

Blockchain Technology in Enhancing Health Care Ecosystem for Sustainable Development

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Received: June 22, 2023; Accepted: August 04, 2023; Published: September 30, 2023

Abstract

The analysis and interpretation portion of the study concentrated on managing blockchain technology and on comprehending the rate of technological advancement in actions that support the development of the sustainability and healthcare ecosystems. The study reports results of a survey from 50 respondents who were directly handling activities in the healthcare industry. The study's discussion and findings section also included information on the analysis of the survey data that was acquired. This information is crucial for raising the healthcare ecosystem's to sustainability level. Blockchain technology is one of the most significant breakthroughs of recent times. By consistently changing the healthcare industry, it advances the entire field. It is seen as a series of building blocks that preserves interpersonal trust and covers vital information. The rapid development of blockchain technology is enabling a wide variety of uses across many industries. The potential of blockchain technology will be revolutionised by the systematic production of literature evaluations. One illustration of how swiftly the world has gone digital is the emergence of countless electronic records in the healthcare industry. Blockchain technology has made it possible to eliminate third-party administration's risks in the medical industry.

Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications (JoWUA), volume: 14, number: 3 (September), pp. 240-252. DOI: [10.58346/JOWUA.2023.I3.018](https://doi.org/10.58346/JOWUA.2023.I3.018)

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Keywords: Data Management, Blockchain Technology, and The Healthcare Industry.

1 Introduction

Nakamoto (2008) proposed the concept of blockchain technology in an article he wrote for Bitcoin in 2008. The foundational infrastructure of the bitcoin money is the blockchain network. The first step towards understanding blockchain technology is learning about bitcoin. Bitcoin is a form of online payment that operates independently of a third party. It requires the enormous processing capacity of linked network nodes.

These people are also known as miners, and in exchange for their services, they receive compensation. Transactions are organised into blocks on the bitcoin network, which are then automatically signed using cryptography and verified by a network of miners. A hash value links each block that miners are trying to solve to previous blocks. It implies that a transaction cannot be modified after it has been completed. Network nodes can contribute verified blocks to the public/shared ledger that the bitcoin network uses to keep track of transactions. It implies that a shared or public ledger is not owned by just one individual. Any network node, or miner, is instead free to offer its services as processing power to carry out legal transactions and maybe join the bitcoin network.

The blockchain technology is now at hand. Given that blockchain is the underlying technology on which the bitcoin network is built, we can say that using blockchain architecture, we may design additional non-financial and financial applications that are similar to bitcoin. A distributed database, a decentralised network, enhanced security, and the inclusion of a trust system in independently verifiable peer-to-peer transactions are other distinguishing features of the blockchain.

The decentralised, safe blockchain network that underpins the digital currency Bitcoin is known as the blockchain. Bitcoin's core strength is security, which is maintained by miners who give up their electricity and processing resources to add a particular block to the Bitcoin network by successfully solving a difficult computational puzzle. There isn't a specific method for cracking the nonce-finding puzzle; instead, it uses a guessing method that uses brute force and requires a lot of computing power, the more guesses the better (providing solution). The likelihood of winning the game increases, but more massive processing from miners does not ensure victory.

The basis of the Bitcoin network and a safeguard against attacks is proof-of-work, or PoW. The Bitcoin network is built on the Hash Cash PoW network. In order to spot any illegal activity, the consensus of the miners on how to solve the cryptographic challenge is evaluated. In proof-of-work, the 50% rule is used, which states that no single miner is permitted to have more than 50% processing power. Because of this, if an adversary node with 49% processing power attempts to add an illegal transaction, other miners will instantly reject it because that solution will be confirmed to be unlawful by miners with a combined total of more than 50% computing power.

This research project will look at the value of blockchain technology in the healthcare industry. This study aims to describe the current application of blockchain technology to enhance the long-term viability of the healthcare system (Kodric, Z., 2021). This study's goal is to evaluate how blockchain technology is being used in the medical sector. Other objectives include defining the function of improved patient data management and talking about the relevance of blockchain technology in the healthcare sector. There are numerous uses for blockchain technology that facilitate the transfer of various aspects of the healthcare system.

