

BLOCKCHAIN BASED SOLUTION FOR ELECTRONIC HEALTH RECORDS: A REVIEW

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INTRODUCTION:

Technology is becoming more and more integrated into daily life, and it is slowly permeating the healthcare industry.

- ❖ EHRs are increasingly being used in many poor countries. Many governments have expressed interest in using EHRs due to the anticipated benefits.
- ❖ The US government decided in 2004 that most people will have access to EHRs by 2014. A total of \$190 million was then set aside as part of the American Recovery and Reinvestment Act of 2009 to be used for the digitalization of health. American health care records.
- ❖ The countries of the European Union sought to have a single a functioning health system by 2015.

ELECTRONIC HEALTH RECORD (EHR):

An electronic health record (EHR) is a digital representation of a patient's medical chart that is kept up to date over time by the provider and may contain all the essential administrative clinical data pertinent to that person's care under a specific provider.

Electronic health record (EHR) systems enable medical personnel to better manage patient care by integrating evidence-based medicine.

A patient's vital signs, medications, medical histories, diagnoses, surgical notes, and discharge summaries are just a few examples of the useful and important automated medical data that may be found in an EHR.

BENEFITS- ✓ Better quality of patient care ✓ Better emergency care ✓ Reduction in medical errors ✓ Increased efficiency & productivity ✓ Cost savings ✓ Large amount of data can be stored ✓ Reduced chances of losing records



BLOCKCHAIN



A blockchain is essentially a digital ledger of transactions that is duplicated and distributed across the entire network of computer systems on the blockchain.

➤ Each block in the chain contains a number of transactions, and every time a new transaction occurs on the blockchain, a record of that transaction is added to every participant's ledger.

➤ Blockchains are typically managed by a peer-to-peer network for use as a publicly distributed ledger, where nodes collectively adhere to a protocol to communicate and validate new blocks.

➤ The decentralised database managed by multiple participants is known as Distributed Ledger Technology (DLT).

➤ Blockchain was invented by a person (or group of people) using the name Satoshi Nakamoto in 2008 to serve as the public transaction ledger of the cryptocurrency bitcoin.

➤ The invention of the blockchain for bitcoin made it the 1st digital currency.

TYPES OF BLOCKCHAIN:

Public Blockchains: Public blockchains offer a completely decentralised network in which every member can view the blockchain material and participate in the consensus process.

Private Blockchains: Private blockchains are used to track data transactions between different departments or persons and are dedicated to single enterprise solutions. To join the network, each participant must first give their approval, after which they will be deemed a known member.

Consortium Blockchains: A consortium blockchain is a permissioned network that is only accessible to a small number of people. It is utilised as a distributed database that is auditable and reliably synced, keeps track of participant data exchanges.

Hybrid Blockchains: It mixes the benefits of public and private blockchains. As a result, a private blockchain operates in the background to control access to the ledger's modifications while a public blockchain is utilized to make the ledger totally accessible.

KEY FEATURES OF BLOCKCHAIN:

(a) Decentralization: With blockchain, data is dispersed throughout the network rather than being centralised. Due to shared input from the network's connected nodes, this also enables the distribution and management of information under consensus. Many reputable organisations now handle the data that was once centralised at one location.

(b) Data Transparency : To achieve data transparency in any system, relationships between entities must be based on trust. The relevant data or record needs to be protected and weatherproof. Any data saved on the blockchain is dispersed throughout the network and is not concentrated in one area or under the control of a single node.

© Security and Privacy: In order to achieve data transparency in any system, relationships between entities must be based on trust. The relevant data or record needs to be protected and weatherproof. Any data saved on the blockchain is dispersed throughout the network and is not concentrated in one area or under the control of a single node.

RATIONALE

With the evolution of technology and rising customer demand, it's more vital than ever to consider how we can use emerging technologies like blockchain to maintain transparency and use trust to improve the value offer. The goal of the research is to learn more about blockchain and how blockchain can be used to improve the security of electronic health records.

