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INTEGRATION OF BLOCKCHAIN TECHNOLOGIES INTO HEALTHCARE DELIVERY

Kanagala Anusha[1*], Gorantla Anil Kumar[2], Nadella Kishore[3], Majji Tarun[3]

1. *Department of MBA, Koneru Lakshmaiah Business School, KLEF, Guntur.*
2. *Department of Humanities and Science, Tirumala College of Engineering, Tirupati, India*
3. *Koneru Lakshmaiah Business School, Koneru Lakshmaiah College of Engineering, Guntur, India.*

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ABSTRACT

Blockchain technology has the potential to transform healthcare delivery by enabling secure and efficient sharing of patient health data among healthcare providers, researchers, and patients themselves. The significant inventions and innovative developments in blockchain technology of today playa role in the business sector. The adoption of blockchain technology holds a series of blocks that contains data. It upholds trust among people no matter how far apart they are. Way past the years, the growth of blockchain technology has forced academics and healthcare professionals to examine novel approaches to integrate blockchain technology into a variety of industries (healthcare). The study offers a thorough analysis of the advantages of integration for blockchain-based healthcare technology. A keyword analysis using the Scopus database and a sentimental analysis with Twitter was conducted. The paper discussesand concludes that healthcare and blockchain integration is to take forward with the growing integration in the field of biochemistry, medicine, and health.

Introduction

Blockchain is a digital decentralized ledger technology that records transactions secure, transparent, and immutable manner. It uses cryptographic algorithms to link the blocks of information together, making it nearly impossible for any one party to alter the data once it has been recorded.

In the context of healthcare delivery, blockchain technology has the potential to revolutionize healthcare information collected, stored, and shared [1, 2]. The secure and transparent nature of blockchain can help to improve the accuracy, efficiency, and accessibility of patient medical records.

For example, blockchain can be used to create a shared electronic medical record (EMR) system that allowsaccess to patients and control the health dataon their own. Further, can improve the speed and accuracy of diagnoses, and will process the coordination of care between the healthcare providers [3, 4]. Additionally, blockchain can help to establish the privacy of patient data, as it can prevent unauthorized access to sensitive information and make it easier to track and detect breaches.

Another use case of blockchain technologies in healthcare with supply chain management and drug traceability [5]. Blockchain can be used to track the journey of drugs from the manufacturer to the patient, helping to ensure the authenticity and safety of the drugs and reducing the risk of counterfeits entering the supply chain.

Overall, while blockchain is however inthe early stages of its development and adoption in the healthcare industry, the potential benefits and applications are significant and havethe potential to greatly enhance the delivery of healthcare.

Literature Review

The benefits would be noticed by integrating blockchain technology with the channels-wide distribution of healthcare information. However, solutions built on the blockchain may reduce or even do away with middleman fees and friction. Blockchain technology poses significant medical hurdles in the perspective ofdata sharing, personal data protection issues,

Corresponding Author: Kanagala Anusha; Department of MBA, Koneru Lakshmaiah Business School, KLEF, Guntur. E-mail: kanagalanusha@gmail.com.

repeatability, and patient role in clinical trials. It shall address several hurdles while enhancing the efficiency, decentralization, and securityofthe system. As technology develops, it can be applied more effectively. It is important to study the issues of socio-technical and blockchain solutions. To achieve the greatest results, technology is used in the healthcare industry [6]. Concerns for security, data privacy, and integrity issues in the healthcare sector are now addressable. Appreciationforthe development of blockchain technology as a transparent data store and dependable distribution method [7].

A Peer-to-peer (P2P) distributed ledger technology with a network of transactions ofdigital data that is distributed to the users in a public or private manner that permits the secure and verifiable storage of any type of data is referred to as a blockchain. If the message is accurate, the receiving node in a distributed P2P blockchain network of transactions verifies it and saves it in a block. One of the most well-known sectors utilizesblockchain technology inhealthcare. The healthcare sector can benefit from the use of blockchain technology to overcome problems related to data privacy, data sharing, and data security and storage.

A new method of illness prevention in the medical industry is being developed with the result of development in genetic and clinical research. A blockchain in the medical supply chain attempts to remove the chance that counterfeit drugs could hurt people all around the world. Blockchain technology is now being researched for several healthcare applications, including storage, data management, device connectivity, and security in the internet of medical things. Organizations and participants in healthcare are using blockchain to enhance business processes, better patient outcomes, streamline and manage patient data, boost conformity, save costs, and make better use of data linked to healthcare.

Block Chain's application in electronic health records was effective and concentrated on enabling the sharing of protected and private e-health records through the cloud. The study asserts the advantage of blockchain in the health insurance and supply chains (pharmaceutical), in addition to MedBlock and Block HIE [8].

