INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

Secure Land Registration Management via Ethereum Blockchain

Dr. P. Ravinder Rao, G. Akhil, K. Pranav, K. Hari Kamal

Assistant Professor, Anurag University, Telangana, India

Student, Anurag University, Telangana, India

ABSTRACT: The transfer of land ownership is a significant yet cumbersome process plagued by paperwork, intermediaries, and verification hurdles, leading to reliability issues and increased forgery risks. Leveraging blockchain technology offers a solution by revolutionizing the land registration system. Blockchain's decentralized and immutable ledger eliminates intermediaries, reducing corruption and enhancing speed while instilling trust without centralized oversight. Through cryptographic techniques, consensus mechanisms, and hashing algorithms, blockchain ensures transparent and immutable transaction records. This work aims to develop a user-friendly blockchain-based land registration system to streamline processes while upholding security and trust. In regions like India with high volumes of land transfers, excessive paper usage can be mitigated, benefitting both the environment and accessibility to technology for common people. By facilitating a transition from manual paperwork to digital records, this system not only modernizes land registration but also contributes to environmental conservation and technological inclusivity.

KEYWORDS: Blockchain, Land Registration, Security, Consensus, Immutable, Decentralized.

I. INTRODUCTION

Land ownership and rights registration is a fundamental function of government organizations worldwide, crucial for maintaining property records, facilitating business transactions, and preventing fraudulent activities [1]. Across different countries, stringent laws govern land distribution and ownership, necessitating adherence to specific rules for land and property sales [2]. However, despite robust regulations, the current land registration system faces numerous challenges, including fraudulent transactions and unreliable property records [3]. Sale documents often lack clarity on ownership, relying heavily on historical records for verification, leading to disputes and conflicts [4].

In many regions, land documentation processes remain outdated and reliant on paperwork, resulting in inefficiencies and risks such as document loss or destruction [5]. While some areas have centralized land documentation systems, others still rely on traditional paper-based methods, leading to disparities and inconsistencies in land records management [6]. The reliance on centralized databases administered by government authorities can also contribute to disputes and a lack of transparency in land transactions [7].

To address these challenges, blockchain technology emerges as a promising solution [8]. Blockchain's decentralized and immutable ledger offers transparency and certainty in land ownership transactions, mitigating the limitations of centralized systems [9]. By decentralizing data storage and transaction execution, blockchain reduces reliance on centralized authorities, fostering trust and efficiency in land transactions [10]. Platforms like Ethereum provide a secure environment for executing logic over decentralized data, leveraging blockchain's decentralized storage system [11].

This study aims to explore the potential of blockchain technology, particularly Ethereum, in revolutionizing land registration systems. By analyzing the limitations of current centralized land registration systems and the benefits offered by blockchain technology, this research seeks to propose a more secure, transparent, and efficient approach to land ownership registration. Through case studies, empirical analysis, and theoretical frameworks, this study aims to demonstrate the feasibility and effectiveness of blockchain-based land registration systems in overcoming the challenges faced by traditional methods.

Furthermore, this research aims to contribute to the existing literature by providing insights into the implementation and adoption of blockchain technology in the domain of land registration. By identifying best practices, challenges, and opportunities, this study seeks to inform policymakers, government agencies, and stakeholders about the potential of blockchain technology in transforming land registration processes. Additionally, this research aims to highlight the

socio-economic implications of adopting blockchain-based land registration systems, including enhanced trust, reduced fraud, and improved accessibility to property rights.

In summary, this introduction provides an overview of the challenges faced by traditional land registration systems and introduces blockchain technology as a potential solution. By outlining the objectives, scope, and significance of the study, this research aims to contribute to the advancement of land registration practices and promote the adoption of blockchain technology for more efficient and transparent land ownership management.