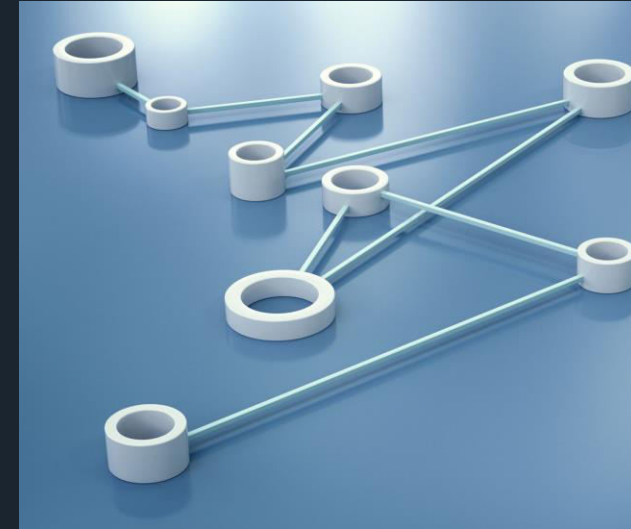


OBJECTIVES:

To know the technology of Blockchain and how does it work.

To know the market position of the Blockchain technology in healthcare

To investigate the application of Blockchain to strengthen Electronic Health Record.



