



A study in understanding the growing role of blockchain technology in enhancing health care ecosystem for sustainable development

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ABSTRACT

The analysis and interpretation part of the research has focused on managing blockchain technology and it has focused on understanding the growth level of technology in developing sustainability and healthcare ecosystem activities. It was further identified that the survey process has obtained information from 50 respondents that were managing activities themselves in the healthcare sector. The discussion and findings section of the study has also offered information that is related to the analysis of the obtained survey information, and it is also important for enhancing the overall sustainability level of the healthcare ecosystem. One of the most important discoveries of recent days is blockchain technology. It moves the entire direction by making persistent changes in the healthcare sector. It is counted as a chain of blocks that covers necessary information by maintaining trust among individuals. The drastic increment of blockchain technology is providing numerous applications within a wide range of different domains. Those domains also include a review of emerging applications of blockchain technology. The potentiality of blockchain technology is going to be revolutionised by producing systematic evidence of literature review. The rapid uptake of the digitalised world is going to be illustrated based on the generation of massive electronic records in the healthcare industry. A rise has been given by blockchain technology to eradicate risk factors of third-party administration in the medical sector.

Keywords: Data management, blockchain technology, the healthcare sector.

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INTRODUCTION

This research study is going to analyse the effectiveness of blockchain technology in the healthcare sector. This study aims to provide an understanding of the ongoing trend of blockchain technology in enhancing the sustainable development of the healthcare system. The objective related to this study is to assess the applications of blockchain technology in the medical system. Other objectives are addressing the functionality of enhanced patient data management in the healthcare sector, and defining the importance of blockchain technology in the healthcare sector. Blockchain technology is counted as a wide range of applications that facilitates transferring sections of the healthcare system.

It helps to distribute datasets related to patients for managing medical supply chains. It helps medicinal providers to decode genetic codons for further improvements. Blockchain technology can be used to develop sustainability in the healthcare sector [1]. The privacy and security systems of the healthcare sector are developing with the help of block chain technology. It means retaining some controls over the medical data records of patients. It assures that medical data record history does not get transferred among medical professionals without any consent. Maintaining patient confidentiality is considered a part of developed sustainability in the healthcare sector.

Therefore, offering a vast range of scopes to assess clinical support privately is offered by developed blockchain technology. Health is counted as the topmost priority of medical providers because it is the main responsibility of physicians. The technological components of the healthcare sector like blockchain technology can administer health services with more efficiency and transparency. Consistent and cohesive outcomes are possible by applying developed blockchain technology [2]. In order to maintain

sustainability in the healthcare sector, a major issue is identified. The accuracy of treatment is considered a severe issue because it can be a hindrance due to the organisational management system.

Recent changes in privacy legislation in the UK refer to patients who can face difficulty in receiving their medical records because of the data management system. Reviewing technology and its areas to improve can be uplifted by implementing blockchain technology. It mainly focuses on working with an encrypted dataset to secure block settings of informative datasets. A systematic literature review is going to be elaborated for distributing the effectiveness of blockchain technology in the healthcare sector.

LITERATURE REVIEW

Systematic evidence is going to be produced to display the advantages and disadvantages of blockchain technology in the medicinal sector. The growing demand of blockchain technology to develop the idea of a sustainable ecosystem is going to be highlighted to some extent. Relevant primary surveys are going to be conducted to understand the positive and negative sides of blockchain technology [3]. Nowadays, the problems of the medicinal sector have been solved so far after introducing blockchain technology. However, the implementation of blockchain technology has reduced the overall expenses by 30% (approximately) while expanding the total amount of profit percentage (75% approximately). Large-sized databases of transactions are observed to be evaluated to contain the medical history of patients [4].