II. LITERATURE SURVEY

Land registration is a crucial aspect of governance, facilitating property ownership, transactions, and legal disputes. Traditional land registration systems often face challenges such as inefficiency, fraud, and lack of transparency. In recent years, researchers and policymakers have explored the potential of blockchain technology to revolutionize land registration processes. This literature survey aims to provide an overview of existing research in this domain, highlighting key studies, methodologies, and findings.

Majumdar et al. [1] propose a blockchain-based land registry system with Delegated Proof of Stake (DPoS) consensus for Bangladesh. Their study emphasizes the use of blockchain to enhance transparency, efficiency, and security in land registration processes. Mishra et al. [2] explore the digitalization of land records using blockchain technology, focusing on its potential to streamline record-keeping and reduce fraud. Their research underscores the benefits of blockchain in ensuring the integrity and accessibility of land records.

Nandi et al. [3] present a secured land registration framework on blockchain, addressing issues such as data tampering and unauthorized access. Their study highlights the importance of security measures in blockchain-based land registration systems. Similarly, S and Sarath [4] discuss securing land registration using blockchain, emphasizing the role of cryptographic techniques and decentralized storage in safeguarding land records.

Shinde et al. [5] conducted a survey of existing land registry systems and proposed a feasible solution for land registration using blockchain. Their study provides insights into various approaches and challenges associated with implementing blockchain in land registration processes. Suganthe et al. [6] explore blockchain-enabled digitization of land registration, focusing on the benefits of blockchain in improving data integrity and accessibility.

Thosar et al. [7] discuss land registry management using blockchain, highlighting its potential to streamline administrative processes and reduce bureaucracy. Their study emphasizes the importance of interoperability and standardization in blockchain-based land registration systems. Castellanos and Benbunan-Fich [8] examine the digitalization of land records from paper to blockchain, discussing the implications of blockchain technology on land governance and administration.

In conclusion, blockchain technology holds immense potential to transform land registration processes, offering benefits such as transparency, security, and efficiency. The studies reviewed in this literature survey highlight various approaches and methodologies for implementing blockchain in land registration systems. However, challenges such as scalability, interoperability, and regulatory frameworks need to be addressed for widespread adoption. Moving forward, further research and collaboration between academia, government agencies, and industry stakeholders are essential to realize the full potential of blockchain in revolutionizing land registration.

III. METHODOLOGY

a) Proposed Work:
The proposed Secure Land Registration Management via Ethereum Blockchain introduces a decentralized and technologically advanced system to address the drawbacks of existing land registration systems.

The proposed system will use smart contracts, cryptographic algorithms, and consensus mechanisms to develop a user-friendly land registration system. Smart contracts are self-executing contracts that have the contents of the agreement between sellers and purchasers directly.

Without the requirement for a centralized authentication system, a formal legal framework, or an external compliance mechanism, smart contracts enable the execution of reliable transactions and agreements between dispersed, anonymous parties. They make transactions clear, irreversible, and traceable.

The system allows for public access to land ownership information while maintaining the privacy of sensitive details. Users can verify ownership and transaction history without revealing confidential information, striking a balance between transparency and data protection.
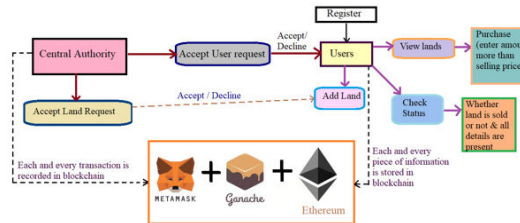
b) System Architecture:

Fig1 Proposed Architecture

The proposed system architecture facilitates land registration and transaction processes, integrating with blockchain technology for enhanced security and transparency. Initially, users submit land requests to the central authority, which validates and registers them. Registered users can then add land listings to the platform, view available lands, and initiate purchase transactions. The system utilizes MetaMask for secure authentication and interaction with the Ethereum blockchain. Ganache serves as a local Ethereum blockchain for testing and development purposes. Ethereum smart contracts manage land ownership, transactions, and status checks, ensuring trust and immutability. Through this architecture, the system streamlines land-related operations, reduces reliance on intermediaries, and enhances transparency and security in land transactions. Users can securely engage with the platform, confident in the integrity of their transactions and property rights, while the central authority maintains oversight and validation of land requests and registrations.

c) Modules

To implement this project we used the following models user, seller.