Patient-related datasets are distributed to manage medical supply networks. It aids in the decoding of genetic codons for future advancements in medicine. Blockchain technology has the potential to help

the healthcare sector become more sustainable (Shin et al., 2020). The privacy and security systems used in the healthcare industry are developing with the help of block chain technology. It entails keeping some control over patient medical records. It ensures that medical providers do not exchange medical data records without permission. In the healthcare industry, maintaining patient privacy is regarded as an important component of developed sustainability.

Therefore, blockchain technology that has been developed offers a wide variety of scopes to discreetly evaluate clinical support. Because it is the primary responsibility of doctors, health is regarded as the top priority of medical professionals. Blockchain technology, for example, can help the healthcare sector administer healthcare services more effectively and transparently. By using blockchain technology consistent and coherent results are feasible (Medaglia & Damsgaard, 2020). So as to continue one of the biggest problems in the healthcare industry is sustainability. The precision of treatment is seen as a serious problem since the organisational management system may make it difficult.

Patient access to their medical records may be hampered by the data management system, according to recent revisions in privacy legislation in the UK. Blockchain technology can be used to review technology and its areas for improvement. In order to protect block settings of informative datasets, it primarily focuses on interacting with an encrypted dataset. In order to disseminate information about the efficacy of blockchain technology in the healthcare industry, a thorough literature review will be developed.

2 Literature Review

It will be possible to demonstrate both the benefits and drawbacks of blockchain technology in the medical field with this systematic research. The development of a sustainable ecosystem and the rising demand for blockchain technology will be partially covered. We'll conduct pertinent primary surveys to better understand the benefits and drawbacks of blockchain technology (Tseng & Shang, 2021). As a result of the introduction of blockchain technology, the issues facing the medical industry today have so far been resolved. However, the adoption of blockchain technology has increased the overall profit percentage to over 75% while decreasing overall expenses by about 30%. The medical histories of patients are seen to be analysed in large transaction databases (Khanfar et al., 2021). Figure 1 shows how blockchain technology can be useful in healthcare sector.

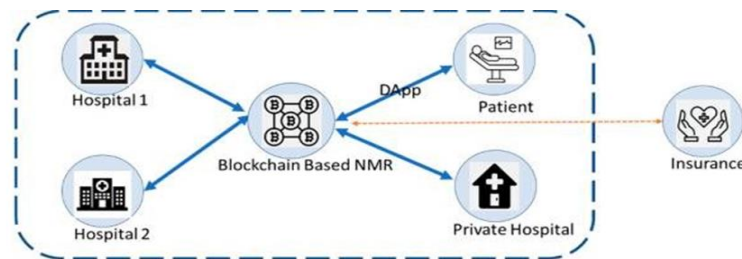


Figure 1: Blockchain Applications in the Healthcare Sector (Khanfar, A.A., 2021)

In the UK's healthcare industry, sustainable development is evident. The sustainable healthcare ecosystem contributes to two goals: transparency and a robust governance structure. The identification of factors influencing the sustainable growth of blockchain technology is made possible by existing case studies (Schulz et al., 2020). Roles and responsibilities are distributed fairly among medical practitioners in a competent governance framework. Applications of blockchain technology have been seen to eliminate risk factors for possible conflicts. Sustainability is a suggested component that strikes a balance between environmental science and social science.

