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A Bibliometric Analysis of Technology in Digital Health: Exploring the Health Metaverse and Visualizing Emerging Healthcare Management Trends

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Abstract- Blockchain technology has revolutionized the healthcare industry by providing a secure and decentralized environment for managing electronic health (eHealth) care data. A blockchain-based eHealth care data management system utilizes the intrinsic properties of blockchain technology to provide solutions to the major concerns of data security, privacy, and interoperability in the healthcare industry. Such a system provides security for the patient's data in a safe environment and provides access only to authorized stakeholders while making data tampering impossible, thus avoiding unauthorized access to the data. Through smart contracts, the system avoids the problem of data sharing and consent management and increases the autonomy and trust of the patients in the care providers. Through decentralization, data interoperability between various healthcare systems and platforms becomes easier, enabling free data exchange. Through this new practice, not only is the efficacy and efficiency of healthcare delivery improved but patients are also empowered By enabling them to maintain control over their personal health information.

Keywords- Digital Health, Health Metaverse, Bibliometric Analysis, VOS viewer, Healthcare Management, Digital Twins, Virtual Reality.

I. INTRODUCTION

Blockchain technology is a distributed and decentralized system by nature. Due to its distributed nature, it has replaced conventional platforms. Blockchain uses a distributed ledger where data is stored in blocks. A large number of signed transactions are stored in every block of the ledger. Cryptographic methods are used to link the blocks, thus referred to as blockchain. A systematic cryptographic method is used to append the new blocks. This will ensure the reliability of the information stored in the blockchain. This will also ensure the integrity of the information when different partners are involved. The Blockchain stores and handles all kinds of transactions openly on a distributed ledger that replaces intermediary databases, employs a consensus mechanism; and achieves decentralization, trust, and data immutability which is useful in many use cases. Data immutability means it is not possible to manipulate or update any transaction. Decentralization in Blockchain helps to replace intermediaries. Trust is assured by a distributed ledger and consensus mechanism which leads to security. One of the advantages of blockchain is to remove intermediaries and thereby minimize transaction costs and frauds with a central authority, which makes business processes faster and provides a

peer-to-peer sharing feature. Distributed ledger technology helps many use cases belonging to businesses for which provenance is relevant. Blockchain works in excellent ways for different application areas like the Internet of Things, the Media Industry, the Public and Legal Sector, Supply Chain Management, and Healthcare. Also, use cases support the transfer of digital assets or improve the supply chain traceability of food or other products. Technology itself is in a development phase which promises digital transformation. Blockchain technology is utilized in different proof-of-concept implementations, prototypes, and application systems. In this dynamic era, continuous cybercrimes are happening, so there is a vital role of digital evidence to check the proof of origin and proof of link connected to cybercrimes. There are a lot of challenges with online evidence. The custody chain can be described as a system used to retain and record the historical history of digital evidence handling. Electronic Forensic evidence goes through various levels of hierarchy, i.e. from the lower responsible entity to the higher responsible entity for handling cybercrime investigations. There is always a complex step of breach of honesty and denial during this transfer of digital evidence. The hour requires to ensure that there is a system that ensures accountability, reliability, safety, and auditability. Blockchain is a series of blocks linked together that stores and maintains all that happens on some distributed systems.

II. LITERATURE SURVEY

BITCOIN: A Peer-To-Peer Electronic Cash System
Author: S. Nakamoto
Year: 2018
Description: As mentioned earlier, this paper and the application of blockchains as immutable ledgers can be described as the beginnings of blockchain technology today. It was in this paper that the blockchain and Bitcoin revolution began. Although the paper had been published in the form of a non-peer-reviewed white paper, it's one of the most cited sources of research work in the blockchain research discipline.[1] The paper itself is short and does not contain so much detail. It outlines the general concept and structure. Specific details on the solution, the exact technologies, and the exact properties of how the Bitcoin network would be arranged are not available. Another remarkable fact is that Satoshi Nakamoto never utters the exact word blockchain anywhere in his paper. But yes, he uses words such as chains of blocks, proof-of-work chains, and lengths of chains.

Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World
Author: D. Tapscott, A. Tapscott
Year: 2020
Description: This book is also well cited but has a quite different wiring perspective compared to the other books and articles. This book focuses on the revolution that blockchain technology brings, explaining the change, transformation, and digitization coming with blockchain technologies. The book primarily explains this from a business and economics perspective, using many historical quotes to put the blockchain revolution into a historical context. But it also highlights the importance of individuals, technology, and economic forces. Finally, the book ends with a look into different promises and perils of using technology, including privacy, leadership, and future challenges.

Blockchain: Blueprint for a New Economy
Author: M. Swan
Year: 2019
Description: This book gives a good overview of the usage of blockchains and Bitcoin as a whole. It also outlines three different versions of blockchain. Blockchain 1.0, 2.0, and 3.0. Where 1.0 can be seen as the currency, such as the original Bitcoin idea by Nakamoto. Where the blockchain is a method for a cryptocurrency, which also incorporates its generation of the cryptocurrency as payments for the proof-of-work that has been done. Blockchain 2.0 is the next step in contracts. Meaning that it can be used for so much more than just currency in the finance world. It can for example be used in digital contracts, stocks, bonds, loans, smart contracts, smart properties, etc. Finally, the textbook explains blockchain 3.0, which extends the applications beyond the finance domain. Looking specifically into applications of government, health, science, literacy, culture, and art. Where the discussions regarding

government blockchains are most important for this pre-study. Including, but not limited to decentralized governance services, blockchain passports, blockchain weddings, and voting.

Sok: Bitcoin and Cryptocurrency Research Directions and Challenges
Author: J Bonneau, A Miller, J Clark, A Narayanan, J Kroll, EW Felten
Year: 2018
Description: This research article is a survey of Bitcoin from a research perspective. It starts with a well-written history and technological analysis of bitcoin, highlighting for example the Nakamoto's consensus algorithm, bitcoin mining, and its communication protocol. The technical survey focuses on research issues on the stability of Bitcoin. Including the stability problem of the validity rules, the consensus protocol, mining pools, and the peer-to-peer layer. The article also highlights problems with client-side security, different modifications to Bitcoin, alternative consensus methods, and alternative puzzles. The survey also presents several alternative cryptocurrencies to Bitcoin, as well as other potential research topics for extending Bitcoin. Overall, the article is a good start for understanding a little more about the details of how Bitcoin works, the many issues with it, potential attacks, and future research challenges in cryptocurrencies.

III. METHODOLOGY

Pathology Lab
Pathology labs will generate forensic reports of the victim and will send them to the doctor or hospital. In the existing system reports are sent via email or hard copies are sent which can be easily altered by the doctor or any other sources. But in the proposed system we will upload the forensic report on the block blockchain network which is an immutable and distributed network. Blockchain is a very secure network that can never be hacked or altered. Also, if a node fails then we can recover the data very easily because data is stored in a distributed way.

Hospital
It is the second node of the proposed system. The hospital receives the forensic report from the pathology lab. The hospital then assigns a particular doctor who will verify the report attach with it his digital signature and then send it to the police officer for further investigation. Doctors cannot modify the report because when the pathology lab officials upload the report on the network, a 16-digit hash code is generated, which is static. If someone tries to modify the report, the hash code changes. As the hash code should be constant throughout the investigation process, whenever it gets updated, we can find out through which node it got updated and find out the culprit. The hospital node can store the report in its ledger.

Police Department
It is the third node of the proposed system. The Police department will get the input from the doctor which is a digitally signed forensic report. The police department will then assign a police officer who begins his investigation after the forensic report. As the report was generated by a pathology lab and successfully verified by a doctor, the police officer gets the details of the victim which are already verified and validated. Hence, it becomes easy for the police officer as he just must concentrate on the investigation part. If the police officer tries to modify the report the hash code again will be changed, and the police officer will be highlighted as the hash is updated from the third node.