These module's descriptions are given below:

User Registration

Individuals seeking to participate in land transactions register by providing personal information including name, contact details, and address. Upon submission, the system generates unique login credentials comprising a username and password for each user. These details are securely stored in the system's database, ensuring confidentiality and accessibility for future reference. This streamlined process facilitates user access and enhances security in land transaction engagements.

Central Authority LOGIN

The centralized authority manages user registrations and land transactions for oversight and control. Upon logging in with secure credentials, the authority reviews and processes user registration requests, either approving or rejecting them based on specified criteria. Additionally, the authority manages land registration requests, ensuring compliance with regulations and standards. Through these actions, the centralized authority maintains control and oversight over the registration and transaction processes, promoting accountability and regulatory compliance.

User LOGIN as Seller

Sellers utilize this module to engage with the system, adding their land details for sale and monitoring request statuses. Upon logging in with unique credentials, sellers input land details along with ownership proof and relevant documentation for sale. They can then track the status of their land registration requests, staying informed about approvals or any necessary actions required. This streamlined process empowers sellers to manage their land transactions efficiently within the system.

User Login as Purchaser

Purchasers access the system to explore and track land transactions. After providing login credentials, purchasers browse through a list of available lands for purchase, viewing relevant details. They can then monitor the progress of their purchase requests, ensuring transparency throughout the transaction process. This streamlined approach empowers purchasers to efficiently navigate the system, facilitating informed decision-making and enhancing their overall experience in land transactions.

d) BLOCKCHAIN INTEGRATION

Ethereum's blockchain technology forms the foundation, leveraging smart contracts, cryptographic algorithms, and consensus mechanisms to create a robust and user-friendly land registration system.

Solidity, a programming language tailored for creating smart contracts on the Ethereum platform, is employed to enact the essential functionalities required for land registration in the project.

Transactions recorded on the Ethereum blockchain are secured through cryptographic techniques, making them clear, irreversible, and traceable. This enhances the overall integrity of the land registration process.

By eliminating the need for middlemen and utilizing blockchain's inherent transparency, the system enhances trust and reduces corruption in the land registration process. Blockchain ensures that all transactions are recorded and visible to participants in a tamper-resistant manner.

GANACHE

Ganache serves as a user-friendly interface facilitating Ethereum blockchain activities in the project. It presents critical details such as accounts, transactions, and smart contracts, offering a convenient platform for users to interact with the Ethereum blockchain.

Ganache provides insights into individual blocks, offering crucial information like block numbers, timestamps, transactions, and gas usage. These insights aid in comprehensive blockchain analysis, enhancing the understanding of the system's performance and transaction dynamics within the project.

Ganache is employed to access data on the local Ethereum blockchain within the project. It encompasses information related to land record storage, system specifics, and user interactions, contributing to the overall functionality and data management of the project.

METAMASK

MetaMask is integrated into the project as an Ethereum wallet and browser extension. It enables users to manage cryptocurrencies and access decentralized applications (DApps) seamlessly within the project's ecosystem.

MetaMask is utilized in the project for secure Ethereum transactions. It ensures transparent ETH deduction and efficient transaction processing, enhancing the security and reliability of financial interactions within the project.

