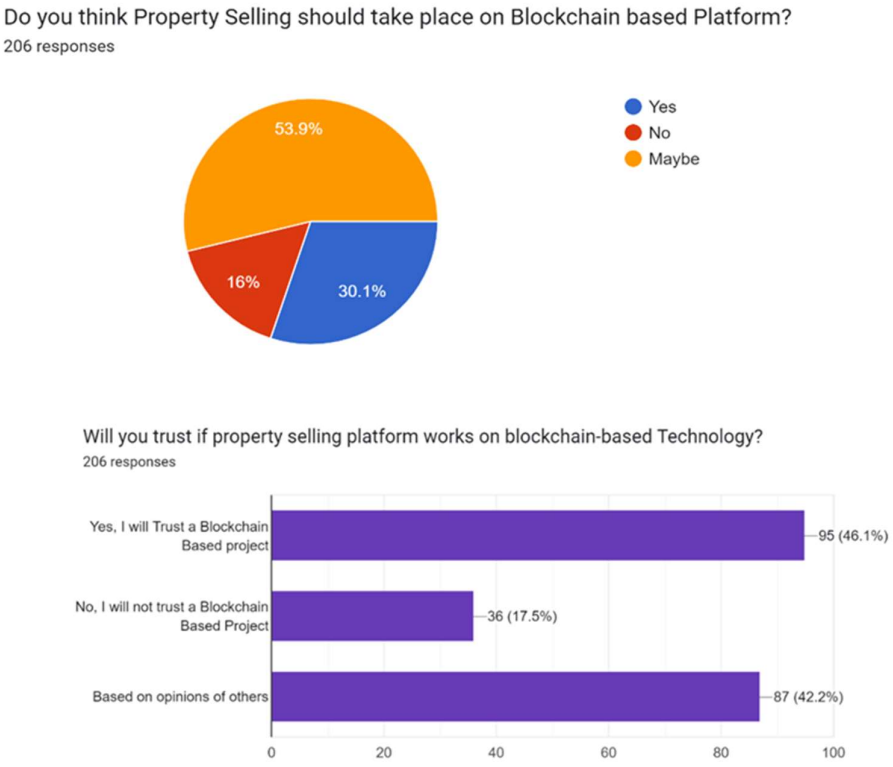
Background Work (Before Starting Research Survey Results) https://forms.gle/oAbj8wjDugt5e1JF8



As you can see here 93.2% people Belong to Agr group of 16-25. Which clearly Depict that person who shown some intrest in the Survey related to Blockchain are from this age.







By this Survey we got a Basic Information that More then 46.1% people who trust on blockchain based project, 30.1% Think that Property Selling should take place on a Blockchain based Platform.

CHALLENGES & SOLUTION

I. Adoption: To increase adoption, there is a need to create awareness and educate real estate professionals, investors, and regulators about the potential benefits of blockchain technology. This can be achieved through training programs, workshops, and conferences.

II. Standardization: Industry leaders should collaborate to standardize blockchain property transactions. This will let systems interact, simplify, and boost efficiency.

III. Legal and regulatory issues: To handle legal and regulatory challenges, blockchain-based property transactions need uniform legal frameworks. Industry leaders and regulators may collaborate and test innovative methods in legal and regulatory sandboxes.

IV. Scalability: To address scalability, there is a need to develop new blockchain technologies that can handle a large number of transactions. This can be achieved through the development of new consensus algorithms, such as sharing or proof-of-stake, which can increase throughput and reduce costs.

V. Privacy concerns: To address privacy concerns, there is a need to develop privacy-preserving blockchain technologies, such as zero-knowledge proofs, which enable transaction details to be kept private while still maintaining the integrity of the ledger.

In conclusion, while there are several challenges facing blockchain-based property selling and purchasing systems, there are also solutions that can be implemented to address these

challenges. By working together, industry leaders, investors, and regulators can create a secure, transparent, and efficient platform for property transactions on blockchain.

RELATED WORK

Krishnapriya S [1] elaborated on The Proof of Work (PoW) algorithm further secures group action data. Nodes validate group actions, mine new blocks, and add them to the blockchain. 200 land transactions are recorded using blockchain technology, which is tamper-proof and updated. Every block's message digest is mounted, and each hash represents a set of group actions at intervals within the block. Since each block's hash is linked to the previous block's, it will be unique. SHA256 hashes. The land-written record blockchain network's 12 nodes calculate labour proof with SHA256. Signature generation using an elliptic curve cryptological algorithm verifies whether the owner signed the group action. Merkle trees link transaction hashes and reduce disc usage.

No Lwazi NCUBE [2] Two peer-to-peer land registration organizations are discussed in this paper. The gateway network and smart contract store and retrieve land data in this system. The decentralized system stores late registration data in each peer. Also, user and administrator. Based on these two roles, the tester tested the system to see if users could register and whether their content and payment method followed the peer-to-peer network path. Amin also checks details like who posted the last ad, who owns the land, and user information.

