Analyzing the Factors Influencing in Blockchain Innovation in Health Care

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Abstract

One sector in which blockchain technology is anticipated to have a significant impact is the healthcare sector. Researches expanding its applications to use cases outside of the financial sector has been ongoing. Since research in this field is still relatively new but expanding at a rapid rate, researchers and practitioners in the field of health informatics are always having trouble keeping up with the latest developments in research in this area. This paper presents findings from an analysis of the factors that are influencing blockchain innovation in the health care industry as well as a review of the research that is currently being conducted regarding the application of blockchain technology in the medical field. The review shows that different studies have come up with different ways that blockchain technology could be used in healthcare. Even so, there aren't enough prototype implementations or studies to figure out how well the proposed use cases work. This study gives more information about where blockchain applications for the healthcare industry are at the moment, as well as their limitations and possible new areas of research. Because of this, more research is still needed to better understand, describe, and evaluate blockchain's use in the healthcare industry. The main aim of this research is to identify factors which influences from blockchain. SPSS analysis has used for analysis using discriminant analysis followed by path analysis.

Keywords : Healthcare, Doctors, Practitioners, Blockchain, Medical

Introduction

There are many ways that blockchain technology could be used in the healthcare sector. This is because there is more interest in blockchain and more organisations and industries are using it. Unfortunately, there is a lot of misinformation, speculation, and uncertainty about how blockchain could be used in the healthcare industry. This is because blockchain is still a relatively new technology, and there is a lot of hype about it in the media and in grey publications like opinion pieces, comments, blog posts, interviews, and so on. Practitioners and people in the research community would be interested in learning about the specific ways blockchain technology can be used in the healthcare industry. Is there a list of the healthcare blockchain apps that have been built so far, based on the use cases that have been found? What problems do blockchain-based healthcare apps have to deal with, and what ways can they get better? Where should we change things?

To put it simply, a blockchain is a distributed, immutable ledger or database that can be accessed and updated in real time by all participants in the network. The foregoing discussion allows for the formulation of this definition. Several intriguing features of blockchain technology that are useful for healthcare applications are readily apparent.

One obvious benefit of blockchain's decentralised nature in the healthcare sector is that it can be used to implement distributed healthcare applications that do not rely on a centralised authority. Therefore, this is just one way in which blockchain technology can enhance the delivery of healthcare. The distributed nature of the blockchain makes it possible for all parties involved in a healthcare system, and in particular patients, to be aware of who has access to their data, when it has been accessed, and what it has been used for. The distributed nature of a blockchain ensures that the integrity of the ledger can never be compromised by the compromise of a single node in the network. Among the many benefits of blockchain technology, this one stands out as crucial. As a result, blockchain's properties make it resistant to data loss, corruption, and security threats like ransomware, which pose a serious threat to the confidentiality of patients' medical records (Oliveira et.al. 2019)

There is a high degree of congruence between the needs for storing healthcare records and blockchain's immutability property, which maintaining precise and comprehensive patient medical records is crucial. The immutability of blockchain data can be used to great effect in this regard. The data stored on the blockchain is encrypted using cryptographic algorithms to ensure that only authorised users can decrypt the information. This protects both the confidentiality and integrity of the information. Patients' personal information can also be encrypted using cryptographic keys and stored in a blockchain in a pseudonymous form. This paves the way for patients' health records to be shared amongst the many players in the healthcare system without revealing their identities. Moreover, blockchain can facilitate smart contracts (Z. Zheng et al., 2018), which can be used to programme the rules that give patients control over the sharing or utilisation of their health records. The processing of this information is forbidden unless either of the following conditions is met: (A. Dubovitskaya et.al. 2017). Therefore, blockchain technology can facilitate the development of medical data management system. To achieve this goal, the smart contract can be programmed with a set of rules that prevent potentially harmful disclosure or use of patient information without proper consent.

Healthcare Industry (HCI) & Blockchain (BC)
One of the most significant industries that blockchain technology has had an effect on to a significant degree is the healthcare industry. In any highly developed and civilised society, health is regarded as the cornerstone upon which the quality of life is built. Because of the important part it plays in the development of the economy, the health sector is important for every country (Srivastava and Singh, 2021). The healthcare sector is the primary focus of this article because, in light of during pandemic, it has become the most urgently important industry. Blockchain technology is becoming a new possibility for the healthcare system because it can be used to do things like store and send a person's health records (Srivastava and Singh, 2021). These procedures can rack up significant costs and may not provide adequate protection for the management of data. The blockchain technology offers solutions to all of these extremely important problems (Khezr et al., 2019). In the field of healthcare, maintaining records and communicating relevant information are both extremely important (Abouelmehdiet al., 2018; Calduch et al., 2021). If healthcare administration makes use of blockchain technology, we will be able to protect the confidentiality of individuals' medical records. The application of blockchain technology is of critical importance for ensuring the safest possible dissemination of these records across the many participants that make up the healthcare network. Researchers believe that BT can play a significant part in laying the groundwork for the exchange of confidential patient medical data (Cyran, 2018). There is a possibility that individuals will wonder why researchers are placing such an emphasis on blockchain technology for the healthcare industry.