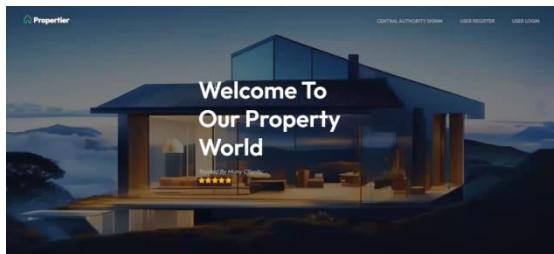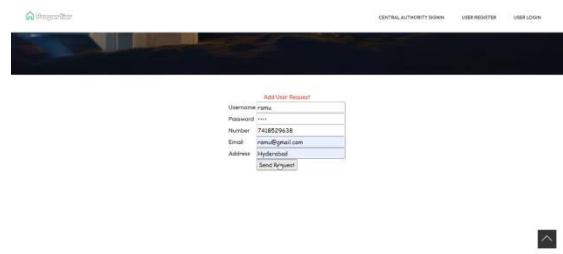## IV. EXPERIMENTAL RESULTS

Fig 1 home page

Fig 2 add user request page

Fig 3 send request page

Fig 4 requests a successful page
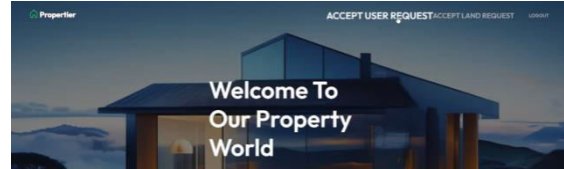
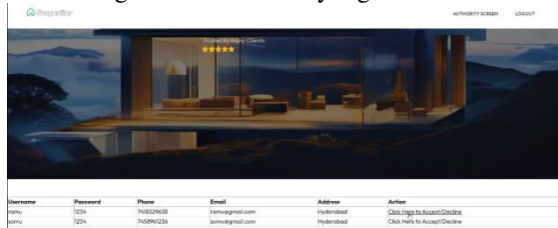Fig 5 central authority login

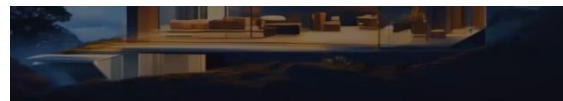Fig 6 Accept user request page

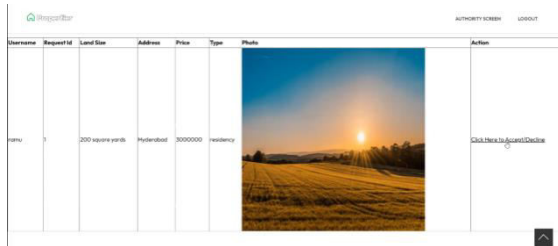Fig 7 output
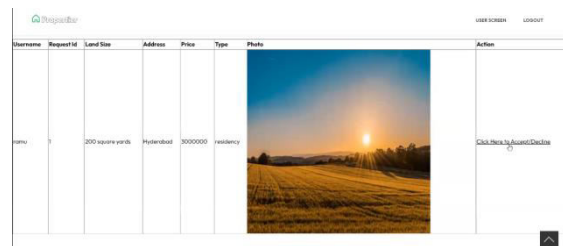