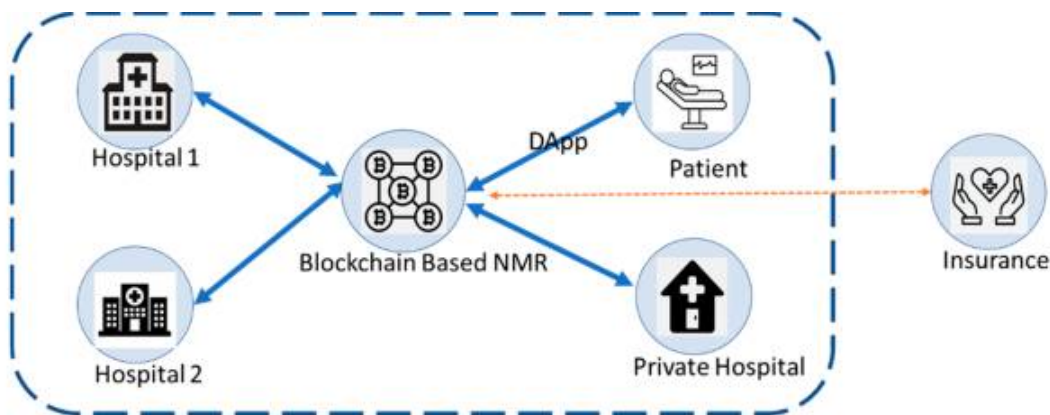


Figure 1: Blockchain process in the healthcare sector [4]

Sustainable development is observed in the healthcare sector of the UK. Transparency and a good governance system are two objectives brought by the sustainable ecosystem of the healthcare sector. Based on the existing case studies identification of reasons behind sustainable development of blockchain technology is discovered [5]. A good governance system is highly associated with distributions of roles and responsibilities among medical providers. Risk factors related to potential conflicts are observed to get eradicated by applications of blockchain technology. Sustainability is a proposed element that balances the bridge between social science and environmental science.

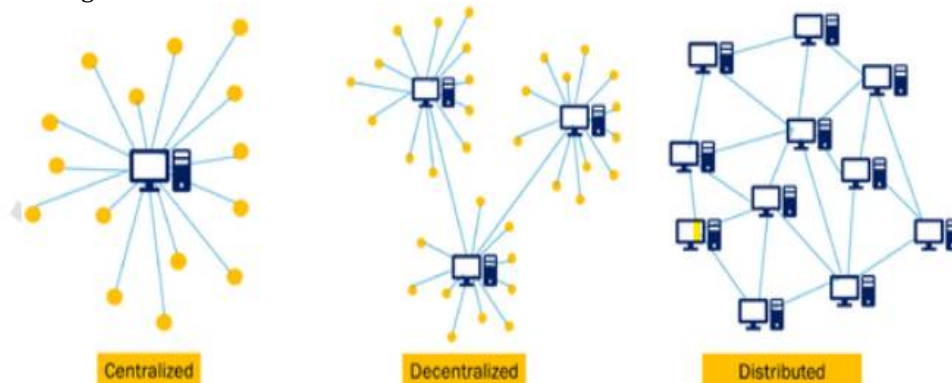


Figure 2: Blockchain technology as a distributed ledger [6]

The concept of sustainability is highly related to human-led ecosystems such as the medical ecosystem. In 2008 blockchain technology was first introduced by *Satoshi Nakamoto* to describe the idea of digital currency [7]. Different applications of blockchain technology intend to open up a new era to change the

framework of coexistence and cooperation. It is counted as a decentralised network due to its designed mechanism. Data modification is observed to be prevented by blockchain technology [8]. In addition, distributed ledgers get the chance to be treated properly in the medical sector of the UK.