METHODOLOGY

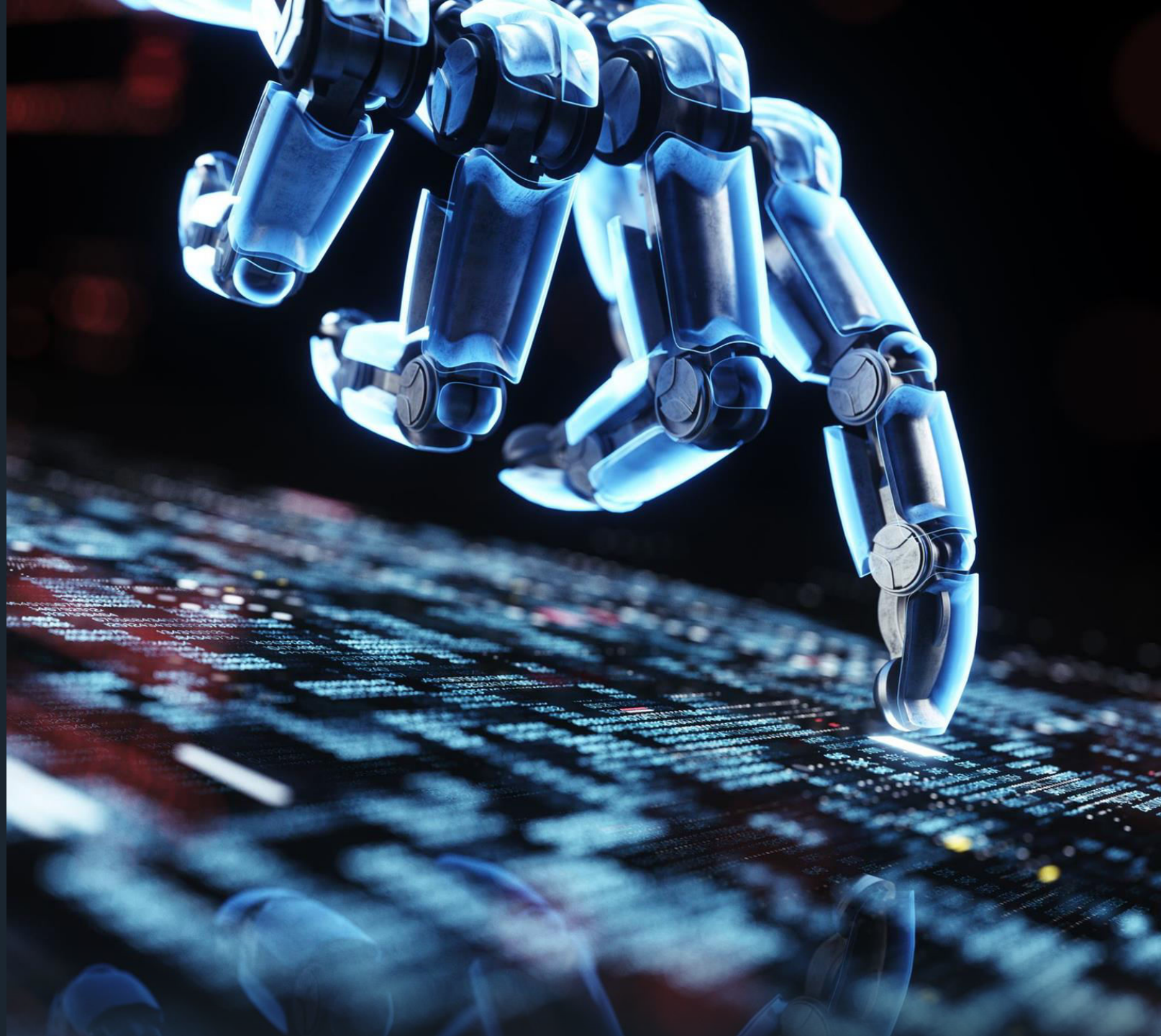
Study design- Desk Review

Type of data- Secondary Data **Study tools-** Research papers, blogs, surveys, analyst reports on relevant blockchain topics, ResearchGate, google scholar, pubmed etc. Information was searched across internet, journals, thought leadership papers, blogs, news articles and published studies to collect the material inclusion criteria.