Fig 8 marks the status page

Fig 9 output page

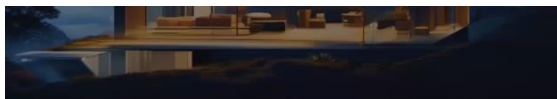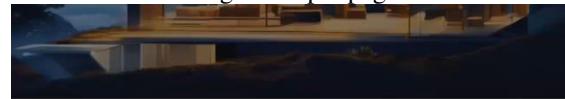

Fig 10 output page
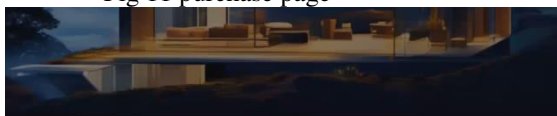

Fig 11 purchase page
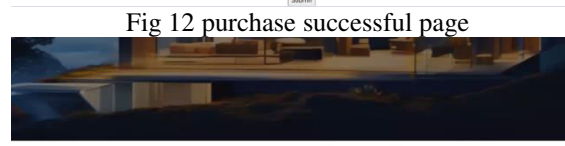

Fig 12 purchase successful page

Fig 13 request amount is more page
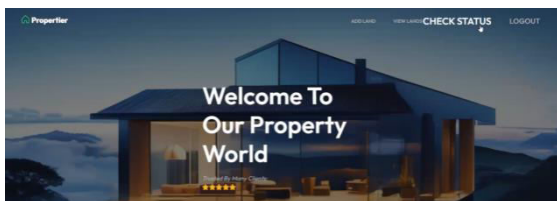

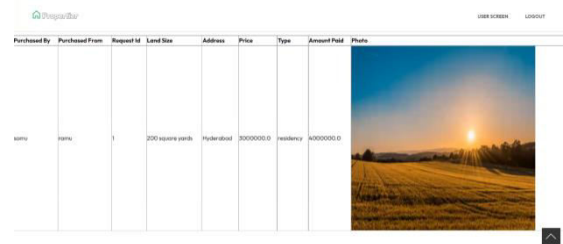Fig 14 Purchase mode successful page

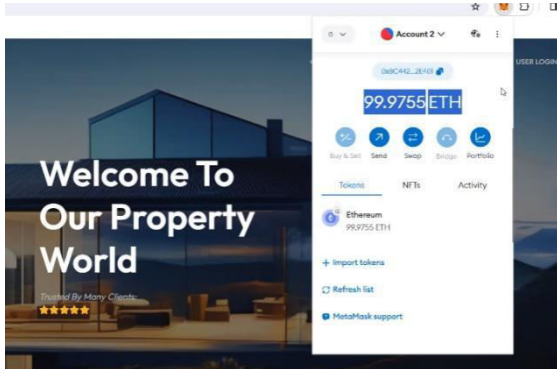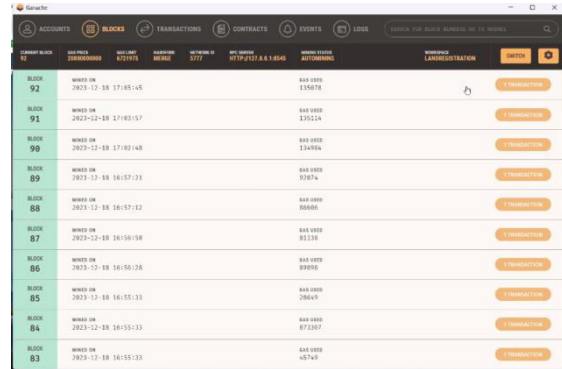Fig 15 Check the status page

Fig 16 output

Fig 17 Meta mask

Fig 18 ganache

V. CONCLUSION

In conclusion, the development of a user-friendly blockchain-based land registration system marks a significant advancement in streamlining the complex process of transferring land ownership while minimizing paperwork. The project's decentralized approach effectively addresses corruption issues by removing intermediaries, thereby enhancing reliability and reducing the likelihood of forgery in land registration processes. Leveraging blockchain technology accelerates land registration procedures by eliminating multiple verifications, resulting in a more responsive and efficient system. Furthermore, the project's positive impact extends to environmental sustainability by reducing paper use in land record maintenance. By promoting technology adoption and eliminating manual paperwork, especially in regions with high land transfer rates like India, the project contributes to environmental conservation efforts. Overall, the successful implementation of the blockchain-based land registration system not only enhances efficiency and reliability but also promotes transparency, trustworthiness, and environmental responsibility in land registration processes.

VI. FUTURE SCOPE

In the future, there are several avenues for expanding and enhancing the current land registration system. Firstly, developing a mobile application alongside the existing web-based platform would significantly improve user accessibility and convenience, catering to users who prefer mobile devices for their transactions. This extension would further streamline the user experience and broaden the system's reach.

Moreover, there is potential for extending the system to include leasable properties, such as rental rooms, homes, and shops, using smart contracts. By integrating smart contracts, the system can automate and secure rental agreements, reducing the risk of forgery and ensuring transparency in lease transactions. This expansion would not only enhance the versatility of the system but also address additional needs in the real estate sector, catering to both property owners and tenants. Overall, these future developments aim to further enhance the system's functionality, usability, and value proposition in the realm of land and property management.