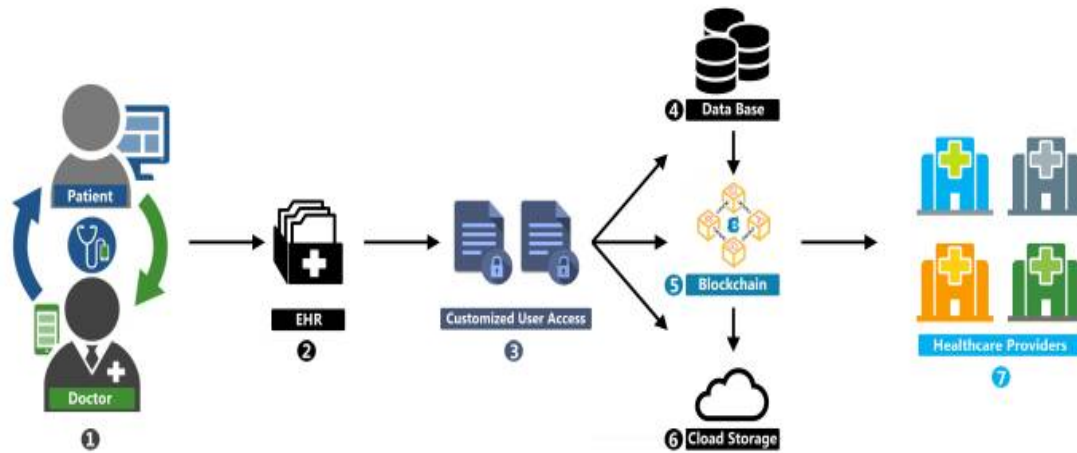


Figure 3: Data management section of healthcare sector in blockchain technology [8]

The main advantage of blockchain technology is that it allows more than two participants to know about value exchange safely. *Security and immutability* are counted as one of the greatest features related to maintaining sustainability in the healthcare sector. It is a protected and encrypted hash function that helps the medical sector to get synchronised with other networking systems [9]. Cracking and tampering become easier due to the decentralised nature of blockchain technology. *Resiliency* is also one of the finest characteristics of blockchain technology. The elasticity of a networking system is maintained through resiliency by avoiding any kind of damage.

Transparency is counted as an advantage of blockchain technology because it transfers value between public key chains [10]. It is observed to be a combination of public-key identity and transparency. It ensures that users are maintaining principles in recorded transactions with the help of blockchain technology. *Auditability* is considered another plus point of blockchain technology because it verifies the occurrence of payment transactions in the healthcare sector. Traceability and transparency are observed to be improvised by blockchain technology. Keeping records of the previous transactions within a reliable blockchain can offer sufficiency by offering proper evidence in front of audiences [10]. *Permissibility* is an essential protected technique of blockchain technology that generates and regulates accessible rights of a shared ledger.

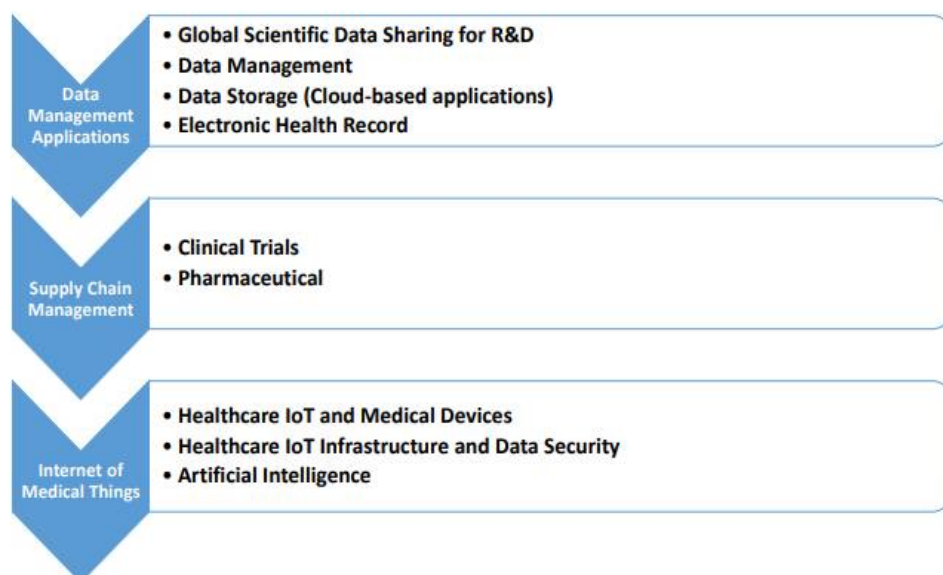


Figure 4: Blockchain technology-based applications of the healthcare sector [10]

The extension of permission blockchain is distributed among *semi-trusted and more-trusted* participants. Some medical organisations in the UK tend to describe blockchain as *private* due to its range of nodes. In the healthcare sector patients have different medical experiences and records such as *incompatible interfaces, multiple types of medical history and records, and changes in communication media*. For maintaining sustainability in the healthcare sector, first, the healthcare information management system needs to be well-focused and highly functional [11]. The growth of blockchain technology in *authorisation, auditing, data verification* needs to be properly revised.

