Chapter 1

INTRODUCTION

The MediSafe: Secure Health Records Powered by Blockchain System is a comprehensive software solution designed to efficiently manage and monitor patient data within hospital using a centralized registry.MediSafe is a groundbreaking software solution that harnesses the power of blockchain technology to revolutionize health record management. With a focus on security, accessibility, and patient privacy, it ensures that patient health records are stored securely and accessed efficiently by authorized healthcare professionals. By leveraging blockchain's immutable ledger and advanced encryption techniques, the system maintains data integrity while providing patients with full control over their health information. Through interoperability standards and anonymization protocols, MediSafe facilitates seamless data exchange between healthcare systems while safeguarding patient privacy rights. The system aims to provide an efficient, secure, and well-managed environment for healthcare institutions. The system allows healthcare providers to track patient health records, ensuring optimal utilization of resources and enhancing the overall quality of patient care. Healthcare professionals can access patient records securely, enabling informed decision-making and timely interventions.

1.1 General Background

The traditional approach to managing health records have been and inconvenient since its dawn. The amount of effort, time and space used up by traditional health information man-

agement systems are so massive that there is a great sense of wonder as to why a better system has not been introduced and implemented on a large scale. There are additional problems associated with the traditional paper-based management which include redundancy, proneness to loss of record, and so on. The use of technology in Blockchain is the health industry has the potential to have finest utility of Blockchain, since it involves store, use and transfer of sensitive information pertaining to any individual. Surprisingly, there has been little to no works or experiments done on this field as it comes up with many difficulties like scalability and awareness. A distributed platform providing technology like Blockchain, if utilized in health sector, and utilized properly, can yield amazing results in many aspects. The basic idea of our product is to minimize the effort and to overcome the aforementioned difficulties by making use of electronic health records to store and maintain the health information of every person. For the secure storage and transmission of sensitive health information, the blockchain technology, which is currently on an upsurge, is used

1.2   Objective

Implementing centralized patient information using blockchain in healthcare can be driven by several key objectives, each aiming to address specific challenges and enhance the overall quality of patient care. Here are some common objectives:

1 - History of previous health records:

The history of previous health records is like a timeline of all the times someone has been to the doctor. It includes details about sicknesses they had before, medicines they took, surgeries they had, and any tests they did. In the past, this information was kept on paper in hospitals, but now, with computers, it's often stored digitally. This record helps doctors understand a person's health better, making it easier for them to give the right treatment. Electronic health records, which are like digital folders for health information, make it simpler for doctors to see these details quickly. Having this record also helps in preventing health issues because doctors can look at past patterns and suggest ways to stay healthy. While using computers for health records is handy, there are still challenges to make sure the information is safe and can be easily shared between different healthcare places.

2 - Security for patient health care information:

Ensuring the security of patient data in the healthcare industry is a top priority, with robust measures like encryption, access controls, and regular audits in place to protect sensitive information from unauthorized access. However, challenges persist as the systems storing patient data may not be entirely secure, and insecure practices, such as doctors sharing information on social media, pose risks of data leaks. Additionally, concerns about data ownership arise, with organizations often holding patient data without explicit permission. Proposing a solution, empowering patients to have control over their data and share it anonymously can enhance privacy. This approach benefits healthcare institutes by utilizing anonymous data for research and improvement while ensuring patients dictate who has access to their information.

1.3 Scope

1 - Interoperability:

Advocate for and implement standardized protocols and interoperability standards across healthcare systems. This facilitates seamless data exchange among different providers, improving the continuity and quality of patient care.Blockchain can solve all the interoperability issues as it acts as a decentralized database. The data can be accessed thanks to the APIs with a focus on the standard data format. Blockchain can also work seamlessly with the current platforms and protocols that are used to access and store data.

2 - Integrity:

Blockchain's integrity also solves a lot of problems that the current healthcare industry is going through. Blockchain in healthcare today realizes heavily on how the data is transmitted between systems. This leads to errors nullifying the importance of the data stored. With blockchain, the data integrity can be maintained at all the levels all the time. It also enables remove multiple instances of obsolete patient data. Also, once the data is uploaded

on the blockchain, it cannot be changed by malicious actors, preserving the integrity of the data. Only the patients can change the details when working with a physician. There are many case studies for blockchain in healthcare hints that blockchain can bring the necessary integrity to protect data from being stolen or misused.