REFERENCES

[1] Majumdar, M. A., Monim, M., & Shahriyer, M. M. (2020). Blockchain-based land registry with delegated proof of stake (DPoS) consensus in Bangladesh. 2020 IEEE Region 10 Symposium (TENSYMP). https://doi.org/10.1109/tensymp50017.2020.9230612.

[2] Mishra, I., Supriya, Sahoo, A., & Vivek Anand, M. (2021). Digitalization of land records using Blockchain technology. 2021 International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE). https://doi.org/10.1109/icacite51222.2021.9404678

. [3] Nandi, M., Bhattacharjee, R. K., Jha, A., & Barbhuiya, F. A. (2020). A secured land registration framework on Blockchain. 2020 Third ISEA Conference on Security and Privacy (ISEA-ISAP). https://doi.org/10.1109/isea-isap49340.2020.235011

[4] S, K., & Sarath, G. (2020). Securing land registration using blockchain. Procedia Computer Science, 171, 1708–1715. https://doi.org/10.1016/j.procs.2020.04.183

[5] Shinde, D., Padekar, S., Raut, S., Wasay, A., & Sambhare, S. S. (2019). Land Registry using blockchain - A survey of existing systems and proposing a feasible solution. 2019 5th International Conference on Computing, Communication, Control and Automation (ICCUBEA). https://doi.org/10.1109/iccubea47591.2019.9129289.

[6] Suganthe, R. C., Shanthi, N., Latha, R. S., Gowtham, K., Deepakkumar, S., & Elango, R. (2021). Blockchain-enabled digitization of Land Registration. 2021 International Conference on Computer Communication and Informatics (ICCCI). https://doi.org/10.1109/iccci50826.2021.9402469

[7] Thosar, A., Hame, M., Sarode, A., & Kaur, P. (2020). Land Registry Management using blockchain. 2020 International Conference on Smart Innovations in Design, Environment, Management, Planning and Computing (ICSIDEMPC). https://doi.org/10.1109/icsidempc49020.2020.9299614

[8] Castellanos, Arturo & Benbunan-Fich, Raquel. (2018). Digitalization of Land Records: From Paper to Blockchain.

[9] Ramya U.M., Sindhuja P., Atsaya R., Bavya Dharani B., Manikanta Varshith Golla S. (2019) Reducing Forgery in Land Registry System Using Blockchain Technology. In: Luhach A., Singh D., Hsiung PA., Hawari K., Lingras P., Singh P. (eds) Advanced Informatics for Computing Research. ICAICR 2018. Communications in Computer and Information Science, vol 955. Springer, Singapore. https://doi.org/10.1007/978-981-13-3140-4_65. [10] A. Sahai and R. Pandey, "Smart Contract Definition for Land Registry in Blockchain," 2020 IEEE 9th International Conference on Communication

[11] Aanchal Anand, Matthew McKibbin, Frank Pichel. (2017). Colored coins: bitcoin, blockchain, and land administration.

[12] Sekhari, Ashwin & Chatterjee, Rishav & Dwivedi, Ras & Negi, Rohit & Shukla, Sandeep. (2019). Entangled Blockchains in Land Registry Management.

[13] How blockchain will revolutionize far more than money | Aeon Essays by Dominic Frisby

[14] Nakamoto, Satoshi. (2009). Bitcoin: A Peer-to-Peer Electronic Cash System. Cryptography Mailing list at https://metzdowd.com.

[15] Vinay Thakur, M.N. Doja, Yogesh K. Dwivedi, Tanvir Ahmad, Ganesh Khadanga, Land records on Blockchain for implementation of Land Titling in India, International Journal of Information Management, Volume 52,2020. https://doi.org/10.1016/j.ijinfomgt.2019.04.013.

