iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** III **Month of publication:** March 2025

DOI: https://doi.org/10.22214/ijraset.2025.67777

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue III Mar 2025- Available at www.ijraset.com

Blockchain-Powered Real Estate: Enhancing Transparency and Efficiency

Anush Shinde[1], Agam Kumar Singh[2], Avinash Awasthi[3]
Computer Science and Engineering, Malaviya National Institute of Technology, Jaipur, India

Abstract: ***In India, there are growing number of rental and lease scams in which potential tenants or landlords are tricked into paying for a rental property. Scammers use bogus real estate brokers and listings, breach lease agreements, and conceal energy bills in order to obtain money from renters and tenants. These schemes may include both the tenant and their landlord as the victim. The government also has problems with tracking and maintaining track of property taxes. Also conventional property transactions are often delayed due to long processing periods, lack of transparency, and inconsistencies, resulting in disputes, delays, and high fees for third-party services. Thus, we can apply blockchain technology inside the process to increase the efficiency of these procedures. By offering a decentralized and transparent platform, this research study aims to decentralize real estate transactions and increase their accessibility, effectiveness, and affordability for buyers and sellers worldwide.***
Index Terms: Blockchain technology, Decentralization, Real Estate

I. INTRODUCTION

The global real estate industry is estimated to reach a remarkable $634.90 trillion by 2024. Among the numerous categories, residential real estate leads the industry, with a forecast market volume of $516.80 trillion in the same year. Looking ahead, the sector is expected to increase at a 2.77% annual pace (CAGR 2024-2029), culminating in a market volume of $727.80 trillion in 2029. In a worldwide context, it is worth noting that the United States is expected to generate the most value in the Real Estate sector, with a staggering $132.0 trillion anticipated for 2024. The real estate market in the United States is seeing an increase in demand for suburban houses as more people work remotely [1].The real estate industry in India is predicted to hit $1 trillion in market value by 2030, up from $200 billion in 2021, and contribute 13% of the country's GDP by 2025. Retail, hospitality, and commercial real estate are also rapidly expanding, providing critical infrastructure for India's burgeoning requirements. The real estate market in India is anticipated to grow to $5.8 trillion by 2047, accounting for 15.5% of GDP, up from 7.3% currently [2].

Maintaining track of land statistics in India is tough due to the large population and frequent ownership transfers. The present procedures employed by the national government are obsolete, generating delays and disruption, resulting in a back- log. The real estate and property management industry, which is an essential component of global economic progress, has historically been managed by complex and manual systems. The industry's reliance on middlemen, excessive documen- tation, and a lack of real-time data exchange have resulted in inefficiencies, higher fees for transactions, and delays. Furthermore, issues like as fraud, a lack of transparency, and difficulties in keeping accurate property records highlight the critical need for transformative technical solutions.

Blockchain technology, with its decentralized, secure, and immutable record, has emerged as a transformative solution for tackling these long-standing issues. Blockchain creates a transparent and tamper-proof ledger to protect privacy and validate transactions. Blockchain eliminates the need for mid- dlemen, creating a system that enables property records, ac- tions, and ownership information freely available and verified. Traditional real estate transactions can be time-consuming and paperwork-heavy. Smart contracts on the blockchain can automate agreements, allowing for faster property transfers while reducing errors and costs. This is especially important in international transactions, where cross-border issues are widespread. Blockchain's decentralized design spreads data across multiple nodes, making it very vulnerable to fraud and cyber assaults. Lease agreements, property titles, and transaction histories stored on the blockchain are tamper-proof. Blockchain makes it easier for property managers and landlords to collect rent and manage leases. Smart contracts automate lease terms like rental payments and maintenance requests, which reduces administrative burdens. Buyers and sellers can connect directly via blockchain technology, elim- inating the need for intermediaries like brokers or escrow agents. This not only speeds up transactions, but also reduces associated fees. Blockchain data are immutable, which reduces errors caused by manual data entry. Accurate data builds trust in property transactions, especially during diligence processes and compliance assessments.

