Revolutionizing the Healthcare System in Indonesia: Solutions for BPJS Health through Blockchain Integration

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Abstract:- **The importance of blockchain implementation in systems of storing data is more than necessary in a populated country such as Indonesia. Electronic medical records in the healthcare industry are one aspect in which blockchain can make significant impacts. With the recent news of data security crisis as well as the increasing price of national healthcare in Indonesia makes blockchain such an important asset to be used today. This article provides a summary on the ways blockchain implementation can solve the issues of data security and increasing costs in the healthcare industry, especially in the national insurance company (BPJS Kesehatan). This article uses an explorative study on the state-of-the-art in companies that have developed blockchain implementation in the healthcare sector and their applications. In the end, there still needs to be more research and a better understanding of areas in our nation that needs support to better shape a beneficial blockchain ecosystem.**

I. INTRODUCTION

The increase of technology and information systems has inspired the change to individuals and companies in many aspects. Blockchain technology is amongst one of them and to be said the future of technology. It is celebrated as a revolutionary technology that can change how data is managed forever. In simple terms, Blockchain is a system of recording information that is impossible to change, hack, or cheat the system. It is essentially a digital ledger of transactions that is replicated and distributed across the entire network of computer systems on a blockchain.

While most blockchain adaptation is used in financial services industry, there are also numerous starting points to implement this technology in the healthcare industry (Mettler, 2016). Blockchain can be applied in mobile health applications, monitoring devices, sharing, and storing medical records and data, clinical trial data and insurance information storage (Chen S.H, 2019). A blockchain powered health information exchange could unlock the true value of interoperability as well as eliminate the friction and costs of current intermediaries (Deloitte, 2019). I hope through this article it will show Indonesian policymakers how implementing blockchain technology will bring so much solution to the healthcare industry, in particular, BPJS Health. The solutions will cover the issues of healthcare rates and most importantly data protection and ownership.

II. HEALTH INSURANCE IS FAILING AS IT TENDS TO INCREASE THE RATE OF SERVICES AND NOT THE EFFECTIVITY OF NATIONAL HEALTH INSURANCE IN INDONESIA

Ideally, the *Badan Penyelenggaraan Jaminan Sosial* (BPJS) insurance is an attempt by the government to achieve universal healthcare coverage for all Indonesian citizens, so that all levels of society can have access to health services. Since July last year, however, it has been reported that BPJS kesehatan has been suffering an estimated deficit of Rp 28 trillion which leads to the increase of national health insurance premiums (Deloitte, 2019).

On the other hand, the increase in rates will only hamper the government's efforts to achieve universal healthcare as seen in **Law No.40 of 2004**, as only those with high purchasing power are the ones able to afford the costs (Sutarsa, Prastyani and Adawiyah, 2020). This makes the health insurance in Indonesia broken as more people starts to realize the access to quality, affordable and effective healthcare in Indonesia is more far-fetched than ever.

There are several factors that causes the increase in the health budget, among others, is less than optimal service transaction system, drug dispensing, management on health services as well as data manipulation from hospitals as well as patients (Deloitte, 2019). In the world of healthcare today, there two focuses that must be addressed: data security and data ownership. Sensitive medical records currently lack a secure structure, resulting into data breaches with severe consequences (Chen, S.H *et al*, 2019). Just recently, Indonesia was taken aback by the rumor a possible data leak for over 279 million Indonesians. Certain allegations stated that the leaked data was from BPJS Kesehatan (Wardani. 2021). This proves the urgency of personal data protection, especially in our medical records.

As Indonesia is still managing this data in a centralized system, it will be difficult to handle millions of data entering the insurance agency (BPJS-Health) from various of sources (Wulandari, 2020). Data will also be difficult to access because it is stored in a different format that varies each time. With the number of participants in BPJS Health reaching 220 million people in 2019 and increasing each year, we need the right system technology information to overcome such issues.

III. THE BENEFITS OF BLOCKCHAIN FOR THE INDONESIAN HEALTHCARE SYSTEM

The main benefit of blockchain is decentralizing data, in a public and simultaneously private manner which leads to lowering unnecessary costs

Blockchain has the potential to solve unnecessary costs and transform the health care system as well as increasing the security, privacy, and interoperability of healthcare systems (McGhin *et al,* 2019). Blockchain is a technology where the data are not stored in one extensive storage system but distributed through the devices or system that uses the blockchain-based system. The infrastructure is peer-to-peer based, and functions by having both users of the network, in this case, -the patient and the health care provider and BPJS Health agency, to authenticate any payments or transactions, sharing of patients' health data, personal records, etc in a decentralized network in a privacy-preserving manner (Zhao *et al,* 2017). Nakamoto and Alharby (2018) also mention the similar mechanism of how the blockchain technology works through a network of nodes or entities with a copy of this database, which will then form a replicated and backed-up memory of all the history of transactions that have occurred. Each block references the previous block by storing its cryptographic hash, resulting in a chain of blocks. In addition to the last block's hash, a block contains a set of transactions that cannot be updated or deleted once accepted and appended to the blockchain. As a result, both integrity and double-spending problems are mitigated (Alharby 2018).

With this, we can solve the issues of data manipulation as whatever data is stored and confirmed in the blockchain cannot be altered or deleted (Srivastav, Agrawal and Shrivastava, 2020).