Ali, S. [3] This article discusses the viability of using blockchain technology as a data storage method. Contributes to the creation of a distributed ledger for data while also helping to decentralize storage. Pros. The use of blockchain for storage, Removes dependency on a central repository.

Do, H. G. [4] The purpose of this article is to discuss ways to improve the safety of the block chain storage. The continued enhancement of the system's security and integrity is a pro.Complexity has increased, which is a con.

A Bhabendu Kumar Mohanta[5] Detailed discussion of the implementation of a smart contract that is capable of performing a task in real time at a lower cost while also providing a higher degree of security. This type of contract is self-verifying, self-executing, and tamper-resistant, and it integrates blockchain technology.

Ms. Disha Shinde [6] elaborated on The current centralised system has problems, such as bottlenecks, a single point of failure, and the possibility of fraud and forgery. So, we can fix all the problems with the current centralised system by using Blockchain. The proposed system will make it easy and safe to store and get property papers, and it will also let the owner know if anyone is looking at his papers. This makes sure that the storage is safe and can't be changed.

Sai Apurva Gollapalli [7] Discussed that Blockchain data storage is safe. It is a public distributed ledger that is hard to modify once data is entered. We intend to apply blockchain in India's Land Registration System, which is very fraudulent. Hyperledger powers our blockchain system. This creates an advanced system that handles buying and selling efficiently and reliably. Blockchain secured and accelerated this system. If this system is improved and combined with helpful API, it will speed up transactions and simplify the entire process, making it easier and more convenient for humans.

R.C.Suganthe [8]Knowing such data about a site makes its location and ownership clear. The paper-based registration system already provides these details, but they can be changed easily.

Storing such characteristics in a blockchain block prevents fraud and data alteration. As described above, this project could be developed for land registration and property transfers. This project may collect land details from owners. Blockchain technology stores these facts, but in the future, land can be bought and sold. It enhances traceability, transparency, and removes third parties.

Mahbub Alam Majumdar[9] described If blockchain technology is applied to the present land registration system for registration and verification functions, it might yield the following benefits: high security and prevention of fraud. Land-written accounts, being manual, could be a rigorous method to deal with in Bangladesh. By digitizing this method and storing transactions and documents on the blockchain, we make the system much clearer, simpler, safer, and faster to use. The verification of possession was correct and quick. In a totally digital system, without the necessity for abundant work, there'll be no missing documentation, as everything is going to be registered into the blockchain throughout a group action or registration. The land transaction method reduced the time to many days rather than months.

Rishikesh Kadam [10] elaborated that Blockchain is the most reliable solution. Stuart Haber and W. Scott Statnett introduced cryptographically protected blockchains in 1991. Public and private blockchains exist. Smart contracts enable blockchain use in finance, land, offer chains, etc. . An organization or company creates a private blockchain, which only authorized peers can access. In 2008, Stuart Haber and W. Scott Storiette reported that Satoshi Nakamoto introduced the Bitcoin cryptocurrency and blockchain as a public ledger. Creating a land registry system with this hybrid blockchain is working. The government creates the blockchain and adds all land registers. This study proposes combining blockchain technology's unchangeability, distributed storage, and security. The ledger's unalterable records settle ownership disputes. . With a hybrid blockchain, general users will have read-only access and pre-authorized peers will submit and validate transactions.

P Singh [11] The use of blockchain in the land registry has become a crucial aspect of today's globe.The land was transferred, and the blockchain platform automatically updated and saved the information. This operating system mode is safest and tamper-proof. No one can change the transaction or ownership, nor can they damage the data asset. Past ownership transfers are used to verify the current landowner. Today's world benefits from blockchain's lack of authority. A decentralized ledger requires no authority or middleman. Bitcoin, Ethereum, and Hyperledger have made "blockchain" popular. Land-based blockchain implementation the registry and its land record maintenance are transparent. Blockchain simplifies and streamlines land registration. It displays all land records. This app will advance us and future generations.

Mohammed Shuaib [12] talkedabout governance model that requires unique ownership records needs a land registry system. The paper concludes with a discussion of theirrelative analysis to determine the best model for land registry system identity issues. This paper critiques the land registry model. It defines blockchain types. It assesses blockchain's suitability for land registry applications. An analysis of the blockchain-based land registry model's identity management flaw was conducted. This work provides a systematic example of assessment and analysis by reviewing the literature in three phases based on three research questions (RQ). Among the 477 source articles culled from scholarly journals and databases, we selected 48 based on research quality criteria and RQ. The vast majority of these studies analyse

identification problems in land registries and examine current identity models to see which is the most effective at solving these problems.