II. LAND REGISTRATION AND TITLE MANAGEMENT IN INDIA

In India, the process of acquiring land and ensuring that all legal documents are free of disputes is both complex and critical. The management of records throughout the land registration and title transfer process is handled by various state departments, including the Department of Registration and Stamps, the Revenue Department, and the Survey and Settlement Department.

Ownership of land is officially transferred when the sale deed is registered at the registrar's office after the agreement between the buyer and seller is finalized. The sale deed then becomes the primary document for maintaining land records. Their are various steps involved in land registration and title management in India. The seller typically consults a real estate broker or middleman who is well-versed in market trends and assists in listing the property for sale.The broker initiates a thorough investigation into the property's ownership details by consulting the Sub-Registrar's Office (SRO). This includes verifying mutation records, sale deed authenticity, and transaction history.The broker assesses the property's value to determine the required stamp duty. Once this is done, the property is listed for sale.The buyer approaches the broker to review the property details. If satisfied, the buyer proceeds with the purchase, paying the required stamp duty. Both parties sign the stamp papers.A lawyer, often engaged by the buyer, drafts the sale deed on stamp paper. The buyer pays the stamp duty through the Collector of Stamps, and the final purchase amount is settled with the seller. The sale deed is signed by both parties in the presence of two witnesses, who must provide valid identification.The broker facilitates the registration of the sale deed at the Sub-Registrar's Office. The buyer, seller, and two witnesses must be physically present, carrying necessary documents such as identification cards and photographs.After all parties sign the sale deed and the documents are verified, the registration is completed. The original sale deed is handed to the buyer, while the SRO retains a copy. Finally, the buyer visits the Land Revenue or Tehsil Office to apply for mutation using the registered sale deed. The Revenue Officer or Tehsildar verifies the documents and updates the ownership record, thereby formalizing the transfer of ownership. (Fig. 1 Shows the steps involved in Property Registration)

Problem in existing in The process of land registration and title management is costly due to the involvement of real estate agents who mediate transactions between buyers and sellers. Many departments still rely on paper-based systems, which increases the likelihood of human errors and delays the transfer of land ownership, often taking months to complete. Additionally, the lack of coordination between departments, which operate independently, results in outdated records, con- tributing to fraud and corruption. Despite efforts to digitize land records, the current centralized system continues to face significant challenges, such as data integrity issues and the inability to verify property titles effectively.

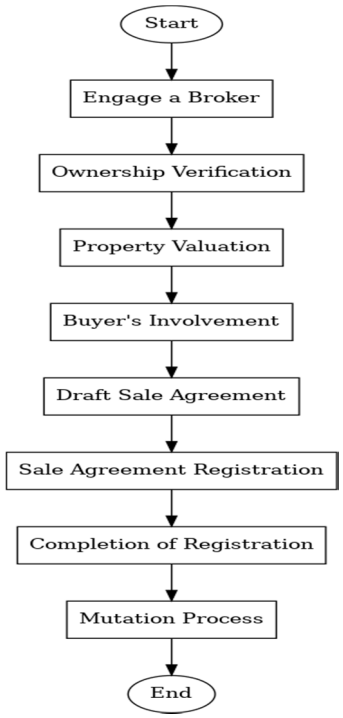


Fig. 1. Steps Involved in Property Registration in India

III. BLOCKCHAIN IN REAL ESTATE AND PROPERTY MANAGEMENT

A. Property Ownership and Title Registration

Blockchain technology can make real estate better by keep- ing clear and secure records of property ownership, reducing the chance of disputes. It can also speed up the process of transferring property ownership by using smart contracts, which automate the work and remove the need for paperwork. Additionally, it helps in valuing properties more accurately and managing assets more efficiently by organizing and analyzing property data.

B. Real Estate Transactions

Smart contracts in real estate transactions can speed up the process and make it more secure by automating tasks, reducing errors, and shortening settlement times. Blockchain technology adds transparency by creating a clear, auditable record of every transaction, which builds trust between the parties involved. Since blockchain is decentralized, it's harder for hackers or fraudsters to manipulate or compromise the system, reducing security risks.