Factors Influencing in blockchain innovation in healthcare
1. Adequate Treatment (AT) – Blockchain innovations influencing that how adequate treatment can be benefitted in order to adopt blockchain innovations in healthcare sector. In adequate treatment these factors identified for the analysis purpose. They are : Therapeutic Focus and Remote Monitoring, Case reviews are reviewed by doctors remotely, help spread security analysis, sensor management in the medical field

2. Doctor & Medical Administration (DMA)- The next important factor is doctor & medical administration. It shows that how blockchain innovations influencing this & how it can be benefitted in order to adopt blockchain

innovations in healthcare sector. In doctor & medical administration these factors identified for the analysis purpose. They are : monitoring of patients, verification of patient identity for the benefit of the patient, Client Authentication Security Mechanisms, Communication between doctors

3. Healthcare coverage (HC)- Similarly, third factor also influenced by blockchain. In health coverage these factors identified for the analysis purpose. They are : process of verifying medical records & streamlined, simplify and lessen the financial burden of health care coverage, safeguarding patients' rights, decrease hospitals' and administration's uncollected funds, expenses incurred by insurance providers

4. Healthcare Regulations (HR) – Blockchain helps to balance the healthcare regulations data. In healthcare regulations these factors identified for the analysis purpose. They are : controlling the flow of medical supplies, the control of the medical system as a whole, controlling the methods of handling medical waste
5. Digital health record (DHR)- Electronic health record maintenance can become very easy after implementing blockchain innovations. In digital health record these factors identified for the analysis purpose. They are: Confidentiality, safety, discretion of information is at risk, a determination of the patient's condition, medical records

6. Saving money (SM)- Although, blockchain initially incurs cost but gradually a huge savings shows cost wise. In saving money these factors identified for the analysis purpose. They are : better accessibility of medical records for both patients and healthcare providers, improving the effectiveness and quality of nursing care, saving money on drug development costs

Review Literature

Companies in the healthcare industry that are "notable" users of blockchain technology are shown in (Engelhardt, M.A., 2017). In this sector, companies are grouped by the services they offer to the healthcare sector. For example, there are divisions for dental, patient-centered medical records, and finding fake prescription drug claims. The another author also wrote the review you're about to read. When it comes to healthcare applications, Ku et al. (2017) publish an article that details the main benefits of blockchain technology over traditional databases. In addition, they elaborate on how these advantages can be put to use to advance clinical research, optimise medical record management, streamline insurance claim processes, and enhance overall healthcare financials. Last but not least, the review by Roman-Belmonte et al. (2018) talks about how blockchain technology is being used now and how it will be used in the future in different medical fields. These fields include "legal medicine, health data analytics, biomedical research, electronic medical records, meaningful use, payment for medical services", and many others.

The healthcare sector has adopted a variety of record-keeping and data-transfer methods. Both the patient's right to privacy and the convenience with which these records can be accessed have been perennial concerns (Calduch et al., 2021). Keeping the records up to date in the old system was a time-consuming and tedious process. Stress and frustration were commonplace when it came to dealing with the challenges of document storage, retrieval, and protection. Because of how simple it was, trespassers misappropriated the data and tampered with the documents. In order to overcome these challenges and prevent data from being tampered with, several resources are used. The final verdict was that the price tag for the necessary resources was prohibitive. Due to developments in ICT, data storage has become more manageable, but secure data transmission remains a challenge (Azaria et al., 2016; Mamoshina et al., 2018). Getting patient information, prescriptions, and other vital pieces of data from one level of operation to the next is an essential part of the healthcare system. Any possibility of document tampering during this transfer must be eliminated, as this could have serious consequences. Concerns about privacy, data breaches, and the medical use of stolen identities persisted. Despite expectations, electronic data storage did not ensure confidentiality (Khanra et al., 2020). Research by Smith and Eloff in 1999 at Boston's Massachusetts General Hospital found that safeguarding individuals' medical records was crucial to national prosperity. They proposed a variety of solutions for the

protection of medical records, including data integrity dashboards, verification via photo identification, and many others.