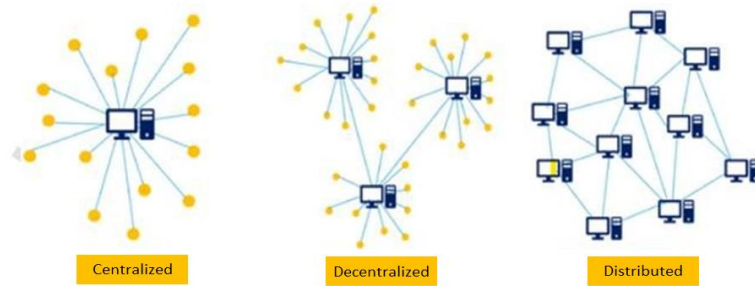


Figure 2: A Distributed Ledger Built on the Blockchain (Gong & Zhao, 2020)

The idea of sustainability is closely tied to ecosystems that are driven by humans, like the healthcare ecosystem. Satoshi Nakamoto originally discussed blockchain technology in 2008 to explain the concept of digital currency (Verdejo Espinosa et al., 2021). As a result of many blockchain applications, a new era of cohabitation and collaboration is intended to be ushered in. Due to the mechanism, it was developed with, it is regarded as a decentralised network. Blockchain technology has been seen to prevent data alteration (Khan et al., 2022). Additionally, distributed ledgers have the opportunity to receive good care in the UK's healthcare industry.

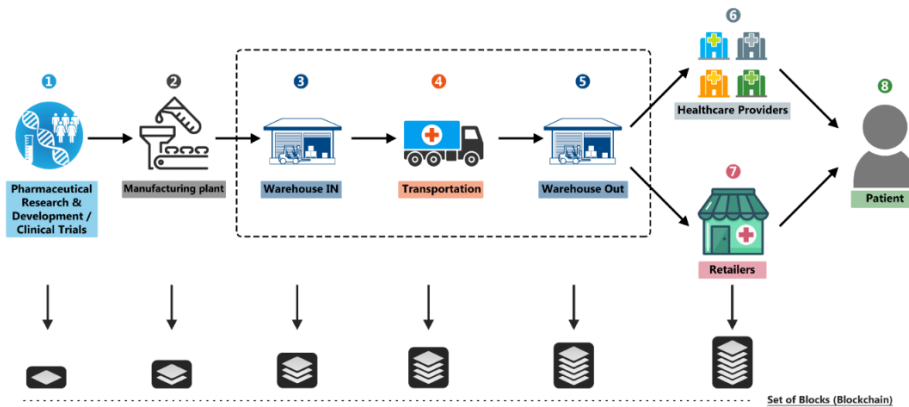


Figure 3: Utilizing Blockchain Technology, the Healthcare Sector's Data Management Portion (Khan et al., 2022)

The fundamental benefit of blockchain technology is that it enables value exchange between more than two participants in a secure manner. One of the most important characteristics for ensuring sustainability in the healthcare business is security and immutability. The medical industry may now be in sync with other networking systems thanks to this secure and encrypted hash function (Kheizr et al., 2019). As a result of blockchain technology's decentralised structure, cracking and manipulation are made easier. By preventing any form of harm, resilience maintains the suppleness of a networking system.

Because blockchain technology transfers value between public key chains, transparency is regarded as a benefit (Van der Velden, 2018). It appears to be a hybrid of transparency and public-key identity. It uses blockchain technology to ensure that users are adhering to rules in recorded transactions. Another benefit of blockchain technology is auditability, which confirms the validity of financial transactions in the healthcare industry. Blockchain technology is seen to improve transparency and traceability. Keeping track of prior transactions in a trustworthy blockchain can be sufficient by presenting audiences with the right proof Van der Velden, (2018). A key secured method used in blockchain technology is permissibility, which creates and controls the rights to access a shared ledger.