C. Property Management

Property management can be greatly improved with blockchain and smart contracts. They can automate rent col- lection and payments, making sure they are done on time and correctly. Blockchain also helps with tenant screening, ensuring a secure and fraud-free process. Additionally, smart contracts can streamline property maintenance by automating tasks, keeping track of maintenance records, and improving overall facility management.

IV. RELATED WORK

Redekar et al. [3] proposed a blockchain-based real estate management system to enhance the security, transparency, and trustworthiness of property transactions. The platform includes separate login options for regular users and inspectors. After registration, users can browse and list properties, providing essential details such as location, price, and features. Sellers are required to upload documents verifying the authenticity of the property, which are reviewed by auditors before the property is added to the system. The blockchain technology ensures immutability by recording all property transactions and ownership changes, thereby enabling buyers to trust the property information. Additionally, buyers must submit documents such as identification, address proof, and credit reports before making a purchase. By leveraging blockchain, the system enhances security and transparency, allowing users to track property histories and trust the transaction process [3]. Verma et al. [4] proposed a system that uses blockchain technology to prevent property fraud by integrating it with traditional government land record systems. The system begins with the government creating a genesis block for each piece of land, and whenever a property is bought or sold, a new block is added to record the transaction details, linking it to the previous block using hash values. All property transactions and details are stored on the blockchain as a distributed ledger, making it impossible to alter the information without invalidating the entire chain. The blocks contain a data unit with land details such as registry information, dimensions, ownership history, price, and transaction details, along with the hashes of the previous and current blocks to ensure data integrity. The system provides transparency and helps the government monitor land transactions more effectively. Java was used to implement the system, generating the necessary hash values for the blockchain[4].

Hassan et al. [5] present a blockchain-based solution called "My Real Estate" aimed at revolutionizing the real estate industry by addressing issues such as transparency, security, and inefficiency. The system is designed in two phases. Phase 1 involves creating a user-friendly web application using React.js for the frontend and blockchain technology (Ethereum and MetaMask) for secure property listings, bidding, and transaction execution via smart contracts. Phase 2 incorporates Non-Fungible Tokens (NFTs) to enable fractional ownership of properties, allowing individuals with smaller funds to invest in real estate. This approach increases liquidity, making it eas- ier to buy, sell, and trade real estate stakes, and facilitates asset diversification. NFTs also simplify ownership transfers, elimi- nating traditional paper-based processes. The system promotes collective governance by allowing verified owners to make decisions about property management and improvements. The paper also highlights the need for a solid regulatory framework and risk management strategies, acknowledging the potential challenges of market volatility, technology vulnerabilities, and evolving legal regulations in the adoption of blockchain and NFTs in real estate. The goal is to contribute to academic discussions on how blockchain and NFTs can reshape the real estate sector, while encouraging responsible engagement and informed decision-making among stakeholders.[5]

Peter et al. [6] propose a blockchain-based real estate management system to address several challenges in the real estate sector, such as limited access to property and a lack of transparency. In their proposed system, the user logs in by providing their credentials, which are then verified by the system. Successful authentication grants access to vari- ous features, as illustrated in Fig 2. These features include adding properties with or without tokens, purchasing tokens or properties, viewing property sale details, checking transaction history, and logging out of the system. If authentication fails, the user is redirected to an invalid credentials message. They suggest using blockchain technology, along with NFTs and tokenization, to transform real estate ownership. By converting property deeds into NFTs, users can have digital proof of ownership, and transactions related to these NFTs can be easily verified on the blockchain, increasing transparency. Addition- ally, this system allows partial ownership of property, where a property owner can lock an NFT and issue tokens representing fractional ownership. This approach enhances liquidity in the real estate market and makes property ownership accessible to individuals with smaller amounts of capital. The platform also supports a marketplace where users can upload JPEG files of properties and convert them into NFTs. These NFTs follow the ERC721 standard, while the fractional ownership tokens follow the ERC20 standard. The system is built on a programmable blockchain, primarily using Ethereum due to its wide usage. Users and admins interact with the platform differently, with users able to register, log in, add or purchase NFTs or tokens, and view transaction details. Admins have access to all public user information and can handle user requests for platform improvements.[6]