3 - Security:

The current traditional healthcare industry suffers from data leaks that can cost them millions of dollars. With no proper solution, they are heavily reliant on trial and error, and that is too failing to secure all their platforms including data integrity. Data tampering and theft is becoming a big concern and should be properly dealt with. Blockchain utilizes data encryption using private keys, and only the receiver can decrypt the content using his key.In short, we can easily say that blockchain offers better security than the currently available solutions out there.

4 - Maintenance Cost:

Maintenance cost is also an integral problem with the current healthcare systems. The current system requires maintenance across different operations and needs a specialized team to ensure that all the functions are running accordingly and are in sync. Blockchain doesn't suffer from this problem as it is a distributed decentralized network.Data is distributed across the network which means that there is no single point of failure. If a node goes down, data can be fetched from other nodes as there are multiple copies of the data on the network. Each node has its copy of the database. The backup mechanism is amazing as it will help hospitals to cope with the emergencies better. Another benefit of having a backup on each node means that there is less transaction cost when it comes to storing or retrieving information.

5 - Universal Access:

Blockchain provides universal access to all its users. It is not dependent on a central authority which makes universal access possible. Authorized entities can easily access data whenever needed, and the whole process can be automated with different mechanisms sim-

ilar to smart contracts. In short, blockchain for medical is promising and should also be encouraged in the working environment.

Chapter 2

LITERATURE SURVEY

Blockchain is a relatively new technology, which was conceptualized only in 2008 by a person or a group of people by the name of Satoshi Nakamoto. So, as the concept is relatively new, most of the individuals and even organizations focus on the one standout feature presented by Blockchain technology, which is crypto currency. Bitcoins and other forms of crypto currencies are still worth a lot and many individuals and organizations are still looking to invest in those crypto currencies and make tremendous profit from them. Other aspects to Blockchain technology are not yet fully discovered. This review dwells into the field of management of medical records which are electronic and which have the primary oversight on the efficiency of the system during emergency and catastrophic situations. A major part of the literature is based on software frameworks and other techniques introduced prior to blockchain and its capabilities of smart contracts. With the introduction of the ability to represent complicated data on the chain with the help of a language that is Turing-complete helped start a new field of distribution and p2p mode of communication. After the introduction of Ethereum , new software-frameworks that can use and employ blockchain have been developed by academic institutions and the IT-industry. Electronic Health Records and Electronic Medical Records are not the same thing . These terms are sometimes interchanged, but there is a big difference in the records containing medical information, stored digitally. An electronic medical record is the digital or electronic equivalent of the paper-records maintained by a patient and the doctor. It contains the history of the patient and other diagnostic and treatment details. The first system to use blockchain

for Health records used a modular method for the sake of integration purposes. For the sake of scalability, the actual records are stored off-chain which is the provider's RDB.

Blockchain contains the meta-data and other location information. In simple terms , a smart contract manages all the interaction between the participants of the system and defines the access matrix or access rules and other data-pointers. The pointers will contain tuples along with a query that will run on both the machines of the provider and the host. The health record software is designed according to the protocols of the network designed as Ethereum and the public as well as the private keys will have to decide which parties (network participants who act as miners of the system) get the permission. This means that every participant must have a node associated to the blockchain for interacting with the network. The concerning drawback of this kind of system is that every participant has to maintain a copy of the data. The other drawback would be the scalability issues because of the consensus mechanism used. If the host does not specify any limit, it is still possible to put a maximum transaction count per second of sixty. The projects were completed by focusing on data-sharing, access-controls and integration mechanism.

The research also focused on the patient-side, on how to ensure security constraints in the patient-data while aggregating the system. The various frameworks and blockchain software's that have been developed so far can be categorized as two permissioned and the permissioned. In a permissioned network, since the participants know each there , it is possible to take advantage of the consensus mechanisms and any network interaction lag can be evaded from while also ensuring security, privacy and transparency. It is not associated to any cryptocurrency models, so the system does not need to be incentivized. This software-framework is most suitable for 2 or more organizations that know each other and want to transfer sensitive information.