Researchers describe the many types of Blockchains and how they might be used in healthcare [9]. They also discuss how data management should be prioritizedto integrate differentsystems and improve the validity of EHRs to modernize healthcare. There are numerous advantages in numerous healthcare domains. medical billing contracting, medical record interchange, clinical trials, and anti-counterfeiting medications are a few more healthcare-related sectors where Blockchain technology can be useful. According to the ECCR, Electromedical, and the Healthcare IT Industry [10, 11] there are a lot of opportunities awaiting to use of blockchain in the healthcare sector, including medical billing and the development of counterfeit medicine detection systems [12, 13].

Results and Discussion

Word Cloud on Block Chain Integration with Healthcare
A Twitter Sentimental analysis is conducted to find the relationship betweenthe blockchain and healthcare. A Sample of 523 is available with Twitter after the removal of retweets for the past five years. A word cloud, sentimental plot is presented.

Figure 1. The figure represents A Word Cloud on Block Chain Integration with Healthcare

The term "health pulse" in **Figure 1** suggests that there is a growing interest and focus on the use of blockchain technology in healthcare. This is further reinforced by the term "data," which implies that there is a recognition of the importance of data security and privacy in healthcare.

The term "solve care" in **Figure 1** suggests that there is a growing recognition of the potential for blockchain technology to solve some of the key challenges facing the healthcare industry, such as data security and interoperability. The use of "opportunities" implies that there is a growing recognition of the potential for blockchain technology to create new opportunities for innovation and growth in the healthcare industry.

The use of "AI-driven" in **Figure 1** suggests that there is a growing trend towards the integration of artificial intelligence in healthcare systems powered by blockchain technology. This is further supported by the term "system medical," which implies the potential of blockchain technology to revolutionize the healthcare industry.

Finally, the term "cutting edge" in **Figure 1** suggests that there is a recognition of the potential for blockchain technology to be a game-changer in the healthcare industry. Overall, the sentiment analysis suggests that there is a growing interest and excitement around the potential for blockchain technology to transform the healthcare industry.

Twitter Terms with Blockchain

The analysis suggests that there is a recognition of the potential for technology, and specifically, blockchain technology, to transform the healthcare industry by improving patient outcomes, enhancing the quality of care, and addressing some of the key challenges facing the healthcare industry.
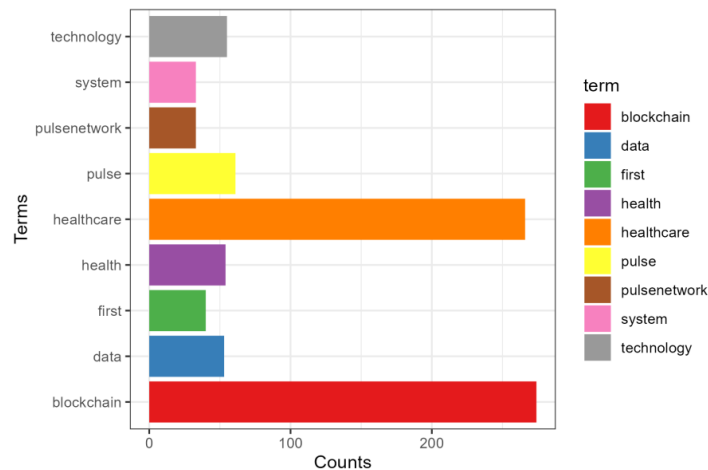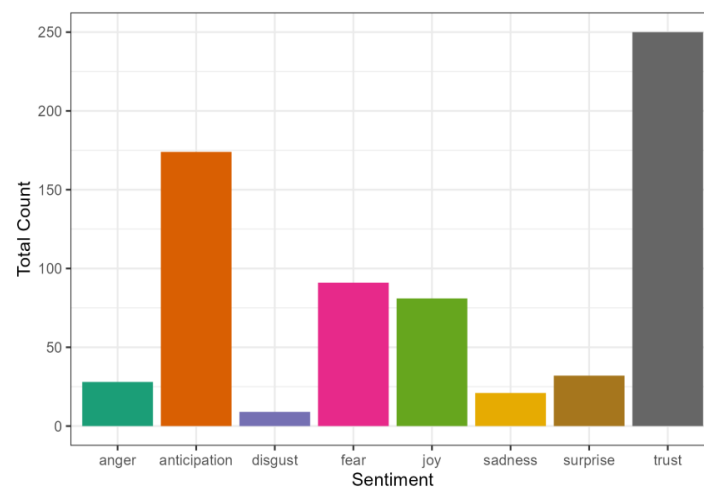

Figure 2. The above graph represents the Twitter Terms with Blockchain

The **Figure 2** suggests that there is a recognition of the importance of technology in the healthcare industry, and specifically, the potential for blockchain technology to transform the healthcare industry.

The inclusion of "healthcare" in **Figure 2** as a frequent term mentioned also suggests that there is a growing interest in the use of blockchain technology to address some of the key challenges facing the healthcare industry, such as data security, privacy, and interoperability.