Rahman et al.[7] present a smart contract-based solution for facilitating safe property transactions in the real estate sector. They propose a platform where users can buy and sell land, houses, or flats, with all transaction data stored on the blockchain. Upon completion of a transaction, a smart contract is automatically generated. The system utilizes Ganache, a private blockchain for Ethereum development, to simulate smart contract deployment and interaction. Web3 and Solidity are used to connect the Ethereum blockchain with the front- end application, enabling developers to create decentralized

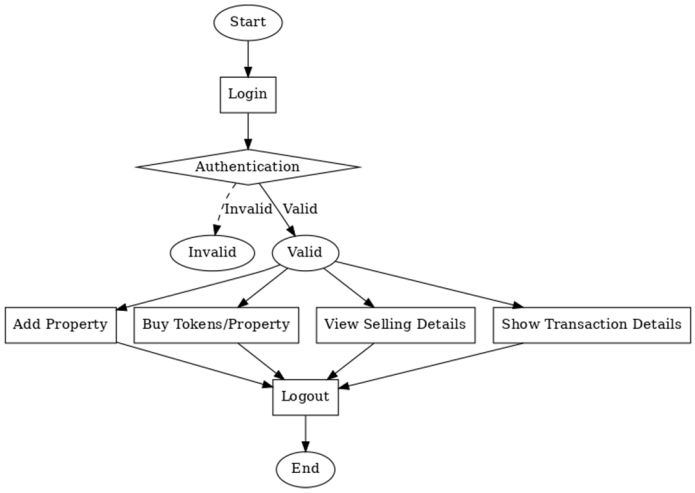


Fig. 2. flowchart

applications easily. The smart contracts, written in Solidity, manage property ownership and transfers. The platform is built with PHP, where users must register using their IDs before they can list properties for sale or purchase. After registering, the system interacts with the blockchain via Ganache, and the smart contracts handle payments and property ownership. The platform allows buyers and sellers to deposit and withdraw funds once the contract's release time has passed. By using PHP and the Web3.js library, the platform can execute smart contract functions and retrieve blockchain data. The cost of creating these smart contracts depends on various factors such as complexity, programming language, platform choice, and testing time, with prices ranging from $10,000 to $40,000, excluding transaction and maintenance fees [7].

S. Raina et al. [8] proposed system operates in three phases. In Phase 1, the admin adds land inspectors to the platform. Phase 2 involves digitizing land records, including ownership, type, encumbrance status, area, location, and map details. In Phase 3, the land registration process unfolds. Citizens register on the platform using their Aadhaar numbers. Sellers list their land for sale, and buyers can request access to view details and send purchase requests. Once approved, both parties fill and digitally sign the sale deed. The land inspector verifies the details, digital signatures, and approves the sale deed. Upon approval, the land ownership is updated on the blockchain ledger, completing the registration process. (Fig. 3 shows the all the phases of the system)

V. CHALLENGES ON INTEGRATION OF BLOCKCHAIN REAL ESTATE AND PROPERTY MANAGEMENT

Integrating blockchain technology into real estate and prop- erty management holds immense transformative potential but comes with a host of challenges that need to be addressed. One of the foremost challenges is regulatory and legal uncertainty. Real estate laws vary widely across countries and regions, creating complications in adopting blockchain universally. The legality of smart contracts, which are integral to blockchain

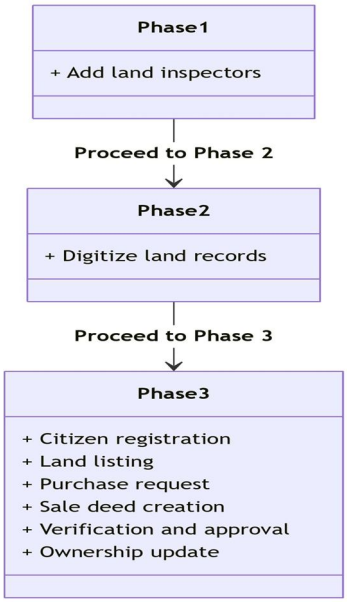


Fig. 3. Phase Chart

transactions, remains uncertain in many jurisdictions, raising questions about their enforceability in traditional courts. Ad- ditionally, compliance with anti-money laundering (AML) and know-your-customer (KYC) regulations can be difficult on decentralized platforms.