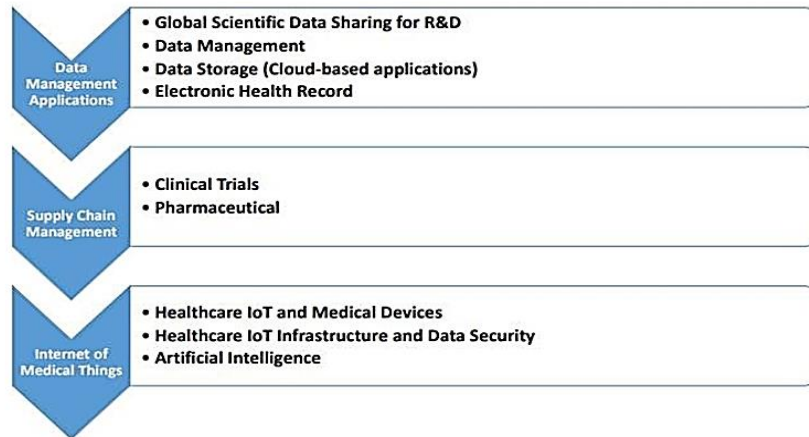


Figure 4: Applications in the Healthcare Industry Based on Blockchain Technology (Van der Velden, 2018)

The expansion of authorization Participants in the blockchain are divided into more and semi-trusted participants. Due to its diversity of nodes, several medical organisations in the UK frequently refer to blockchain as private. Patients in the healthcare industry have a variety of medical histories and records, including incompatible interfaces, various kinds of medical histories and records, and evolving communication technologies. First and foremost, a well-focused and highly functioning healthcare information management system is required to preserve sustainability in the healthcare sector (Adams et al., 2018). It is necessary to carefully review the development of blockchain technology in authorisation, auditing, and data verification.

The cost-effectiveness and scalability, however, demand careful thought. The context of decentralised disintermediation appears to have significant promise for additional innovation in the healthcare sector. Blockchain technology has been seen to automate interorganizational information systems. Disintermediation is a phrase used to describe the electronic review of patient medical records in the UK's healthcare system (Esmailian et al., 2020). Blockchain technologies are an example of a cyber-intermediary that focuses on managing application operations to mediate via new forms of communication. The solutions offered by blockchain technology will be shown in the following sections.

3 Methodology

In this study paper, a conclusion based on the advancement of blockchain technology within the ecosystem of the medical business was drawn in order to further promote sustainability. It was done by gathering information from different primary resource kings. Through the use of a quantitative data gathering technique, the effectiveness of blockchain technology in the healthcare industry was examined. The aforementioned method of data collecting was assumed in order to conduct and carry out pertinent surveys and analysis (Tham & Sigala, 2020). To create a significant result in the analysis phase, pertinent datasets to the UK healthcare sector must be appropriately edited.

People would be helped to comprehend the significance of blockchain technology by conducting efficient surveys. A positivist research philosophy must be embraced before conducting surveys. It will be useful in compiling reliable medical datasets for surveys using blockchain technology. Deductive research methodology must be the major focus because it contributes to the topic's ideal outcomes. Additionally, the use of a descriptive research approach will highlight the benefits and difficulties that blockchain technology in the healthcare industry faces (Rathee et al., 2020). To demonstrate the

advantages of blockchain technology in the medical field, the earlier blockchain records must be appropriately evaluated.

The effects of implementing blockchain are depicted using a variety of study approaches. The surveys for the healthcare industry will be organised after the necessary datasets have been collected. The information was gathered from a variety of healthcare professionals, including doctors, nurses, medical professionals, and other hospital workers. The study of this subject will assess blockchain technology's consequences at various phases in order to comprehend their importance in creating sustainability. A total of 50 individuals were gathered to discuss their opinions on the many uses for blockchain technology. Participants voiced their perspectives about the advantages blockchain technology has brought to the medical industry (Tseng & Shang, 2021). The panellists agreed that it will take some time for the healthcare ecosystem to achieve total sustainability.

To ascertain whether blockchain technology may be used in the healthcare sector, four survey questions will be completed. In addition, this research study will demonstrate how precisely blockchain technology can handle transactions for medicinal purposes. For the survey's administration, a random sample method is used. In order to make it simpler to collect pertinent and essential datasets linked to the topic, a probability sampling technique is taken into consideration (Parmentola et al., 2022). The results of the surveys show that the majority of respondents concur that blockchain technology assisted in the development of medical chain platforms for larger items.