Blockchain promotes transparency and efficiency

Healthcare is an industry that is heavily dependent on real-time upgradation in order to meet the intended need for patients in a quick and efficient manner. Information systems that are supported by the blockchain technology can also increase the effectiveness and efficiency of data accuracy by providing data in real time, which in turn reduces transaction costs to a great extent. Research (Chen. S.H *et al,* 2019; Fan.K *et al,* 2018) is also in line with this point of view as data errors and manipulation of medical data and costs can be reduced. This will make it easier for BPJS Health internal parties to supervise agencies that are in coordination with them without any hassle (Wulandari, 2020).

Blockchain reduces intermediaries in the healthcare sector

As the healthcare industry is an intertwined web of multiple organizations working in different domains in the same sector, each plays a crucial role in the value chain and records. Blockchain technology can change Electronic Medical Records (EMR) that are stored from a centralized system to a distributed, decentralized, and secure system. When dealing with transactions especially, blockchain can bridge between insurance companies with referral hospitals in support of the blockchain implementation. They can then produce transaction reports for the use of drugs or other services from the hospital to BPJS Health correctly and in real time. With Blockchain, direct transactions suddenly become possible, whereby a central actor, who controlled the data, earned commission, or even intervened in censoring fashion, can be eliminated (Mettler, 2016).

System Design for Blockchain Implementation in BPJS Kesehatan
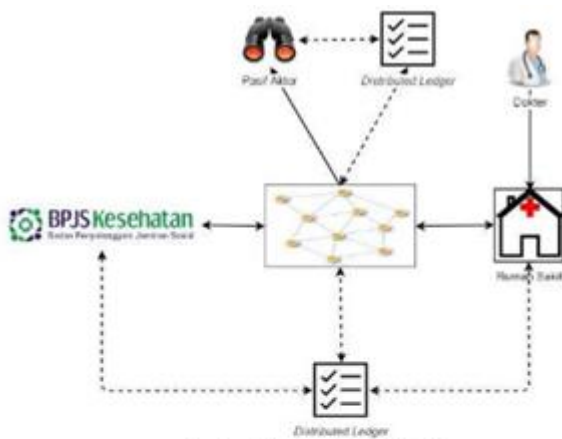
The implementation of blockchain would change the structure of how the previous system works. There are several of actors (as seen in Figure1), the added actors other than what was stated in the official website of BPJS Health (https://www.bpjs-kesehatan.go.id) is to aim for an increase in security in hopes to lower data manipulation and fraud. All the actors, especially the patients, healthcare providers and BPJS Health would be participating in providing real-time, transparent, and secure data. In the design below, the healthcare providers would input the billing data in the system where it would be received by the insurance agencies to verify the data and process it. All of this activity would be recorded inside the blockchain system where every actor involved can access such information where the issue of transparency and fraud will be managed, resulting in lower costs (Trimanda and Rahardjo, 2018).

Figure 1. Source:
http://is.its.ac.id/pubs/oajis/index.php/file/download_file/1840

IV. REAL LIFE IMPLEMENTATION IN THE HEALTHCARE SECTOR TODAY

The above facts on how blockchain may change the healthcare system in Indonesia may seem surreal for now. However, there are several companies out there that has already proved the benefits of blockchain by implementing such technology on providing healthcare services. *First*, Healthcare Data Gateway (Yue. X *et al,* 2016), which is a mobile application that organizes data with a secure multi-party computing (MPC) system. This app enables third party interaction with protected healthcare data without privacy breaches and without authoritative power over the information (Chen. S.H *et al,* 2019). With the help of smart contracts to verify and monitor the blockchain activity, they are able to enable real-time patient monitoring (Griggs K.N *et al*, 2018). *Second,* MedBlock, which is a blockchain based information management system enables the accessing and sharing health data through distributed blockchain principles (Fan.K *et al,* 2018). MedBlock is highly secured by access control and cryptography so that patient, healthcare providers and insurance agencies, will not have to worry about the network being overloaded by activity. Lastly, MIStore is a medical insurance storage system (Zhuo L, Wang L, and Sun Y, 2018). This software is intended to verify each activity and security of different hospitals, patients, and insurance agencies. This helps creates a productive and secure relationship between all parties by minimizing errors and data manipulation.

V. CONCLUSION AND SUGGESTION

The immense potential of implementing this has proved how (data) intermediaries can be avoided. This technology opens new doors for BPJS Health on how data portability, interoperability is possible to do. Most importantly, this technology would alleviate the pressure of cost for BPJS Health as well as patients, making it the optimal solution on providing universal healthcare for all citizens of Indonesia. However, implementing blockchain technology will not be immediate as there are several technical, organizational, and behavioral economic challenges that must be addressed before a health care blockchain can be adopted by BPJS Health or health organizations nationwide (Deloitte, 2019). In this case, the government, alongside its professional partnerships, will need to track this rapidly evolving field to identify trends and sense areas where government support is needed for the technology to realize in full potential in health care (Deloitte, 2019). To shape this technology's future, the government should consider mapping and assembling the blockchain ecosystem with professionals to fully support the adoption and dialogue for blockchain implementation in Indonesia.

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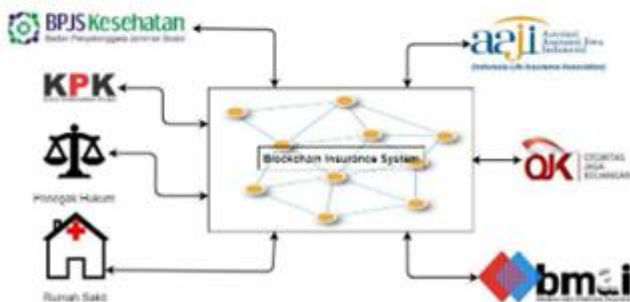[8]. Nakamoto S (2008) Bitcoin: A Peer-to-Peer Electronic Cash System. [Google Scholar]

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