Another significant issue is data privacy and security. Real estate transactions involve sensitive information, which ne- cessitates stringent data protection measures. The immutable nature of blockchain, while beneficial for transparency, can conflict with privacy laws like GDPR, which require provi- sions for data rectification and deletion. Furthermore, stake- holder resistance and the lack of understanding of blockchain technology hinder its adoption. Industry players, including realtors, property managers, and government bodies, often resist moving away from established systems, and a general lack of education about blockchain exacerbates the situation. Integration with existing systems is another area where chal- lenges arise. Legacy systems used for property management and government land registries are often not compatible with blockchain solutions, making integration complex. Interoper- ability among various blockchain networks also poses prob- lems, necessitating the development of common standards.

Additionally, the high initial costs of developing blockchain platforms and maintaining the necessary infrastructure can deter smaller players from adopting the technology.

Scalability and speed are critical technical challenges. Real estate transactions typically involve significant data, and cur- rent blockchain networks often struggle with high transaction volumes. Public blockchains, in particular, can be slower compared to centralized systems, making them less suitable for industries requiring quick processing. Similarly, tokenization of real estate assets, while promising increased liquidity, presents its own set of challenges, such as accurate valuation, pricing, and achieving liquidity in the early stages of adoption. Fraud and misuse risks further complicate blockchain inte- gration in real estate. The technology, if exploited, could facil- itate fake transactions or be misused by individuals with stolen identities. Moreover, the irreversible nature of blockchain transactions means that any mistakes or fraudulent entries cannot be easily rectified. Environmental concerns also arise, especially with energy-intensive consensus mechanisms like Proof-of-Work (PoW), which may not align with sustainability goals.

Finally, the lack of standardization in the blockchain space creates inconsistencies in its application across the real estate industry. With no universal standards and multiple competing platforms, achieving uniformity and interoperability becomes challenging.

Addressing these challenges requires a multi-faceted ap- proach. Governments and organizations must establish clear regulatory frameworks to guide blockchain adoption in real estate. Public-private collaborations can help develop inter- operable and scalable blockchain solutions, while education and awareness campaigns can equip stakeholders with the knowledge needed to embrace the technology. Additionally, adopting innovative protocols such as Proof-of-Stake (PoS) can address environmental concerns, paving the way for sus- tainable blockchain solutions. By tackling these issues strate- gically, blockchain can revolutionize real estate and property management, delivering enhanced transparency, efficiency, and trust.

VI. CONCLUSION AND FUTURE SCOPE

The integration of blockchain technology into real estate and property management represents a transformative shift in how the industry operates. Blockchain's decentralized, secure, and transparent nature addresses many of the challenges tradition- ally faced in real estate, including inefficiencies in transaction processes, fraud risks, and lack of trust among stakeholders. By enabling smart contracts, blockchain eliminates interme- diaries, reduces costs, and ensures automated execution of agreements, thus streamlining operations. Additionally, it en- hances data integrity and transparency, which is critical for verifying ownership, tracking property history, and managing tenant agreements.

A key aspect of blockchain's impact is the implementation of smart contracts. These self-executing contracts, embedded with predefined terms and conditions, automatically trigger transactions once requirements are met. In real estate, smart contracts can be used for automating rental agreements, escrow services, and ownership transfers, significantly reducing the time and costs associated with traditional processes. Further- more, they provide a tamper-proof record of transactions, en- suring security and reliability. The adoption of smart contracts could also enhance dispute resolution mechanisms, as all terms and transactions are transparently recorded on the blockchain, minimizing ambiguities and conflicts.