However, the *cost-effectiveness and scalability* require some serious considerations. In the healthcare sector, the context of decentralised disintermediation seems to have great potential for making further innovations. Interorganizational information systems are observed to get automated with the help of blockchain technology. In the healthcare sector of the UK, the term *disintermediation* depicts the electronic evaluation of medical records of patients [12]. A cyber-intermediary such as blockchain technologies focus on operating activities of applications to mediate through new modes of communication. In the further sections, the provided solutions of blockchain technology are going to be displayed.

MATERIAL AND METHODS

In this research paper, an interpretation is going to be finished based on the growth of blockchain technology within the ecosystem of the medical sector to develop further sustainability. It is going to be done by gathering information from various kinds of *primary resources*. A *quantitative data collection method* is going to be applied to understand the effectiveness of blockchain technology in the healthcare sector. In order to conduct and perform relevant surveys and analyses, the mentioned data collection method is going to be implied [13]. Relevant datasets to the healthcare sector of the UK needs to be revised properly to produce a profound outcome in the analysis section.

Conducting effective *surveys* is going to help people to understand the importance of blockchain technology. In order to conduct surveys first, a *positivism* research philosophy needs to be incorporated. It is going to help in gathering authentic medical datasets for conducting surveys to discuss blockchain technology. The main focus has to be a *deductive research approach* because it helps produce desirable results based on the topic. In addition, the inclusion of a *descriptive research design* is going to illustrate the advantages and barriers faced by blockchain technology in the healthcare sector [14]. In order to depict the advantages of blockchain technology in the medical sector, the previous records of blockchain technology require proper interpretation.

Different kinds of research methodologies are applied to depict the effects of blockchain implementation. After collecting the necessary datasets, the surveys are going to be organised in the healthcare sector. The data are obtained from different healthcare employees such as *doctors, nurses, medical practitioners, and other hospital staff*. The research on the topic is going to evaluate different stages of implications of blockchain technology to understand its significance in developing sustainability. A total of 50 participants are taken for defining their views on various applications of blockchain technology. Participants placed their opinions to define opportunities gotten by the medical sector because of blockchain technology [15]. According to the participants, developing complete sustainability in the healthcare ecosystem is going to take a few amounts of time.

Four survey questions are going to be conducted to estimate the future scope of blockchain technology in the healthcare sector. Apart from this research study is going to highlight the accuracy of blockchain technology in handling transactions based on medical purposes. A *random sampling technique* is used for conducting the survey. A *probability sampling technique* is considered so it becomes easier to gather relevant and necessary datasets related to the topic [16]. The outcomes of those conducted surveys convey that most of the participants agree that blockchain technology helped in developing medical chain platforms for greater goods.

According to most of the participants, the collaborative version controlling system in the medical sector is properly developed by blockchain. Furthermore, analysing those survey outcomes is going to leverage the decision-making procedures to make further progression.

RESULTS

In the previous standard, it was identified that the primary data collection process is to be used for analysing the results related to the use of blockchain technology that is associated with managing the healthcare ecosystem that is related to sustainable development [17]. This section of the study is to manage information from the primary data collection process, so that accurate information can be gathered. The study is to obtain information from 50 respondents from individuals who are managing

activities in the healthcare sector of the UK. Valid questions that were initially developed by the researcher are:

- How can Blockchain technology be highly important within the healthcare sector?
- What are the ways blockchain technology can develop a healthcare ecosystem related to sustainable development?

Research survey questionnaires:

Question 1: Do you agree that blockchain technology works for defending the legal interests of patients while developing its sustainability level?