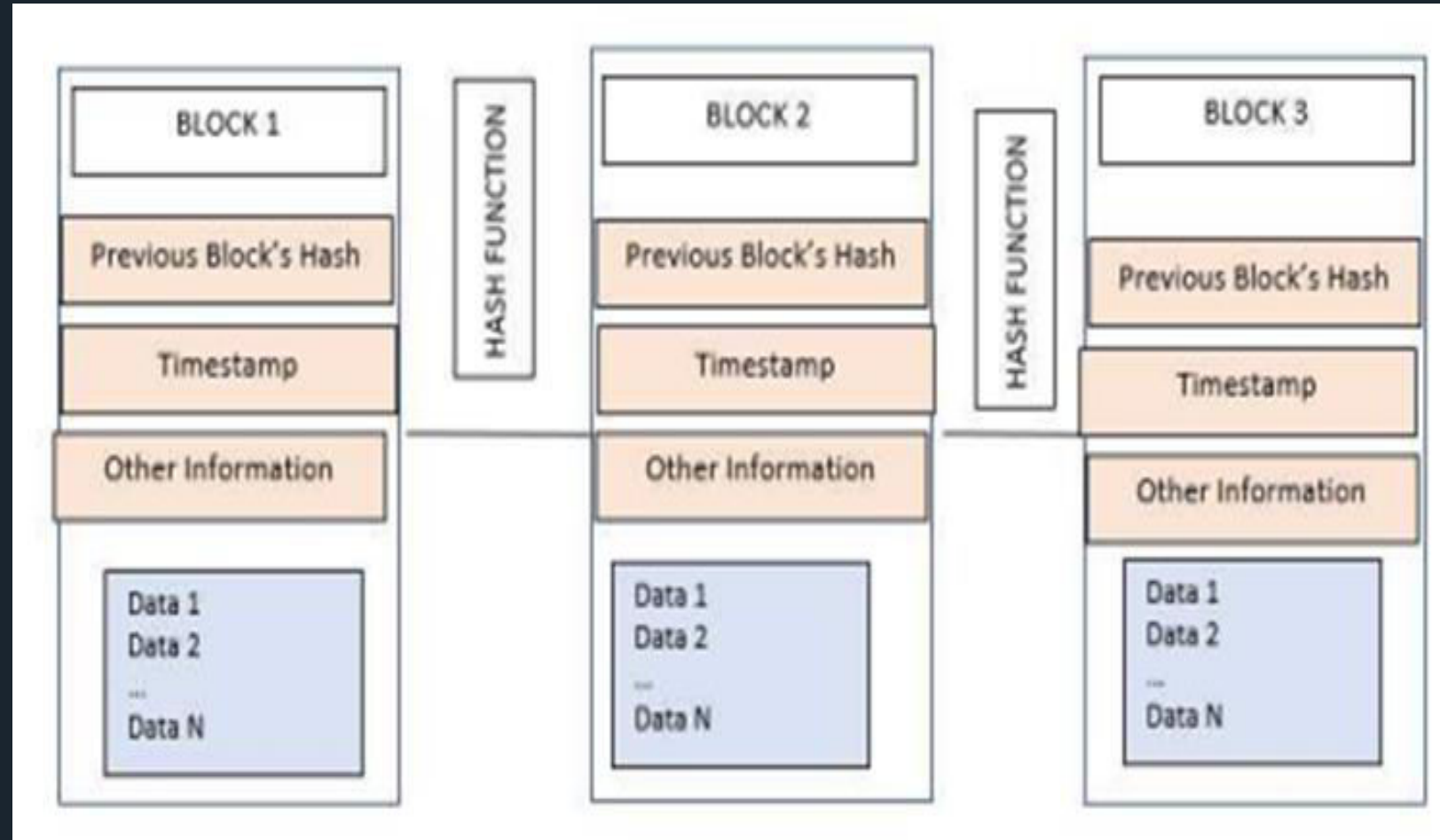
DURATION OF STUDY- 3 months

DISCUSSION

The blockchain technology has grown in popularity. Many industry experts believe it will be a game changer, and it has even been dubbed the "internet of value. The creation of blockchain technology may be likened to the world-changing inventions of the wheel, engine, and internet. It is even predicted to rule the next decade.



STRUCTURE AND WORKING



- A new block is created after every transaction that contains all the relevant information of this transaction. The block is then sent to each node which verifies the block. Once the verification is done the block gets added to the blockchain. The verification and validation of blocks by these participating nodes is called consensus. If a specific node tampers with the block, other nodes will reject it thus making it tamper proof in nature.
- The first block in the blockchain is called the genesis block- it is the block from where the chain originates. Each block has 3 elements- 1) Data and transaction
2) Hash 3) Hash of the previous block.
- All the information related to the transaction and other information like timestamp, sender information, receiver information etc. is stored in the first element. Each block also includes a hash - a unique identifier for the block and all its contents. As soon as a block is created, the hash of the blockchain gets generated simultaneously. Tampering with a block changes its hash. If hash of the block changes it indicates that the block has been tampered with and is no longer the same block