Despite its immense potential, the adoption of blockchain in real estate is still in its infancy. Several challenges, including regulatory uncertainties, technological complexities, and the need for standardization, must be addressed before the tech- nology can achieve widespread implementation. Stakeholders must work collaboratively to create supportive legal frame- works and interoperability standards that facilitate blockchain integration across borders and jurisdictions. Moreover, pub- lic awareness and education about blockchain's benefits are necessary to build trust and encourage participation.

Looking ahead, the future scope of blockchain in real estate is vast. As the technology matures, it is likely to enable advanced applications such as tokenization of real estate as- sets, which democratizes investment opportunities by allowing fractional ownership. This innovation could significantly lower the entry barrier for small investors and increase liquidity in the property market. Furthermore, blockchain-powered plat- forms could facilitate global real estate transactions with minimal friction, making cross-border property investments more accessible and secure.

Integration with other emerging technologies like artificial intelligence (AI) and the Internet of Things (IoT) holds ad- ditional promise. AI can leverage blockchain data to provide predictive analytics for market trends, while IoT devices can feed real-time property data into blockchain systems for en- hanced asset management. Together, these technologies could create a more connected and intelligent property management ecosystem.

In conclusion, blockchain technology is poised to revolu- tionize real estate and property management by enhancing efficiency, transparency, and inclusivity. Continued research, innovation, and collaboration among industry stakeholders are essential to overcome existing challenges and unlock the full potential of this groundbreaking technology.

REFERENCES

[1] Statista, "Real Estate - Worldwide — Statista Market Forecast," [Online]. Available: https://www.statista.com/outlook/fmo/real-estate/worldwide. [Accessed: Nov. 15, 2024].

[2] India Brand Equity Foundation, "Real Estate Industry in India – Overview," [Online]. Available: https://www.ibef.org/industry/real- estate-india. [Accessed: Nov. 15, 2024].

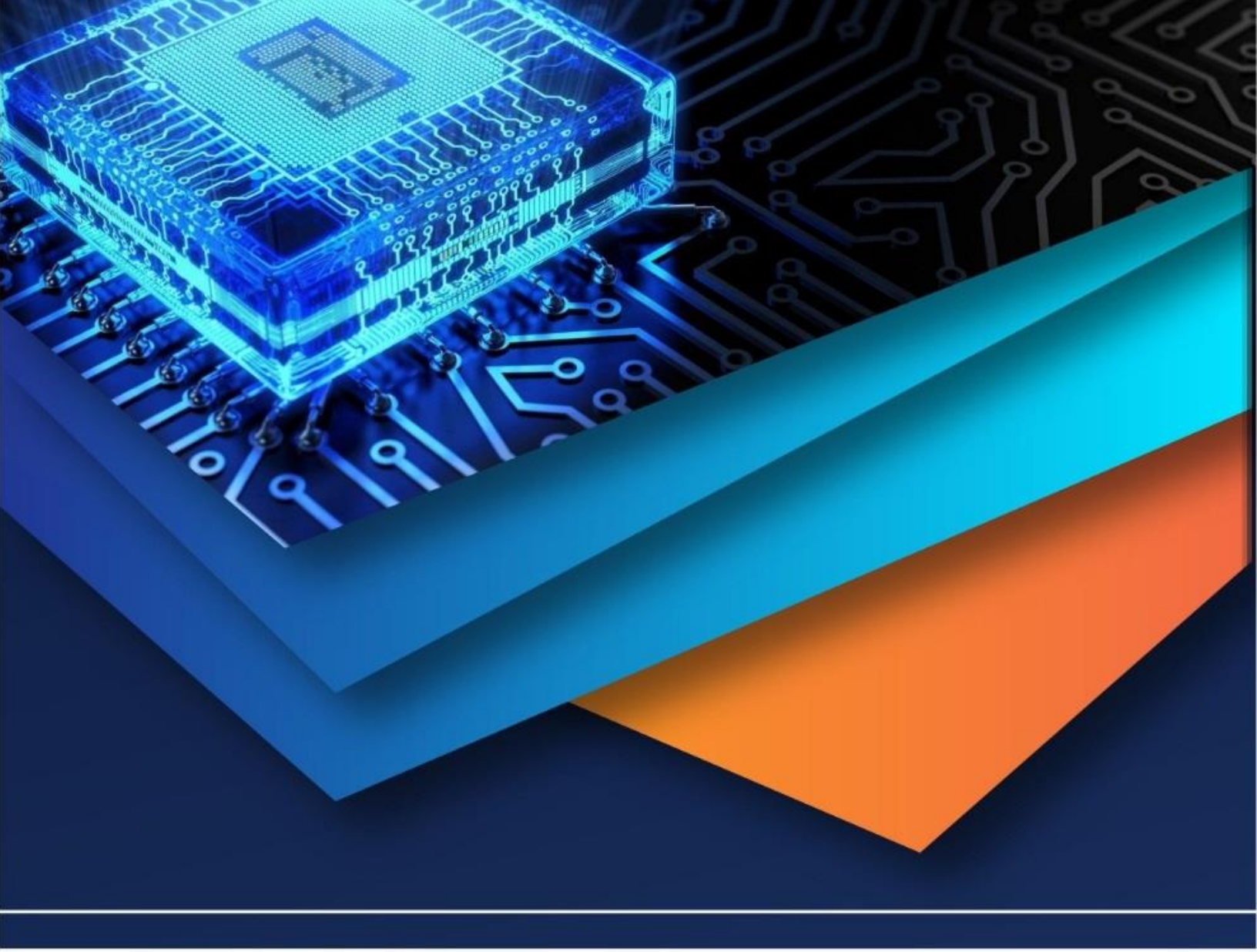
[3] S. Redekar, S. Bhagwat, K. Upasani, S. Jha and V. Tho- rat, "Real Estate Management System using Blockchain," 2024 3rd International Conference on Applied Artificial Intelligence and Computing (ICAAIC), Salem, India, 2024, pp. 1455-1460, doi: 10.1109/ICAAIC60222.2024.10575191.