If what Yli-Huumo et al. (2016) say is true, the ongoing development of blockchain technology could help alleviate worries about patient privacy and data security in the healthcare sector. They concluded that blockchain technology should be implemented because of its ability to guarantee the security of stored information. The decentralised nature of the system's organisational structure increases transparency between the various healthcare providers (Randall et al., 2017). Blockchain technology ensures the integrity of the data it stores by providing an immutable audit trail. Focusing on who does what and when is essential to this investigation. As a result, it improves responsibility while decreasing the possibility of interference from outsiders.

One of the most cutting-edge and consequential uses of blockchain technology in the real world today is in the healthcare sector. It's a Swiss-founded digital startup with a global presence. This health bank's operational strategy and methodology include the management of data transactions and the transfer of individuals' health records. Users are given a secure space in which to maintain their medical files. The user has completed say over any actions taken in relation to their own health records. P.B. Nichol's study of this digital startup suggests that its implementation could facilitate better communication of medical records (Mettler, 2016).

Research Methodology

This is a quantitative study. Both primary & secondary data has been taken for the research. For the primary data, approached to healthcare professions & practitioners to collect data with the help of closed ended questionnaire. Purposive random sampling has been used. Total 50 respondents has taken as a sample. The sample area is Andhra Pradesh. Secondary data like review literature & theory has captured from websites & published articles. The factors identified on the basis of review literature. Discriminant analysis & path analysis has used for the analysis using SPSS.

Objective of the study
- To analyse the blockchain influencing on factors (adequate treatment, doctor & medical administration, health coverage, health regulations, digital health records, saving money)
- To discuss conclusion & future research

Hypothesis framework

H1 : There is positive relation between blockchain innovations & healthcare sector

H2 : There is positive relation between blockchain innovations & adequate treatment

H3 : There is positive relation between blockchain innovations & doctor & medical administration

H4 : There is positive relation between blockchain innovations & health coverage

H5 : There is positive relation between blockchain innovations & health regulations

H6 : There is positive relation between blockchain innovations & digital health records

H7 : There is positive relation between blockchain innovations & saving money
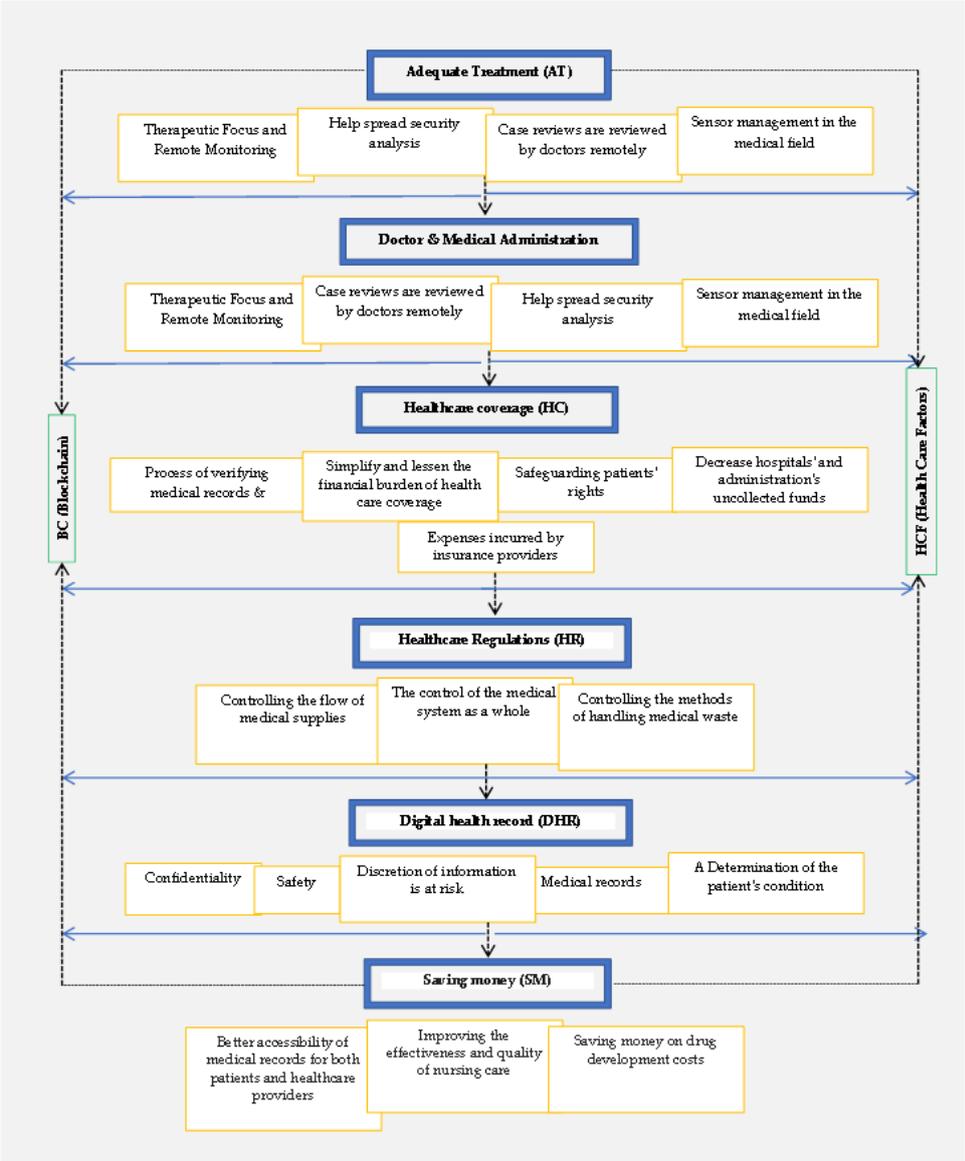
Figure 1: Conceptual Framework for the Study (Self-Prepared)