Twitter Sentiment Analysis on the Blockchain and Healthcare

The sentiment analysis suggests that there is a mix of positive and negative perceptions regarding the potential impact of blockchain technology on the healthcare industry.

Figure 3. The graph represents the Twitter sentiment analysis on the blockchain and healthcare.

Figure 3 represents the most frequent sentiment expressed is trust, which suggests that there is a growing recognition of the potential for blockchain technology to address some of the key challenges facing the healthcare industry, such as data security and privacy.

The second most frequent sentiment expressed in **Figure 3** is anticipation, which implies that there is a growing expectation for blockchain technology to create new opportunities for innovation and growth in the healthcare industry.

However, the third most frequent sentiment expressed is fear, which suggests that there is a concern about the potential

impact of blockchain technology on the healthcare industry, such as the potential for job displacement and loss of control over personal health data.

The fourth most frequent sentiment expressed is joy, which implies that there is a recognition of the potential for blockchain technology to improve the quality of healthcare and enhance patient outcomes. Overall, the sentiment analysis suggests that there is a mix of positive and negative perceptions regarding the potential impact of blockchain technology on the healthcare industry.

VoS Viewer

Systematic Literature Review on VoS viewer on blockchain & healthcare964 papers are present in the Scopus database is analysed.

Figure 4. The figure represents an SLR on VoS viewer on blockchain & Healthcare.

The inclusion of blockchain in **Figure 4** as a theme is not surprising, as it is a key technology that has the potential to transform the healthcare industry. Blockchain can help to address some of the key challenges facing the healthcare industry, such as data security, privacy, and interoperability.

The inclusion of IoT as a theme is also not surprising, as it is another technology that has the potential to transform the healthcare industry. IoT devices can help to collect real-time data on patients, which can be used to improve the quality of care and enhance patient outcomes.

The inclusion of medical computing as a theme suggests that there is a recognition of the importance of computing technologies in the healthcare industry. Medical computing can help to improve the efficiency and effectiveness of healthcare delivery, as well as support decision-making processes.

Finally, **Figure 4** the inclusion of information management as a theme suggests that there is a recognition of the importance of managing healthcare data effectively. Effective information management can help to improve patient outcomes, as well as support research and innovation in the healthcare industry [14].

Systematic Literature Review in VoS Viewer on Blockchain & Healthcare with Respect to the Subject Area is Below

Figure 5. The above pie chart represents an SLR conducted in VoS viewer on blockchain & healthcare with respect tos the subject area

The systematic literature review is on the VoS viewer related to blockchain and healthcare indicates that the subject area of medicine represents 6.2% of the literature included in the review **(Figure 5)**.

However, the inclusion of medicine as a subject area is still significant, as it suggests that there is a growing recognition of the potential for blockchain technology to transform the healthcare industry by improving patient outcomes and enhancing the quality of care.

Blockchain technology has the prospect to transfigure the healthcare industry by improving the security, privacy, and efficiency of medical data management [15, 16]. Several studies have shown the potential advantages of blockchain in healthcare, including:

1. Secure and transparent data sharing: Blockchain technology can provide secure and transparent sharing of medical records among healthcare providers, reducing the risk of data breaches and unauthorized access to sensitive patient information.
2. Interoperability of health systems: Blockchain can help to overcome the challenges of data interoperability among different healthcare systems and providers, enabling a more coordinated and efficient delivery of care.
3. Clinical trial management: Blockchain can be used to securely manage and track clinical trial data, increasing the transparency and accuracy of trial results.
4. Supply chain management: Blockchain can be used to track the flow of drugs and medical supplies, reducing the risk of counterfeit products and improving supply chain efficiency.
5. Patient engagement: Blockchain can help to give patients more control over their health data, enabling them to share their information with healthcare providers and participate in research studies.

However, the integration of healthcare and blockchain technology is still in its early stages, and several challenges need to be addressed, including technical complexity, regulatory compliance, and the need for standardization [17, 18].

In conclusion, while blockchain has great potential to improve the healthcare delivery system, it is important to carefully consider the challenges and limitations before fully implementing the technology [19].

Conclusion

The integration of blockchain technology in the healthcare industry has the potential to bring about several benefits and improve healthcare delivery. By leveraging the immutable and secure nature of blockchain, patient health data can be securely stored and shared between healthcare providers, enabling better coordination and improved patient outcomes. The use of smart contracts can automate various processes in healthcare, such as claims processing and drug traceability.

Moreover, blockchain technology can also be used to create decentralized platforms for the secure exchange of electronic medical records, making it easier for patients to access and control their health data. This can lead to more informed decision-making, improved patient privacy and security, and greater transparency in the healthcare system.

However, the adoption of blockchain in healthcare is still in its early stages and some challenges need to be addressed, such as interoperability between different systems and regulatory hurdles. Nonetheless, with the increasing demand for secure and efficient healthcare delivery, the use of blockchain technology is expected to grow in the coming years.

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