



# Blockchain Technology in Healthcare : Key Factors determine the Adaptation of Blockchain in Healthcare form Multiple Perspectives

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## ABSTRACT

Blockchain has been attracting considerable attention as a secure and reliable technology for data sharing in different industries such as the financial sector, supply chain, energy, and healthcare. However, while much research on Blockchain focuses on technical and legal aspects of the blockchain applications, such as the cryptocurrency, a few number of research have addressed the factors influencing the strategic adoption decision at the organizational level. In this paper, we conduct a review of existing literature for the application of Blockchain in the healthcare ecosystem. Then, we define the critical issues within the healthcare ecosystem and how Blockchain can provide solutions. Finally, we categorized the influencing factors into three categories: organizational, technological, and environmental factors. This work should help address the gap of knowledge in literature by providing healthcare leaders and researchers more insight into the value and challenging aspects of considering solutions based on blockchain technology.

## INTRODUCTION

Healthcare is a highly complex industry with many stakeholders, such as service providers, patients, insurance companies, clinical researchers, regulation agencies, and pharmaceutical companies. All of these different parties handle overwhelming amounts of medical data for various purposes (M. Bublitz et al., 2019). Medical data is considered the backbone of the health system; it is usually generated by service providers, such as hospitals and clinics, in the form of medical records. However, due to the data sharing and interoperability issues, strict regulations, and patient privacy, exchanging data is a time-consuming and challenging task. For instance, in the insurance domine, the lack of trust between service providers, insurance companies, and patients prevent efficient care coordination and results in high service costs. Also, in medical research, researchers face trust and cost-based issues in obtaining medical data necessary for impactful research (Kulemin, Popov, & Gorbachev, 2017), which results in delayed response to the epidemic, limited understanding of drugs harms and benefits, and lack of consistent consent management. Since these issues are generated by different parties within the healthcare system and have no single solution, many experts are expecting that blockchain technology has a potential benefit. According to IBM survey in 2016 and 2018, which includes more than 400 healthcare and life science executives from 18 counties, 56% of healthcare executives and 70% of life sciences executives had plans to adopt blockchain technology in the next five years (M. Bublitz et al., 2019). Blockchain can help the healthcare industry overcome many issues such as trust, data sharing and interoperability, data fragmentations, and counterfeit drugs. However, blockchain technology is relatively new, and therefore a few research has been done on the impacts on organizational performance, such as profitability, productivity, and patient experience. Most research on blockchain technology has been conducted from a technical perspective (Saheb & Mamaghani, 2021). The aim of this paper is to review blockchain technology from the management perspective and assessing its adoptability within a dynamic organizational environment.

## BLOCKCHAIN OVERVIEW

Blockchain is best known as the technology enabling the Bitcoin cryptocurrency, first introduced by Nakamoto (2008) as a peer-to-peer payment system. Blockchain allows peer-to-peer transactions without a third trusted party (Lacity, 2018), which expanded its benefits beyond monetary applications. Organizations in different industries are considering the adoption of blockchain technology due to its promising business values. It is enabled transparent, traceable, low-cost transactions that allow asset tracking and ensure the provenance of data (Lacity, 2018). However, Organizations are different from individuals in their needs and value; confidentiality and compliance with regulations are essential, including KYC and data protection. Many organizations are required to control who can submit transactions and who can perform validation. Currently, there are three types of blockchain ledger (Meng, Zhao, Wolter, & Xu, 2021). 1) Public Blockchain: highly decentralized and has no central control; anyone can interact with the network and run a validator node. 2) Private Blockchain: a permissioned blockchain where a central authority strictly controls all nodes. 3) Consortium blockchain: in this type of Blockchain, the control over the network is shared between trusted enterprises. Figure 1 shows the main types of blockchain systems and their degree of decentralization.