TABLE 1: BLOCKCHAIN TECHNOLOGY IN MANAGING LEGAL INTERESTS

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

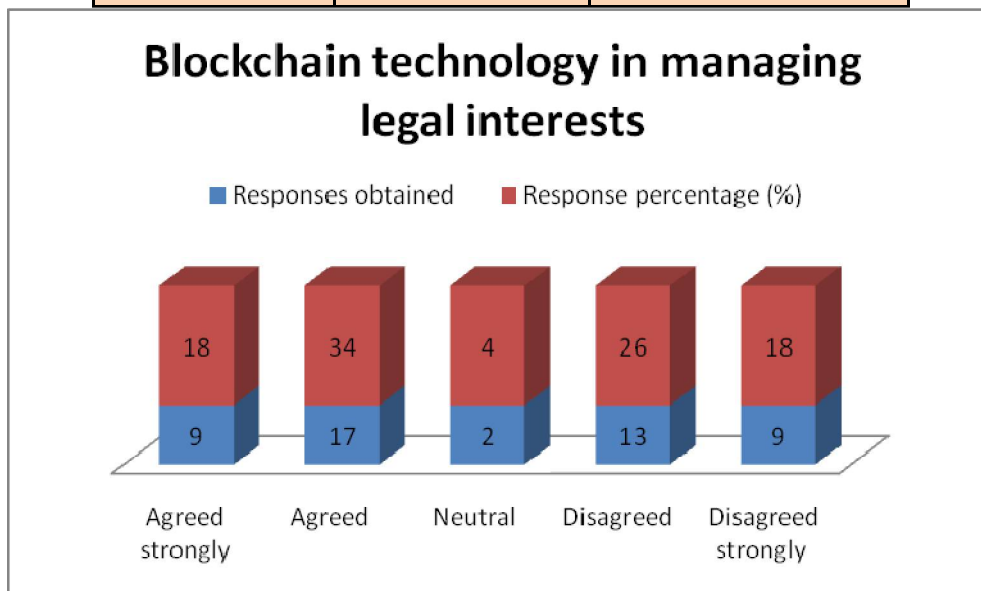


Figure 5: Blockchain Technology in Managing Legal Interests

The above information is associated with the use of blockchain technology in managing legal interests that helps in understanding the sustainability level of the healthcare system. This is associated with an understanding satisfaction level of the patients as it is associated with maintaining privacy and secrecy in the treatment process. On the other hand, it was observed that the majority of the responses have agreed to the fact that blockchain technology has helped in defending the legal interests of the individual while developing the sustainability level of the healthcare process.

Question 2: How far do you believe that blockchain technology has helped in developing EHR access?

TABLE 2: BLOCKCHAIN TECHNOLOGY IN MANAGING EHR ACCESS

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

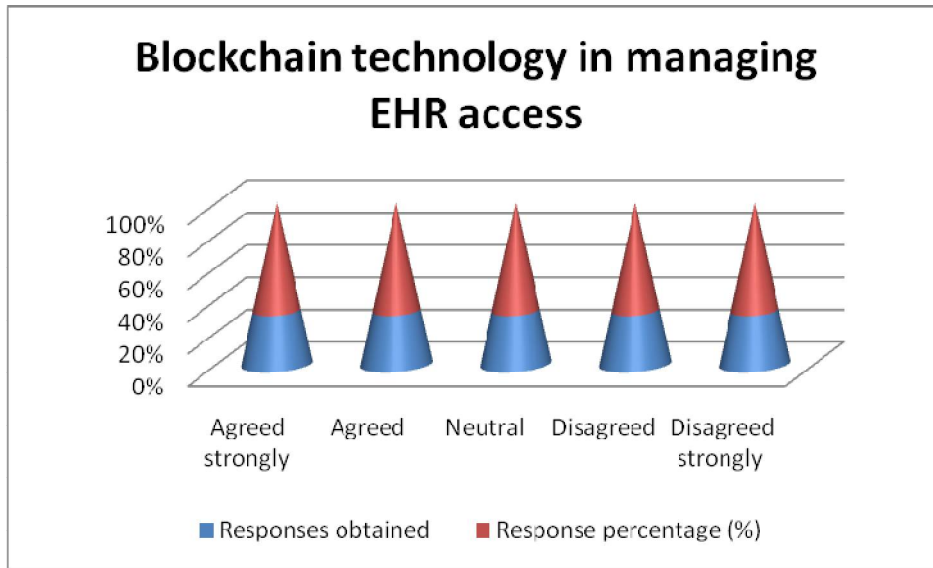


Figure 6: Collaborative version control in the healthcare ecosystem

This question is related to the use of blockchain technology in managing EHR access levels, which has overall developed the service quality used in hospitals. It was identified that this question is associated with opportunities for blockchain technology. It was identified that entirely 56 percent of the respondents agreed to the importance of Electronic Health Records (EHR) that is obtained from the use of blockchain technology.