File Upload
Users will log in to their account and upload a file or image, and those files/images are encrypted and stored on the admin side. Even uploaded users also don’t access, it before the admin can accept it. Cloud computing also presents extremely serious security issues, particularly for users' data stored within the cloud. To protect users' privacy, when legal cloud users use cloud service resources, users must authenticate the cloud server, and the cloud server must identify the login requests of users to guarantee the users are legal.

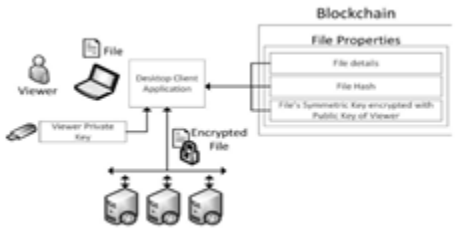
Registration Phase
•The user chooses calculates and sends them to the cloud server via a secure channel. On receiving the registration request, the server computers.
Login phase:

•The login and authentication steps are called whenever a user intends to use the server resources.
•Users insert the smartcard into the smartcard reader and keys
•tin IDi and PWi.

Final Report

It is the last node of the planned system. One administrator who is responsible for maintaining the blockchain network can glance through the genuine transaction history as well as the path of the forensic report. If the static hash code generated when the pathology lab posts the report on the network remains the same throughout the network, it will mean the report is tamper-proof and nobody attempted to alter the report. And if the hash code has been modified during the time of the network, it means the report is altered. Since the system is split into nodes, he can easily track through which node the hash code was modified and identify the perpetrator.

Architectural Diagram



User Interface Design

Feasibility Study

The project's feasibility is examined during this phase and the business proposal is presented with a very vague plan for the project and some estimated costs. During system analysis, the feasibility study of the proposed system is to be conducted. This is being done to ascertain that the proposed system is not a burden to the company. For feasibility analysis, it is necessary to have some idea of the major requirements of the system. Three major considerations involved in feasibility analysis are

- Economical Feasibility
- Technical Feasibility
- Social Feasibility

Economical Feasibility

The research is conducted to verify the economic effect that will be caused to the organization by the system. The budget with which the company can invest in the research and development of the system is restricted. The expenses must be validated. Therefore, the system developed here is well within the budget, and this has been made possible as most of the technologies utilized are available for free. Even the customized products needed to be bought.

Technical Feasibility

This research is being conducted to test the technical feasibility, i.e., the system's technical needs. Any system that is developed should not place high demands on the available technical resources. This will result in having high requirements against the accessible technical resources. This will result in there being high demands against the client. The implemented system should not need a big demand, because for this system implementation, little or null modification would be required.

Social Feasibility

The study aspect is to verify the extent of the user's acceptance of the system. This entails training the user on how to utilize the system effectively. The user should not feel threatened by the system but must accept it as a requirement. The extent of acceptance by the users depends only on how the user is taught about the system and how he is made acquainted with it. His confidence level has to be improved so that he can even provide some positive criticism,

which is welcome since he is the ultimate user of the system.

IV. CONCLUSION & FUTURE IMPROVEMENT

The application of AI and biosensors has been increasing in use within the healthcare sector for various reasons. AI-based solutions are being welcomed in the healthcare sector where inexpensive, wise, and smart methods are finding application in the areas of clinical decision support, diagnosis, prevention, tele-healthcare, healthcare policy making, and medical recommendation. More accessible machine learning technologies, including AutoML, Clinical AI, patient-centric AI, and explainable AI, are needed to enhance the confidence of healthcare stakeholders and to integrate machine learning into routine clinical practice. Integrating biosensors and imaging data, or other data modalities, can enhance the model's performance, as well as the clinicians' confidence. To conclude, this review offers researchers and practitioners in health an overview of the status of technology in this field, both technically and clinically. Different uses of AI towards diagnosis, prognosis, treatment as well as monitoring have been presented, alongside characteristics about explainability and the tools that are beneficial in clinical practice. In addition, technologies that allow for the usage and creation of biosensors for healthcare purposes have been introduced. Finally, open-minded research problems and issues concerning biosensor-based healthcare systems have been discussed where additional work is needed.

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