[4] V. Verma, S. Priya, S. Mishra, R. Priyadarshini and R. Misra, "Prop- erty Fraud Detection And Prevention Using Blockchain," 2019 In- ternational Conference on Intelligent Computing and Remote Sensing (ICICRS), Bhubaneswar, India, 2019, pp. 1-5, doi: 10.1109/ICI- CRS46726.2019.9555856.

[5] M. Hassan, M. Raafat and H. Mansour, "My Real Estate: Revolu- tionizing Real Estate Transactions and Ownership Management with Blockchain and NFTs," 2024 6th International Conference on Com- puting and Informatics (ICCI), New Cairo - Cairo, Egypt, 2024, pp. 437-442, doi: 10.1109/ICCI61671.2024.10485078.

[6] A. Peter, A. A. Kumar, A. Rajeev, B. Baiju and V. S. Chooralil, "Real Estate Management System using Blockchain," 2023 International Con- ference on Innovations in Engineering and Technology (ICIET), Muvat- tupuzha, India, 2023, pp. 1-4, doi: 10.1109/ICIET57285.2023.10220623.

[7] F. Rahman, M. M. Mim, A. Kashem Nibir, M. Karmokar, M. Safaet and
[8] R. Afrin, "Smart Contract Implementation in Real Estate Sector.," 2023 IEEE Global Humanitarian Technology Conference (GHTC), Radnor, PA, USA, 2023, pp. 177-183, doi: 10.1109/GHTC56179.2023.10354773.
[9] S. Raina and S. Kaur, "Land Registry and Title Management using Blockchain and Smart Contracts," 2022 International Conference on Computing, Communication, and Intelligent Systems (ICCCIS), Greater Noida, India, 2022, pp. 110- 113, doi: 10.1109/ICCCIS56430.2022.10037712. keywords:
[10] Authorization; Distributed ledger; Smart contracts; Decentralized applications; Forgery; Fabrics; Blockchains; Blockchain; Hyperledger fabric;Land Registration; Distributed ledgers



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY