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MEDICINE SUPPLY CHAIN MANAGEMENT USING BLOCKCHAIN TECHNOLOGY

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Abstract: - **This work describes the functioning of blockchain technology, its potential use or impact on current supply chain management (SCM) registry systems, and the role of legal experts. Fake products have emerged as a major global issue, leading customers to purchase fraudulent goods without any means to verify their authenticity. This system utilizes blockchain technology to counteract the auctioning of counterfeit products. We utilize blockchain technology to enable producers or creators to incorporate verifiable product serial numbers into the balance sheet, which customers can use to confirm the authenticity of the product before making a purchase. Blockchain ensures the integrity of data, fostering a trustworthy environment. The proposed system uses a custom algorithm, which helps to identify fake products. This approach primarily focuses on generating QR-codes for individual accounts and utilizing Supply Chain Management (SCM) to ensure secure data distribution to end users.**

Keywords: *Blockchain, Smart contracts, PHR (Personal Health Records), healthcare, access control.*

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I INTRODUCTION

Blockchain technology, or the distributed, secure ledger technology, has gained much attention in recent years. This paper presents a detailed survey of blockchain technology literature and its applications. The sources of blockchain literature examined for this survey include research papers, books and book chapters, journal papers, specific cryptocurrency sites and wikis, conference papers, company 'Point of View's (PoVs), and whitepapers published by various organizations implementing and experimenting in blockchain. Blockchain being a much-hyped and experimented technology, a lot of literature is found in content hosted on proprietary forums, such as company websites, web articles, etc. This survey is extensive and covers the various aspects of blockchain, including consensus algorithms and their variations, as well as currently implemented and possible future applications. The bibliography contains references that address the technical aspects of blockchain, which this survey will not cover in detail.

People are referring to blockchain as the fifth disruptive innovation in computing. In simplest words, it is a distributed ledger of records that is immutable and verifiable. People have used the concept of blockchain in various ways since its introduction in 2008. Numerous cryptocurrencies have emerged, demonstrating the largest impact or application of blockchain. However, with time, it has become clear that blockchain as a technology is likely to have an impact much wider than just the cryptocurrency domain and much deeper than simple distributed ledger storage. This comprehensive survey aims to compile all the significant advancements made thus far in implementing blockchain. While the finance and banking domain is the most common place to adopt blockchain, many major players are conducting experiments in various other domains. other domains. This work aims to delve into the diverse domains where blockchain has made a significant impact and anticipate potential future implementations.

II LITERATURE REVIEW

Patients have authority over their medical records thanks to blockchain [1]. Smart contracts based on the Ethereum blockchain allow patients control over their data in a decentralized, immutable, transparent, traceable, trustworthy, and safe way. To securely collect, store, and exchange patients' medical data, the proposed solution uses decentralized storage of interplanetary file systems (IPFS) and trusted reputation-based re-encryption oracles. Algorithms are presented together with complete implementation information. We assess the suggested smart contracts based on two key performance indicators: cost and accuracy. We also explore the generalisation elements of our technique and give security analysis. The suggested approach's drawbacks are outlined. On Github, we make the smart contract source code openly accessible.

IPFS [2] provides a blockchain-based secure storage and access solution for electronic medical data. We built an attribute-based encryption scheme for safe storage and efficient exchange of electronic medical records in IPFS storage environment based on the ciphertext policy attribute-based encryption system and IPFS storage environment, paired with blockchain technology. Our method is based on ciphertext policy attribute encryption, which effectively regulates access to electronic medical data while maintaining retrieval efficiency. Meanwhile, we store encrypted electronic medical data in the decentralized Interplanetary File System (IPFS), which not only provides storage platform security but also eliminates the single point of failure concern. Furthermore, we use blockchain technology's non-tamperable and traceable characteristics to enable safe storage and search for medical data. Our approach delivers selective security for pick keyword assaults, according to the security proof. Our approach is efficient and viable, according to performance analysis and actual data set simulation studies.

Blockchain technology is being used to handle health records [3]. a patient-centered, entirely decentralized strategy that can detect data theft, prevent data modification, and gives patients control over access. Blockchain technology is the most effective way to solve all issues and meet all demands. As a decentralized and distributed ledger, blockchain has the potential to affect billing, record sharing, medical research, identity theft, and financial data crimes in the future. Smart contracts in health care may help to simplify things even further. On the Blockchain, invocation, record generation, and validation will all take place. on a patient-driven model of record maintenance based on Blockchain technology, with smart contracts to be added in the future, allowing for more data sharing possibilities. Finding its vast reach, I hope that additional study will be conducted and actual applications will be realised.

A medical data exchange and protection method based on blockchain[4]. To enhance the hospital's electronic health system, a medical data exchange and protection strategy based on the hospital's private blockchain was developed. For starters, the system may meet a variety of security requirements, including decentralisation, openness, and tamper resistance. Doctors will be able to retain medical data or retrieve patient history data via a secure approach that respects their privacy. A symptom-matching technique is also provided between patients. It enables patients who have the same symptoms to complete mutual authentication and generate a session key for future disease communication. PBC and OpenSSL libraries are used to implement the suggested approach.

HealthyBlock is a blockchain-based IT architecture for electronic medical records that is resistant to network outages. [5]. a patient, posing a direct danger to the person and resulting in large public health expenses for governments. The creation of electronic medical record (EMR) systems using blockchain networks is one of the proposed solutions to this problem; however, most of them fail to account for the occurrence of connectivity failures, such as those found in various developing countries, which can lead to data integrity failures. To address these issues, Healthy Block is described in this paper as a blockchain-based architecture that proposes a unified electronic medical record system that takes into account multiple clinical providers, has data integrity resilience during connectivity failure, and has usability, security, and privacy characteristics. A prototype for patient care in a network of hospitals was developed based on the Healthy Block architecture. The evaluation's findings revealed a high level of efficiency in maintaining patients' EMRs unified, updated, and secure, regardless of which network healthcare provider they contact.

[6] A blockchain-based personal health record sharing system with certified data integrity. A novel blockchain-based personal health record sharing system with certified data integrity. The new scheme uses searchable symmetric encryption and attribute-based encryption techniques to achieve privacy protection, keyword search, and fine-grained access control in the process of personal health record sharing, addressing the problems of privacy disclosure, limited keyword search ability, and loss of control rights. In comparison to other comparable methods, the new approach enables patients to give attribute private keys to users, eliminating many of the security issues that the scheme's attribute authority causes. Furthermore, the new scheme manages keys in the scheme using blockchain, reducing the single point of failure concern associated with centralised key management. The new technique, in particular, maintains the hash values of encrypted personal health information in blockchain and the corresponding index set in a smart contract, which may boost data integrity verification efficiency even further.

An efficient consortium blockchain for the exchange of medical data [7]. a new business approach for exchanging medical data and a blockchain-based platform Our solution takes use of the benefits of blockchain in the recording and exchange of medical data. The distributed network's participants may store, exchange, and reliably verify information. A novel consensus method and a universal anonymous sharing mechanism are also proposed. These techniques improve the efficiency and security of medical data exchange among users. To avoid manipulation and fraud, both the information and the traces of the transaction may be maintained in a dispersed manner in this fashion.

For improved privacy, scalability, and availability, blockchain is being used to retain patient information in electronic health records [8]. consortium blockchain to create a distributed system using existing EHRs utilizing Hyper ledger Fabric. The address of a patient record in an EHR is recorded on the same ledger held by peer nodes. Individual patients are recognized by one-of-a-kind certificates issued by local certificate authorities who operate together in a network channel. When transferring data, we employ a proxy re-encryption mechanism to preserve a patient's privacy. We created and implemented a number of chain codes to handle business logic that was agreed upon by the network's member organizations.

In healthcare, a poll on blockchain-based self-sovereign patient identification [9]. Blockchain (BC)-based self-sovereignty and patient data records in healthcare are at the cutting edge. Our objective is to look into the possibilities of using BC technology in patient data and identity management. BC may be particularly advantageous as a distributed decentralized technology, providing patients ownership over their own data and self-sovereign identification. To the best of our knowledge, no literature exists that addresses the same issues. More particular, solutions aimed at realizing comprehensive BC-based Electronic Health Records (EHR) and Patient Health Records are the emphasis (PHR). EHR and PHR are used to keep track of patient information such as doctor's notes and radiological pictures. As a result, they include crucial information on the patient's privacy and identity. As a result, in terms of architectural and technological framework, developing pure decentralized Healthcare Information Systems (HIS) is a significant problem. Designing a strong and dependable EHR and PHR, which serve as the basis for a variety of other healthcare services, requires carefully balancing a number of aspects, including decentralisation, privacy, scalability, and data throughput.

Using blockchain to protect the privacy of electronic health records [10]. a way to use blockchain technology to build EHRs and make them more safe and private. Using cryptographic methods and decentralisation, blockchain technology will maintain control over information access. It will also strike a balance between data security and data accessibility. This project's major goal is to frame data privacy and security challenges in electronic healthcare.

TABLE 1: LITERATURE REVIEW

Sr. No.	Name of Paper	Authors	Publication Name	Approaches
11.	"Using Blockchain for Electronic Health Records."	Ayesha Shahnaz 1 ,Dr. Usman Qamar2 and Dr. Ayesha Khalid.	March 27 2021 IEEE	In this paper, we discuss how the blockchain technology can be used to transform the EHR systems and could be a solution of these issues.
12.	"eHealthChain—a blockchain-based personal health information management system".	Pravin Pawar1 ·Neeraj Parolia2 · Sameer Shinde3 ·Thierry Oscar Edoh 4 · Madhusudan Singh	March 5-7, 2021 IEEE	The Personal Health Information Management System (PHIMS) supports activities such as acquisition, storage, organization,
13.	"Research on the Application Hierarchical Framework"	Xiamen Du , 1 Beibei Chen , 2 Ming Ma,2 and Yanjiao Zhang 3.	December31 2020 IEEE	Constructed a development application system of smart healthcare under the blockchain based on stakeholder theory.
14.	"Application of Blockchain inthe Hospital management system"	ZEQI leng.	July 3 2020 IEEE	Compared to existing systems, eHealth Chain provides complete control to the user in terms of personal health data acquisition, sharing, and self-management..

III EXISTING TECHNOLOGY

Infrastructure (both technical and social) that enables data to move electronically between institutions. Depending on the system and health care settings, mobile devices like tablets and smartphones with handwriting capabilities may also be used to access and update patient records in an electronic medical record (EMR). Individual notes from an electronic medical record (EMR) might be linked to a patient's private health record (PHR), making this information readily available to patients.

Limitations of Existing System

- There are significant differences in how each care environment operates. In the realm of electronic health records, it's challenging to create a "one-size-fits-all" solution.
- The possibility that electronic health records may one day be utilized longitudinally and linked across locations of treatment further complicates the challenges surrounding their long-term preservation. Multiple independent parties may generate, access, and make changes to records.
- Doctors, hospitals, insurance companies, and patients are all part of the healthcare ecosystem.
- Users' data may be compromised

IV SYSTEM ARCHITECTURE

System must validate the previous block before commit block. User can access the data over the internet 24*7. If any block has changed by third party attacker or unauthorized user, it must show during transaction current blockchain is invalid. It can recover the invalid blockchain using other data nodes, with the help of majority of trustiness. The node or user who wants to initiate a transaction would record and broadcasts the data to the network. The node or user who receives the data verifies the authenticity of the data received in the network. Then the verified data is stored to a block. All nodes or users in the network validate the transaction by executing either the proof of work algorithm or the proof of stake algorithm to the block that needs validation. Consensus algorithm used by the network will store the data to the block that is added to blockchain. And all nodes in the network admit the respective block and extend the chain base on the block.

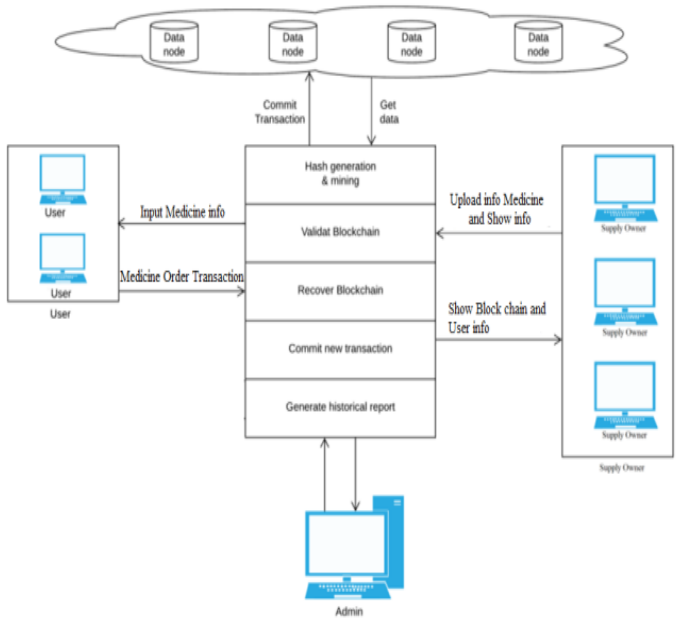

Figure 1: System Architecture

The system contains following modules:

- This system highlights the implementation of e-transaction system using blockchain for such a proposal from a practical point view in both development/deployment and usage contexts.
- Concluding this work is a potential roadmap for blockchain technology to be able to support complex applications.
- In the system carried out transaction system for online user, where end user easily access the system and make the transaction without using any third party validation .
- The system can't be generating any high level hardware configuration requirement, it possible to make vote using traditional configuration.
- The able to perform the transaction without any hardware device with drastic security manner.
- In this data is processed in multiple servers so the transactions are processed in sequencing P2P distributed network. This illuminates the quality of service issue and time limits.
- This is a middleware system in which the processing environment in which the load will be balanced using threads.
- The request generated will be parallels saved on all nodes in a Blockchain manner
- We use the Hash generation algorithm and the Hash will be generated for the given string.
- Before executing any transaction, we use peer to peer verification to validate the data.
- If any chain is invalid then it will recover or update the current server blockchain.
- This will validate till the all nodes are verified and commit the query.
- Mining algorithm is used for checking the hash generated for the query till the valid hash is generated.

V CONCLUSIONS

The complexities of this area and the need for more stable and efficient information management frameworks have led to several research directions that aim to apply blockchain technology to the transaction industry. An interoperable architecture will undoubtedly play a significant role in several transaction usage scenarios that confront similar data exchange and communication problems. Further research on safe and efficient software practices for the use of blockchain technology in transactions is necessary to educate software engineers and domain experts on the potential and limitations of this new technology, and to determine whether to build a decentralised application using an established blockchain. The algorithm has selected acceptable levels of complexity, efficiency, and implementation complexity to operate the system effectively. Through empirical studies, we have a better understanding of the pace of knowledge creation in the supply chain. There are several significant obstacles to fully utilizing the blockchain and applying it to the field of health. The primary issue is the scalability of the technology and the management of data.

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