Jacques Vos [13] This paper discusses blockchain technology, its potential impact on land written account systems, and legal specialists. The economist wrote that blockchain's use as a trust machine is bad for trust businesses, such as government authorities trusted to handle transactions. Land registries worldwide are broken, mismanaged, or corrupt. Blockchain technology should end land registry insecurity and injustice. Shared ledgers should build trust. Is this true? ц Can a blockchain-based system replace this land registration system. Thus, it ignores modern developments.

Yarlagadda Jyotsna [14] discussed about Real estate is crucial to a nation's economy, but the current system has various problems that can cause financial loss or other issues for buyers, sellers, renters, agents, and others. Blockchains work with property transactions. Blockchain will improve several aspects of the real estate market. Yet, a large percentage of digital data is hosted on multiple platforms, ending the era of opaque data and increasing the likelihood of fraud-causing errors. Blockchain could improve apartment trading. Blockchain disintermediation for estates offers a new answer for enterprises that frequently unearth some of these information.

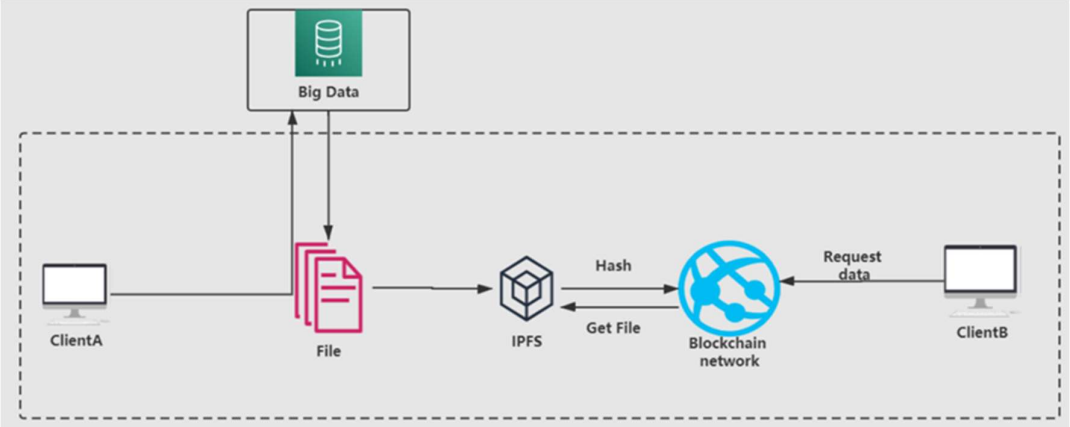
Andrei Larion [15] Discussed Blockchain technology has transformed the financial industry, including real estate, since the early 2000s. Title, deed, mortgage, and leases must be organized, filed, and registered to transfer real property. Brokers and lawyers are often needed to guide this procedure. Real property tokenization may reduce these restrictions and "open up" real estate markets.

METHODOLOGY

There are several methods to secure Land/Property data using blockchain technology:

1. Decentralized Data Storage: Securing Land/property data using decentralized data storage involves using a distributed network of nodes to store data rather than relying on a central server. This approach provides several benefits for securing the data, including:

- Decentralized Control: Since no central authority controls the data, it makes it more difficult for hackers to access and steal data.
- Improved Data Privacy: Decentralized data storage systems use encryption and other security measures to keep data private and secure.
- Reduced risk of data loss: Since data is stored across multiple nodes, there is less risk of data loss in the event of a single node failure.
- IPFS – Use of IPFS in this project Enhance Security, Enhance Performance which will Decrease the time of verification.



2. Smart Contract–It will be used for Registration of User and for integration of WEB 3.0 Wallet for Payments.The benefits of using Smart Contract in Real estate include:

- Transparency: Smart contracts, which are based on blockchain, guarantee data immutability, allowing parties to make contracts without knowing each other and avoiding contract breaches or management errors.
- Cost Reduction:Costs are reduced by not needing a third party to verify contract terms and provide confidence. This contract eliminates intermediary fees.
- Speed:When there are no middlemen, both the time and money costs are lower. Since it is done automatically, it takes less time than when contracts were signed by hand in front of a third party.
- Web3.0 MetaMask Wallet: Security from Clipboard Virus – When a payment is made using a MetaMask wallet, the Clipboard Virus, which is used to convert the seller's Wallet address to the hacker's Wallet address, ensures that the money that should be paid to the seller is instead transferred to the hacker.