The majority of participants claimed that blockchain is appropriately developing the collaborative version controlling system in the medical industry. Additionally, the results of the analysis of the survey will be used to advance the decision-making processes.

4 Result and Discussion

According to the previous guideline, the main data gathering method should be utilised to analyse the outcomes of the usage of blockchain technology in managing the healthcare ecosystem in relation to sustainable development (Medaglia & Damsgaard, 2020). In order to get correct data, this portion of the study is responsible for managing data from the primary data gathering phase. 50 responders who are in charge of overseeing operations in the UK's healthcare industry participated in the study and provided information. The researcher first posed the following pertinent queries: How may Blockchain technology be significantly important inside the healthcare sector?

What are the ways blockchain technology can help create a sustainable healthcare ecosystem?

Survey Questions for Research

Question1: Do you agree that blockchain technology advances its sustainability level while protecting patients' legal interests?

Table 1: Application of Blockchain Technology to Manage Legal Interests

Determinants	Responses obtained	Response percentage (%)
Agreed strongly	9	18
Agreed	17	34
Neutral	2	4
Disagreed	13	26
Disagreed strongly	9	18

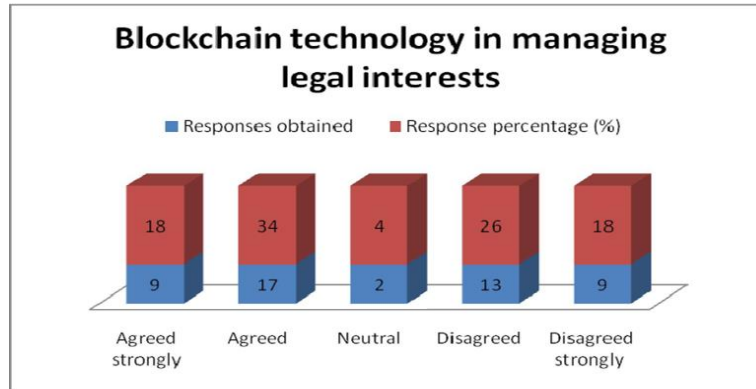


Figure 5: Managing Legal Interests with Blockchain Technology

The data mentioned above relates to the application of blockchain technology to the management of legal interests, which aids in determining the sustainability level of the healthcare system. This relates to an appreciation of the patients' degree of satisfaction as well as the preservation of confidentiality in the therapeutic process. Contrarily, it was noted that the majority of replies concurred that blockchain technology has aided in safeguarding individual legal interests while raising the sustainability level of the healthcare system (Table 1, Figure 5).

Question No 2: How much do you think blockchain technology has advanced EHR access, specifically?

Table 2: Using Blockchain Technology to Control Access to EHR

Determinants	Responses obtained	Response percentage (%)
Agreed strongly	10	20
Agreed	18	36
Neutral	1	2
Disagreed	14	28
Disagreed strongly	7	14

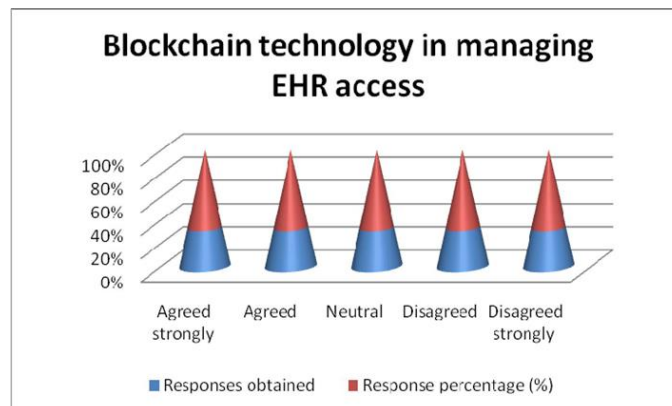


Figure 6: Version Control in the Healthcare Environment that is Collaborative

This concern relates to how blockchain technology is being utilised to control EHR access levels, which has improved hospital service quality overall. It was determined that this query relates to blockchain technology opportunities. The significance of Electronic Health Records (EHR) obtained through the usage of blockchain technology was acknowledged by 56 percent of the respondents (Table 2, figure 6).