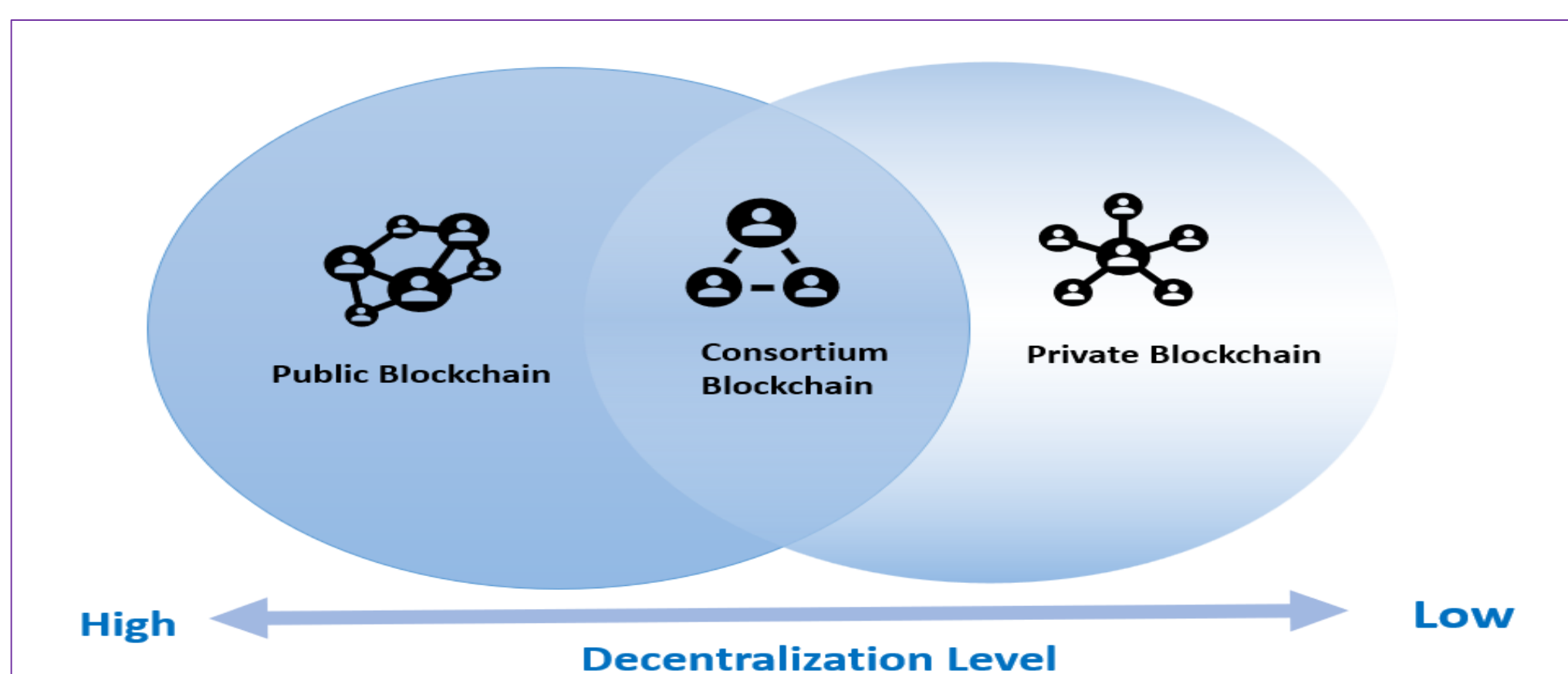


Table 1: The main types of blockchain

## LITERATURE REVIEW

There is a considerable research interest in blockchain technology adoption in the healthcare industry (e.g., A. Thakur (2022),Kulemin et al. (2017),Alzubi (2021),Bayramzadeh and Aghaei (2021), Cousaert, Vadgama, and Xu (2021),Hussien, Yasin, Udzir, Zaidan, and Zaidan (2019). The research found that developing secure and easy access to patient data across the healthcare ecosystem is becoming highly important (Westphal & Seitz, 2021). Many researchers have proposed Blockchain-based solutions to manage data in healthcare. Khatoon (2020) proposed a permissionless blockchain-based on smart contract to enhance the medical data process. The information of different processes such as finance, claims, and medical data are compressed and cryptographically secured in Blockchain. In their work, Abbas, Afaq, Ahmed Khan, and Song (2020) have proposed a permissioned Blockchain-based management and recommendation system that utilize machine learning to track and monitor drugs through the supply chains. (Wang & Song, 2018) propose electronic healthcare system EHR based on blockchain technology. They used identity encryption to encrypt medical data and implement digital signatures.