Question 3: Do you agree that blockchain technology has fostered collaborative version control in the healthcare ecosystem?

TABLE 3: COLLABORATIVE VERSION CONTROL IN THE HEALTHCARE ECOSYSTEM

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

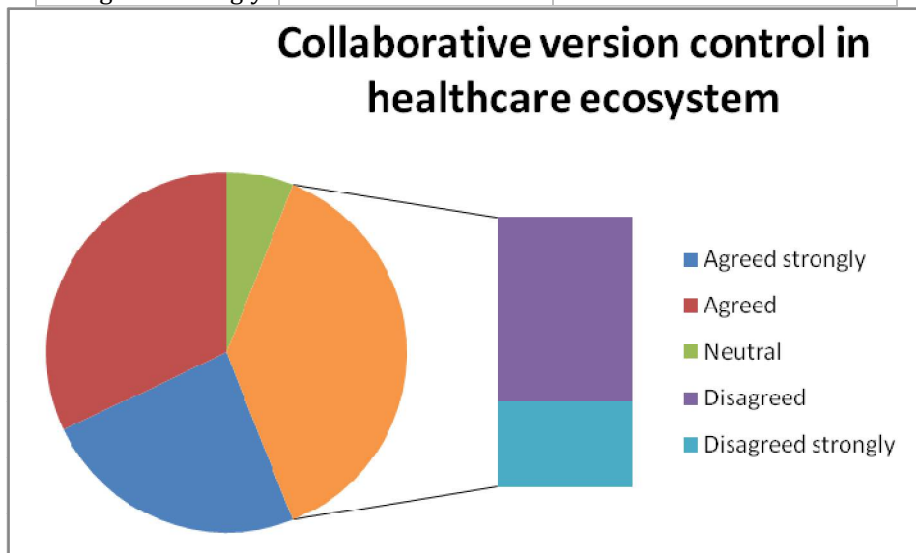


Figure 7: Collaborative version control in the healthcare ecosystem

This question is associated with the use of blockchain technologies that are known for managing costs and burdens that is related to the reconciliation business process. Collaborative version control is associated with managing the local memory process and it is important for linking the blockchain activities with patient needs. The business is also known for managing continuum business challenges. It

is also required for managing a higher level of authorization that is related to developing sustainability in the healthcare ecosystem.

Question 4: How far do you agree that blockchain technology has helped in the development of medical chain platforms in healthcare?

TABLE 4: BLOCKCHAIN TECHNOLOGY IN DEVELOPING MEDICAL CHAIN PLATFORM

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

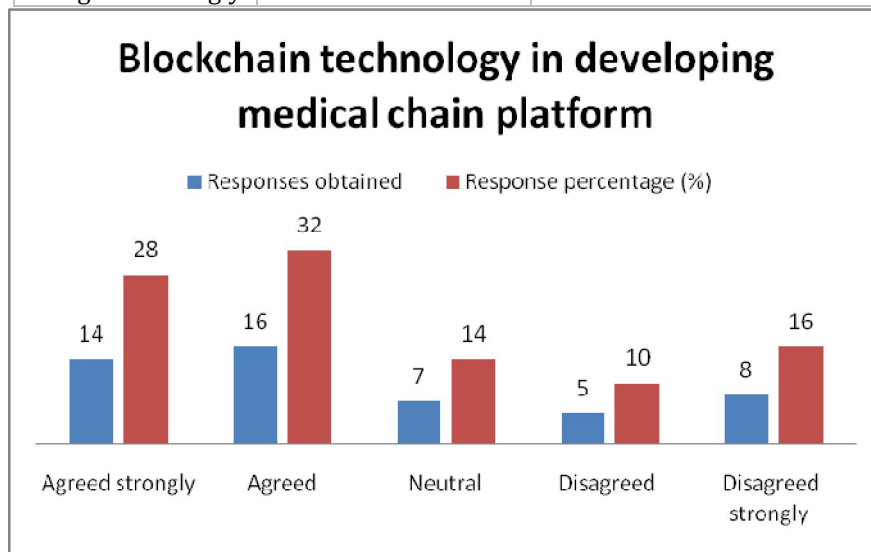


Figure 8: Blockchain technology in developing medical chain platform

This study is associated with understanding the importance of blockchain technology in the development of medical chain platforms, which is necessary to be sustainable within the healthcare ecosystem. It was identified that blockchain technology is capable of determining a double block chain structure, and it is to offer support towards the development of the entire healthcare infrastructure. On the other hand, the medical chain platform tends to form a distributed ledger system in healthcare that is required for enhancing the level of scalability, flexibility and security.