Question No 3: Do you agree that the healthcare ecosystem has benefited from collaborative version control made possible by blockchain technology?

Table 3: Healthcare Ecosystem Collaborative Version Control

Determinants	Responses obtained	Response percentage (%)
Agreed strongly	12	24
Agreed	16	32
Neutral	3	6
Disagreed	13	26
Disagreed strongly	6	12

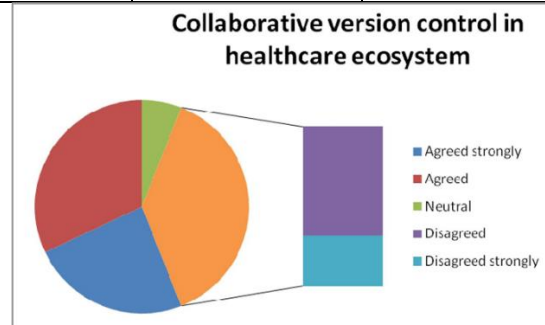


Figure 7: Version Control in the Healthcare Environment that is Collaborative

This inquiry relates to the application of blockchain technology, which are well-known for reducing financial and administrative difficulties connected with the business process of reconciliation. Collaborative version control is crucial for connecting blockchain activities with patient demands and is connected with controlling the local memory process. The company is renowned for managing issues in continuity business. In order to manage a greater degree of authorisation connected to fostering sustainability in the healthcare ecosystem, it is also necessary (Table 3, Figure 7).

Question No 4: How much, in your opinion, has blockchain technology aided in the growth of medical chain platforms for the healthcare industry?

Table 4: Medical Chain Platform Development Using Blockchain Technology

Determinants	Responses obtained	Response percentage (%)
Agreed strongly	14	28
Agreed	16	32
Neutral	7	14
Disagreed	5	10
Disagreed strongly	8	16

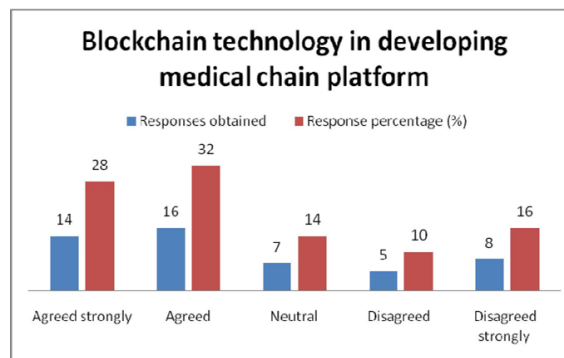


Figure 8: Medical Chain Platform Development Using Blockchain Technology

In order for medical chain platforms to thrive and be sustainable within the healthcare ecosystem, it is important to grasp the significance of blockchain technology. The growth of the complete healthcare infrastructure will benefit from the use of blockchain technology, which can determine a double block chain structure. The medical chain platform, on the other hand, tends to create a distributed ledger system in the healthcare industry that is necessary for raising the level of scalability, flexibility, and security (Table 4, Figure 8).