3. Cryptographic Algorithm- These Algorithm are used to convert plan text into a Cypher text, to make it unreadable. These algorithms are used in the process of encrypting and also authenticating the data.Algorithm used to make Blockchain based Real-estate More Strong-

- AES (Advanced Encryption Standard) – This is an algorithm for a symmetric block cypher that has a block/chunk size of 128 bits. A file will be locked with AES which will create a Random 4 Digit Key.
- RSA – When using RSA cryptography, a message may be encrypted using either the public key or the private key. When a communication has to be decrypted, the key that was used to encrypt it must be used in reverse.
- Hybrid Method –In this method, both AES and RSA are used when documents are uploaded and downloaded. First, a property document is locked with the AES algorithm, which creates a 4-digit key. This key is then encrypted with RSA, and a hash with a private key and a public key is made. The private key is kept on the user's system, and the public key is kept on the server. If the user wants to download the file, he or she needs to match the private key, which will decrypt the RSA. Once the RSA is decrypted, user will get a 4-digit AES key, which will be used to unlock the documents. It will secure documents from Several cyberattacks occur on IPFS storage, but this solution secures our file by preventing hackers from unlocking it.This approach replaces the unreversible SHA 256. Hybrid approach is reversible and prevents hackers from accessing files.

Code for Encryption –

```
def encrypt(key, filename):
    chunksize = 64*1024
    outputFile = "fileEnc."+filename.split('.', 1)[1]
    filesize = str(os.path.getsize(filename)).zfill(16)
    IV = Random.new().read(16)

    encryptor = AES.new(key, AES.MODE_CBC, IV)

    with open(filename, 'rb') as infile:#rb means read in binary
        with open(outputFile, 'wb') as outfile:#wb means write in the binary mode
            outfile.write(filesize.encode('utf-8'))
            outfile.write(IV)

            while True:
                chunk = infile.read(chunksize)

                if len(chunk) == 0:
                    break
                elif len(chunk)%16 != 0:
                    chunk += b' '*(16-(len(chunk)%16))

                outfile.write(encryptor.encrypt(chunk))
```

Fig – Code used In Hybrid Method for Encryption

Code for Decryption –

```
def decrypt11(key, filename,file):
    chunksize = 64*1024
    outputFile = file
    print('FILEIS',outputFile)
    with open(filename, 'rb') as infile:
        filesize = int(infile.read(16))
        IV = infile.read(16)

        decryptor= AES.new(key, AES.MODE_CBC, IV)

        with open(outputFile, 'wb') as outfile:
            while True:
                chunk = infile.read(chunksize)

                if len(chunk) == 0:
                    break

                outfile.write(decryptor.decrypt(chunk))

            outfile.truncate(filesize)
```

Fig – Code Used in Hybrid Method for Decryption

4. Privacy-Preserving Techniques: There are several privacy-preserving techniques that can be used in conjunction with blockchain technology to secure Users Data:

• Zero-knowledge proofs: Zero-knowledge proofs prove the authenticity of data without revealing the data itself. This can be used to verify that the data will match the data finding nonce in the previous blocks.

• Ring signatures: Ring signatures are a form of digital signature that allows a group of users to sign a message without revealing the signer's identity. This can be used to create secure communications while still preserving their privacy.

RESULTS

- Improved Data Integrity: By storing data on a decentralized blockchain network, the risk of data tampering or manipulation is reduced, leading to improved data integrity.
- Better Security: Implementing cryptographic hashes, smart contracts, and decentralized data storage with Hybrid Method (AES + RSA) on local system can make it more difficult for cyber attackers to steal or tamper with data, resulting in improved security.
- Reduced Costs:Costs are reduced by not needing a third party to verify contract terms and provide confidence. This contract eliminates intermediary fees.
- Improved Traceability: The immutability of blockchain networks makes it possible to track the history of data transfers and processing, improving traceability and accountability.
- Reduce Time:The current system for buying and selling real estate, completing all of the necessary paperwork may take up to ten to fifteen days, and even then, it is not a given that everything will go without a hitch at any point in the transaction. On the other hand, in a system that is built on blockchain, all of this time will be saved, and it will be recorded in a digital form that cannot be edited or altered. So, it will cut down on the amount of time and boost the user's trust.

CONCLUSION

An approach that is based on blockchain technology and uses a hybrid algorithm proves assurance as a method that protects users' privacy while maintaining their security in a decentralised setting. In this article, we have discussed the fundamental ideas behind this technique, as well as its challenges and benefits, and we have also analysed the findings of earlier studies that have been conducted in this field over the course of many years. Based on the findings of this study, we are able to draw the conclusion that implementing a Blockchain-based system for the real estate industry will allow for effective solutions to the problems of data ownership, privacy, and security, while also directly increasing scalability, trust, and decentralisation. However, there are several technical and practical challenges that need to be addressed, such as the performance and efficiency of algorithms. By using Hybrid Algorithm, it is a new starting point to secure property documents that are present on the server, and it can be saved from all cyberattacks. Additionally, because it will be done on the server only, it is very user friendly. It is necessary to conduct additional research and development in this field in order to fully realise its potential and overcome the challenges that still exist.

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