Results & Discussion

Table 1: Discriminant Analysis

		1	2	3	4	5	6	7	8
1.	Healthcare Factors (HCF)	0.871[a]							
2.	Adequate Treatment (AT)	0.632	0.761*						
3.	Doctor & Medical Administration (DMA)	0.661	0.623	0.567*					

4.	Healthcare coverage (HC)	0.598	0.538	0.571	0.794[a]			
5.	Healthcare Regulations (HR)	0.574	0.497	0.483	0.626	0.811[a]		
6.	Digital health record (DHR)	0.521	0.501	0.578	0.571	0.613	0.794[a]		
7.	Saving money (SM)	0.548	0.498	0.552	0.563	0.839	0.837	0.769[a]	
8.	Blockchain (BC)	0.521	0.521	0.549	0.549	0.894	0.891	0.752	0.819[a]

Following an investigation into the system's dependability, a discriminant analysis was performed on table 1, and the correlation matrix was examined; the results revealed that the majority of the values were higher than 0.50. As a result, the matrices have a strong positive correlation with one another.

Hypothesis Testing

Table 2: Path Coefficients and Indirect effect Model

Hypothesized Path	Value	CI$_{low}$	CI$_{high}$	Results
HCF ⬅ BC	0.172	0.13	0.42	Partially Accepted
AT ⬅ BC	0.353	0.19	0.58	Accepted
DMA ⬅ BC	0.297	0.18	0.49	Accepted
HC ⬅ BC	0.321	0.14	0.51	Accepted
HR ⬅ BC	0.399	0.29	0.57	Accepted
DHR ⬅ BC	0.364	0.20	0.52	Accepted
SM ⬅ BC	0.301	0.21	0.48	Accepted

After applying through path model above, the findings of this research suggested that alternate hypothesis is accepted in majority of the cases. All statements are accepted and shows there is positive relation in between all factors & blockchain innovations in healthcare sector.

Conclusion

But privacy protection has become a bottleneck in the smart health industry of today. This means that data about individual patients can't be shared safely between institutions. Studies in the field of "smart healthcare" are currently focused on specific information technologies, like the Internet of Things, in the medical field. There are a few studies that look at how blockchain technology and smart medical care work together. However, the vast majority of these studies look at how one part of blockchain technology can be used in smart medical care, with patients and hospitals as the main research subjects. In addition, there is no application system for the advancement of smart healthcare under blockchain, and only a few studies have considered multiagent cooperative development. Based on a stakeholder perspective, this study investigates blockchain's multi-level development path in the smart healthcare sector, and the resulting blockchain TIS application system is more clear and thorough than anything that has come before it.

Future Research

The criteria developed in this paper are chosen after a thorough literature review, but they are still not exhaustive. Additionally, the group is made up of healthcare management experts. As an extension of the current hierarchical framework, future work will focus on having more in-depth conversations with experts to

find a better way to use block chains for intelligent medicine. In addition, other methods of analysis can be incorporated into this study for a deeper dive. At the end of the day, the majority of this paper's data comes from India. A more robust and culturally nuanced blockchain intelligent medical governance framework can be investigated in the future.

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