As part of the survey procedure, 50 respondents provided information about the prospects and improvements to the healthcare ecosystem that may be made by taking into account blockchain technologies. Blockchain technology has been found to be useful for building support for medical supply chain activities (Jain et al, 2020). Additionally, it is crucial for addressing mistakes made by people as they gain expertise. However, the survey method has also determined that blockchain technology is useful for controlling immutability, which is necessary for generally strengthening public health initiatives. It was also noted that the researchers had made sure that all the data was gathered in accordance with the study's objective, which is the growing significance of blockchain technology in the management of company services. On the other hand, it was discovered that blockchain technology is primarily imposed with EHR and is vital for developing the use of health records as well as for managing transparency and immutability between the patient and management of the organization (Jain et al., 2019). On the other hand, it was discovered that blockchain technology is connected to managing operations across various industries and that it aids in the management of the migration of data related to healthcare-related encrypted blocks. Blockchain technology has concentrated on understanding the ledger relationship that aids in producing centralised information and managing distributed ledger models in order to manage the healthcare ecosystem (Jain & Pandey, 2019). Additionally, this technology is important for developing mutual trust, and the EHR system has made sure that patients can communicate clearly with various departments, improving the total service and care quality provided to people. Table 5 presents the results from survey.

Table 5: Survey Results Related to Blockchain Technology's Development in Improving the Healthcare Ecosystem

Topic of Discussion	Supported	Neutral	Disagree
(A) The ability of blockchain technology to protect patients' legal rights and to promote the sustainability of the entire healthcare ecosystem.	52%	4%	44%
(b) Blockchain technology is seen as a chance since it improves EHR access, which is connected to the growth of the healthcare ecosystem.	56%	2%	42%
(c) Blockchain technology is well known for managing collaborative activities that are crucial for creating collaborative version control, as well as managing the sustainability and healthcare ecosystems.	56%	6%	38%
d) Because blockchain technology is known for enhancing the scalability, adaptability, and security of the entire healthcare ecosystem, it is important for managing development in the medical chain platform.	60%	14%	26%

The importance of treatment privacy, which is necessary for providing patients with satisfaction, was discussed in the first poll question. The study is credited with raising the sustainability level of the entire healthcare ecosystem, it was discovered afterwards. Additionally, it was noted that the majority of respondents agreed with the data and that overall organisational activities had proven to be secure Jain & Pandey, (2017). The study's second question concerns EHR access, which is one of the key mechanisms that has contributed to improving the quality of the professionals' work. Additionally, it has assisted in lowering the likelihood of human error and assures that all information can be accessible digitally by the accountable parties. Additionally, control over the healthcare system depends on

knowing specific business requirements, which can be found in a collaborative version (Panwar et al., 2021). On the other hand, it was discovered that a collaborative version aids in establishing flexibility and scalability of the business process as well as understanding patients' requirements. The final poll question relates to the creation of a medical chain platform, and it is crucial to give healthcare professionals empowerment so they may oversee operations using smart contracts.

5 Conclusion

It is clear from the discussion above that sophisticated intermediates are helping to facilitate and simplify information technology. The identified benefits provided by blockchain technology are connected to the sustainability environment. To give structural models of the sustainable implementation of blockchain in the healthcare sector, more research is urgently needed (Jain et al., 2021). The creation of a sustainable ecosystem is considered to be a crucial component of this research study. The social pillar has been reduced when evaluating the environmental and economic aspects of the healthcare industry using blockchain technology. Therefore, the inclusion or deletion of this study may have an effect on the empirical data. Depending on the applications in various industries, blockchain technology performance may change. Therefore, it is necessary to pinpoint blockchain technologies and their viability in various industries. A major idea of a circular economy is creating a sustainable economy (Jain et al, 2022). A better use of natural resources based on medicine is defined by the services offered by the healthcare sector.

6 Acknowledgements

"This study is supported via funding from Prince Sattam bin Abdulaziz University project number (PSAU/2023/R/1444)"

Authors' Contributions

All authors contributed toward data analysis, drafting and revising the paper and agreed to be responsible for all the aspects of this work.

Declaration of Conflicts of Interests

Authors declare that they have no conflict of interest.

Consent for Publication

All authors read and aware of publishing the manuscript in Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications.

Data Availability Statement

The database generated and /or analysed during the current study are not publicly available due to privacy, but are available from the corresponding author on reasonable request.

Declarations

Author(s) declare that all works are original and this manuscript has not been published in any other journal.

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