


Chapter 4

Blockchain With the Internet of Things for Secure Healthcare Service Using Lightweight Cryptography

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ABSTRACT

Technological innovation greatly supported global healthcare service in the recent coronavirus pandemic. The healthcare technical support came in two forms: (1) digitization of business functions and (2) development of new healthcare products. Healthcare-related data collection, preservation, and analysis using digital technologies support pandemic mitigation strategies. Gathering big data using the internet of things (IoT) technology, data analysis with the help of artificial intelligence (AI) techniques, mobile networking technologies for providing communication channels, and deploying the secure infrastructure are essential for the regular functioning of global healthcare services. In addition, healthcare operational data and infrastructure are highly vulnerable to traditional privacy and security-related issues. In addition, this chapter presents a survey of how security, trust, and privacy issues can deal with blockchain-based IoT computing architecture for securing healthcare information systems using lightweight cryptography.

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INTRODUCTION

The end of 2019 brought together several challenges for global healthcare services. The spread of the coronavirus pandemic began its journey in a Chinese city, Wuhan, and global leaders started imposing a travel ban to parts of China and laying down stricter policies to control this unknown virus infection. The coronavirus pandemic (known as COVID-19) has placed enormous strain on the global healthcare workforce, infrastructure, and supply chain and highlighted global social inequalities in healthcare clearly and catastrophic effects on people around the globe. These inequalities are due to a shortage of skilled workforce, medical equipment, strategic knowledge to control the new virus category, and technological infrastructures (e.g., information and communication technology-related issues). Several foundational shifts are arising from COVID-19's spread. For example, some healthcare services or medical treatments are heavily restricted or delayed, the rapid use of virtual consultation and other digital technologies advancements, the adoption of interoperable data and data analytics, and tremendous public-private collaborations (i.e., vaccination services offered by public and private organizations) in the healthcare industry.

Consequently, healthcare organizations started investing resources in optimizing or replacing foundational structures, technologies, and business process automation. This way, digital transformation is helping individual healthcare organizations and the broader health ecosystem enhance working practices, widen access to services, and provide a more effective patient and medical practitioner experience. For example, patients might expect healthcare to be available when and how it is most convenient and safe. In addition, it includes virtual care and consultation, at-home prescription delivery, remote monitoring of the patient's condition, and digital diagnostic and medical decision support systems.

The demand for the above transformative requirements has created significant challenges for healthcare industries, the country, and the global economy. The challenges must be mitigated with continuous improvement in organization-specific healthcare business processes, patient caring activities, supply chain management, and improved security measures for healthcare data and infrastructure. Some healthcare leaders, such as England's chief medical officer, Professor Chris Whitty, and United Kingdom's chief medical advisor – Professor Patrick Vallance, are urging to take a scenario planning approach for strategic decision-making in this uncertain time (Godlee & Looi, 2020) (IMechE, 2022). Such an approach benefits the current pandemic volatility and elevated uncertainty regarding the future. When used against a range of plausible future possibilities, scenario-based strategic planning permits businesses to prepare for all possible outcomes, helps business leaders identify crucial decision points, and positions the industry to propose advantage of opportunities during an eventual recovery.

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