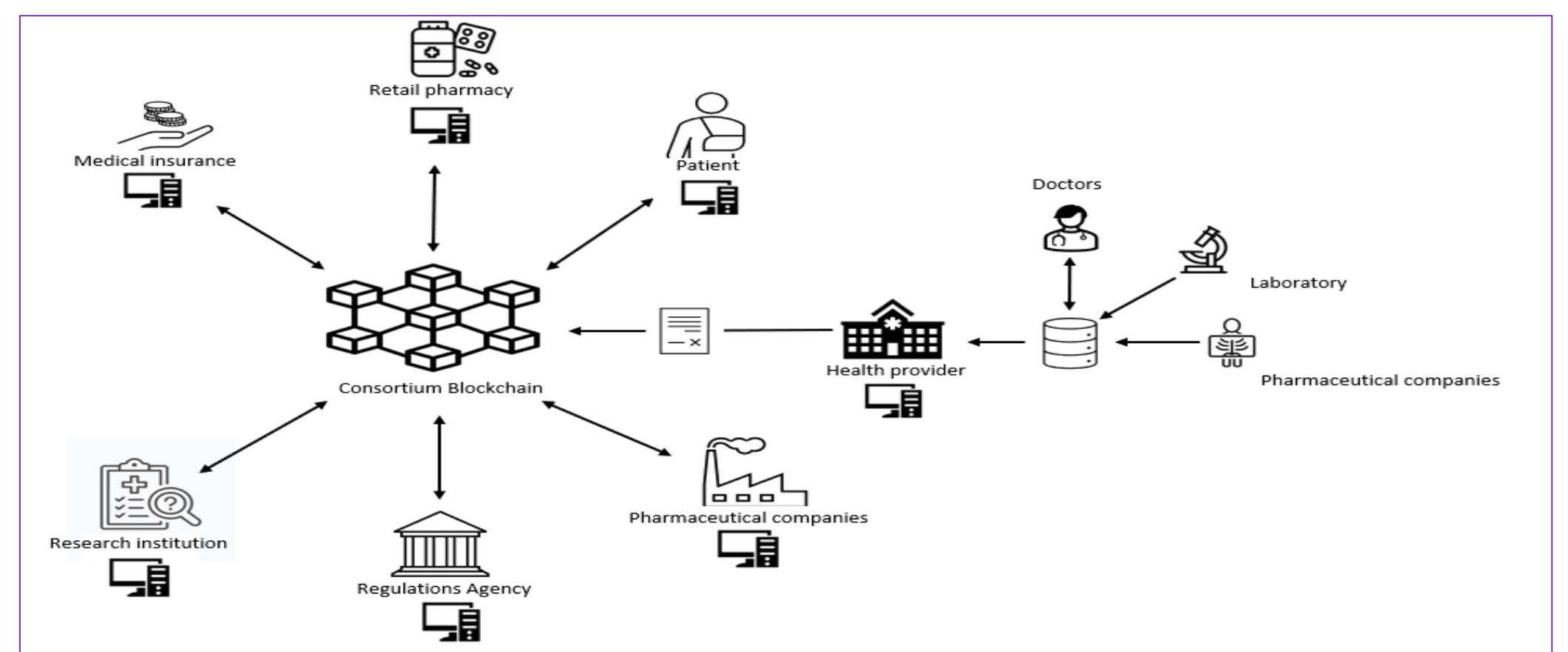


Figure 2: Blockchain system model in healthcare

## Discussion

Blockchain technology has potential promising solutions for the healthcare sector, organization openness to adopt this technology is critical. Healthcare organizations build their strategies based on patients' needs and market orientation (R. Thakur, Hsu, & Fontenot, 2012). Since blockchain technology is designed to address patient data issues, internal and external factors will play a role in implementation decisions. At the organizational level, top management awareness, availability of skilled human resources, and stakeholder readiness are major factors that determine the adoption rate (Soni, Sharma, Singh, & Kapoor, 2020). From the technological perspective, several factors related to the design and performance of blockchain networks may influence adoption intention, such as the scalability limitation, the security and privacy, and the reliability over time. The external factors also play a vital role adoption process; the healthcare environment is highly complex and integrates different interest groups. Compliance and regulation, legal validity, and political and cultural resistance are essential factors that decision-makers highly consider. Additionally, the high energy consumption of blockchain computing raise concerns about environment sustainability.

## CONCLUSIONS AND FUTURE RESEARCH

This paper supports the potential application of blockchain technology in healthcare as it relates to improving sharing and interoperability issues. Also, it provides an overview of the types of blockchain systems and presents related academic works. Then, it discusses the main factors that may play a significant role in future implementation within the healthcare sector. The future work should further investigate the implication of blockchain technology from the patient perspective, such as the intention to share and exchange data using a decentralized based network.

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