[16] Transformations, transitions, or tall tales? A global review of the uptake and impact of NoSQL, blockchain, and big data analytics on the land administration sector, Land Use Policy, Volume 83, 2019, https://doi.org/10.1016/j.landusepol.2019.02.016. [17] N. Kshetri and J. Voas, "Blockchain in Developing Countries," in IT Professional, vol. 20, no. 2, pp. 11-14, Mar./Apr. 2018, doi: 10.1109/MITP.2018.021921645.

[18] Website: www.blockchain-council.

[19] Sivaganesan, D. D. (n.d.). A hybrid architecture combining artificial intelligence and blockchain for IOT Applications: ScienceGate. Wireless Systems. March 2019 - IRO Journal on Sustainable Retrieved December 3, 2022, from https://www.sciencegate.app/document/10.36548/jsws.2020.3.006

[20] Atul Lal Shrivastava, Rajendra Kumar Dwivedi, "Designing A Secure Vehicular Internet of Things (IoT) using Blockchain: A Review",1st IEEE International Conference on Advances in Computing and Future Communication Technologies (ICACFCT 2021), MIET Meerut, India, 16-17 Dec 2021 (2021).

[21] Neelam Chauhan, Rajendra Kumar Dwivedi, "A Secure Design of the Healthcare IoT System using Blockchain Technology", 9th IEEE International Conference on Computing for Sustainable Global Development (16th INDIA Com 2022), Bharati Vidyapeeth, New Delhi, India, to be held on 23- 25, DOI: 10.23919/INDIACom54597.2022.9763187(March 2022).

[22] Atul Lal Shrivastava, Rajendra Kumar Dwivedi, "A Secure Design of the Smart Vehicular IoT System using Blockchain Technology", 9th IEEE International Conference on Computing for Sustainable Global Development (16th INDIA Com 2022), Bharati Vidyapeeth, New Delhi, 10.23919/INDIACom54597.2022.9763216(March 2022).

[23] Trishla Kumari, Rakesh Kumar, Rajendra Kumar Dwivedi, "Design of A Secure and Smart Healthcare IoT with Blockchain: A Review", Part of the SIST Book Series, Springer, 6th Springer International Conference on Information and Communication Technology for Intelligent Systems (ICTIS 2022), Ahmedabad, India, 22-23 April 2022.

[24] Neelam Chauhan, Rajendra Kumar Dwivedi, "Designing A Secure Smart Healthcare System with Blockchain", Part of the LNNS Book Series, Springer, 6th Springer International Conference on Inventive Systems and Control (ICISC 2022), JCT College of Engineering and Technology, Coimbatore, India, 6-7 Jan 2022

[25] R.C. Suganthe; N. Shanthi; R.S. Latha; K. Gowtham; S. Deepakkumar; R. Elango, et. al., "Blockchain-enabled Digitization of Land Registration" published in IEEE Open Access, available at https://ieeexplore.ieee.org/document/9402469.

[26] Ishita Mishra; Supriya; Astha Sahoo; M. Vivek Anand, et. al., "Digitalization of Land Records using Blockchain Technology" published in IEEE Open Access, available at https://ieeexplore.ieee.org/document/9404678

[27] Ramya U.M, P. Sindhuja,RA Atsaya,B. Bavya Dharani, et. al., "Reducing Forgery in Land Registry System Using Blockchain Technology" published in Research Gate Open Access, available at https://www.researchgate.net/publication/329602952.

[28] Archana Sahai; Rajiv Pandey, et. al., "Smart Contract Definition for Land Registry in Blockchain" published in IEEE Open Access, available at https://ieeexplore.ieee.org/document/9115752.

[29] C. Roopa, R.C. Suganthe and N. Shanthi, "Blockchain-Based Certificate Verification Using Ethereum And Smart Contract", Journal of Critical Reviews, vol. 7, no. 9, pp. 330-336, 2020

INTERNATIONAL JOURNAL
OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

📱 **9940 572 462** ⬤ **6381 907 438** ✉ **ijircce@gmail.com**

Scan to save the contact details