DISCUSSION

The survey process has represented information that is gathered from 50 respondents in relation to understanding the opportunities and healthcare ecosystem measures that can be enhanced by considering blockchain technologies. It was identified that blockchain technology is effective for developing support towards medical chain activities [18]. It is also important for resolving human errors while developing the experiences of the person. On the other hand, the survey process has also evaluated that blockchain technology is effective for managing immutability, which is required for overall enhancing public health activities. It was also identified that the researchers have ensured all the information is obtained based on the aim of the study that is growing importance of blockchain technology in managing business services. On the other hand, it was identified that blockchain technology is mainly imposed with EHR is important for developing the usage of health records and further it is also important for managing transparency and immutability in between the patient and management of the organization[19]. On the other hand, it was identified that blockchain technology is related to managing operations of different sectors and that it helps in managing the relocation of information that is associated with healthcare encrypted blocks. In managing the healthcare ecosystem, blockchain technology has focused on understanding the ledger relationship that helps in developing centralized knowledge, along with managing distributed ledger model [20]. Moreover, this technology is also significant for building reciprocal trust, and that EHR system has ensured clear information of the patient towards different departments that has overall enhanced the service and care quality offered to the individuals.

Table 5: SURVEY OUTCOMES RELATED TO THE GROWTH OF BLOCKCHAIN TECHNOLOGY IN ENHANCING HEALTHCARE ECOSYSTEM

<i>Topic of Discussion</i>	<i>Supported</i>	<i>Neutral</i>	<i>Disagree</i>
(a) Blockchain technology in defending legal interests of patients, and that it helps in developing sustainability of the entire healthcare ecosystem.	52%	4%	44%
(b) Blockchain technology is considered to be an opportunity as it helps in enhancing EHR access, that is related to development of healthcare ecosystem.	56%	2%	42%
(c) Blockchain technology is known for managing a collaborative activity that is important for developing collaborative version control along with managing sustainability and healthcare ecosystem.	56%	6%	38%
(d) Blockchain technology is significant for managing development in the medical chain platform, as it is known for developing scalability, flexibility and security of the entire healthcare ecosystem.	60%	14%	26%

The first question of the survey process has presented information regarding the importance of treatment privacy that is required for offering satisfaction to the patients. Later on, it was identified that the study is known for developing the sustainability level of the entire healthcare ecosystem. It was also identified that maximum respondents have supported the information and that the overall organizational operations have turned out to be safe [21]. The second question of the study is related to EHR access and it is regarded to be one of the primary processes that have helped in enhancing the service of the professionals. It has also helped in reducing the chances of human errors and that it ensures all the information can be digitally accessed by the responsible persons. Moreover, control in the healthcare system is related to understanding individual business requirements, and that information is obtained in a collaborative version [22]. On the other hand, it was identified that a collaborative version helps in understanding patients' requirements, and it also helps in developing flexibility and scalability of the business process. The last survey question is related to developing a medical chain platform, and it is important for offering empowerment to the healthcare professionals so that they can manage activities with smart contracts.

CONCLUSION

From the above discussion, it can be concluded that information technology is getting facilitated and simplified due to advanced intermediaries. The identified contributions made by blockchain technology are interrelated with the context of sustainability. Further studies are highly required to provide structural models of the sustainable application of blockchain in the healthcare sector [23]. Developing a sustainable ecosystem is counted as an important part of this research study. By comparing environmental and economic dimensions of the healthcare sector based on blockchain technology the social pillar has appeared less. Thus, both the inclusion and exclusion of this study can impact empirical evidence. The performance of blockchain technology may vary based on the applications of sectors. So, there is a requirement to identify blockchain technologies and their sustainability in different sectors. Developing a sustainable economy is counted as a central concept of a circular economy [24]. Circularly the services provided by the healthcare sector are observed that defines better usage of medical-based natural resources.

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