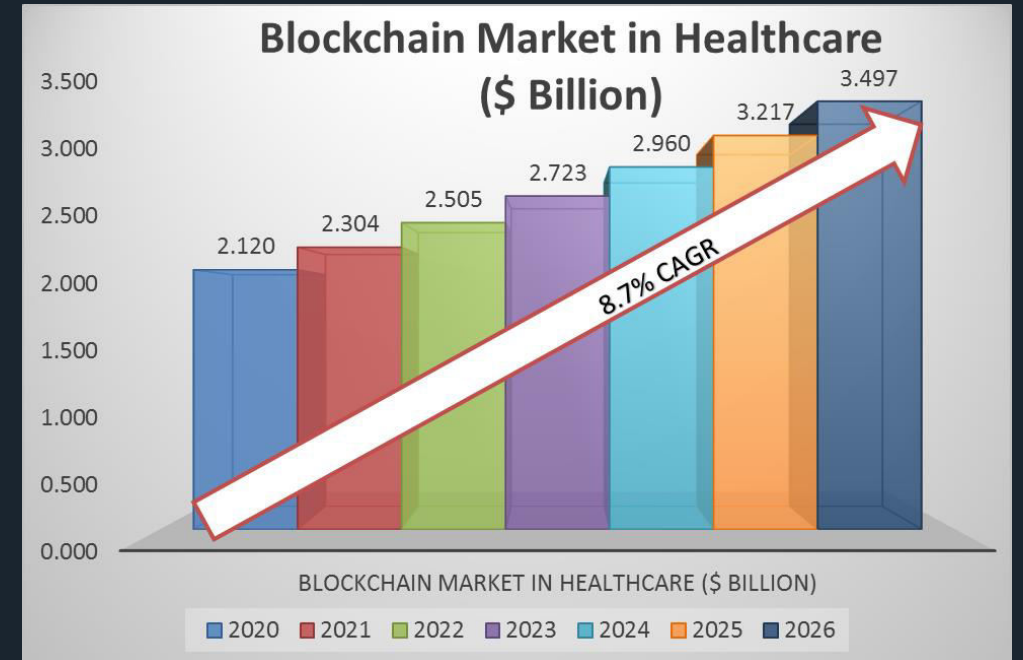


- Every block also has the hash of the previous block. This piece of information is what links one block to another and makes the whole network safe and secure. This unique property of the blockchain makes it transparent and secure because in any case of data tampering the whole network gets to know which block got compromised in the blockchain.
- Smart contracts are a relatively new addition to the blockchain. Smart contracts are entirely digital contracts that are kept on the blockchain. They are made up of software code and are performed by the blockchain network. Once decided, these smart contracts cannot be changed or updated
- This saves contract negotiating guidelines, automatically checks the contract, and then executes the negotiated terms. They do not necessitate any manual involvement in order to execute and implement contracts. The use of blockchain in conjunction with smart contracts eliminates the need for reliance on third parties.



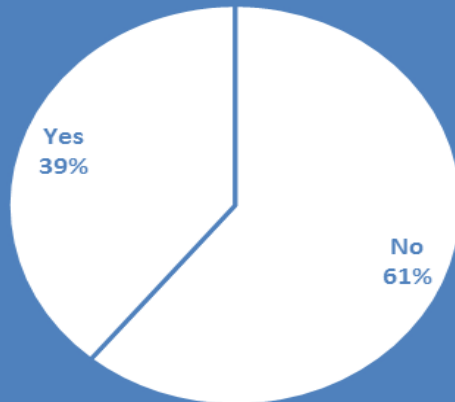
MARKET SIZE OF BLOCKCHAIN IN HEALTHACRE

According to the report of Mordor intelligence, blockchain market of healthcare had value of USD 2.12 billion in 2020 in expectation to reach to USD 3.49 billion by 2026, with CAGR of 8.7% during the forecast period, 2021-26. According to GLOBE NEWSWIRE's global blockchain analysis, the global Blockchain in Healthcare market's expectation is to grow at a CAGR of 36.2 percent from USD 354.9 million in 2020 to USD 3126.8 million in 2027, up from USD 354.9 million in 2020.



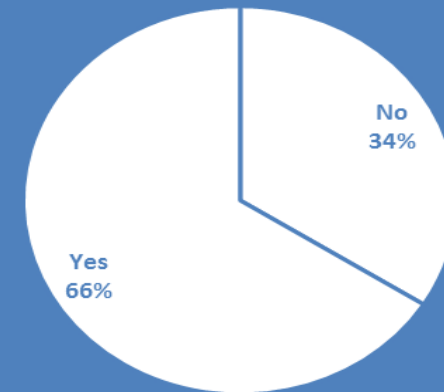
STATISTICS ON SECURITY, PRIVACY OF ELECTRONIC HEALTH RECORDS

PERCENTAGE OF CLIENTS WHO THINK THEIR DATA IS SECURE



According to the article by K.T. Win, only 39% of clients believed their healthcare information was safe and secure and rest 61 % were dicey about it.

PERCENTAGE OF CLIENTS PAYING ATTENTION TO THEIR DATA PRIVACY



According to the article by K.T. Win, 66% of clients showed concerned about the privacy of their personal health records, and only 39% believed their information was safe and secure

APPLICATION OF BLOCKCHAIN IN STRENGTHNING EHR:

DATA SECURITY AND IMMUTABILITY:

The major sources of security concerns were inappropriate employee usage or insider employee misbehavior as well as physical theft of data storage equipment like hardware and computers .The potential threat categories can be categorized as – administrative, technical, physical, insider use and portable devices. Healthcare businesses are no strangers to threats and breaches. Due to a lack of follow-up, cyber-attacks have become more targeted and vulnerable. Blockchain technology is capable of handling everything and ensuring that data is not tampered with in any manner because it is encrypted by nature, it is possible to do adequate validation.



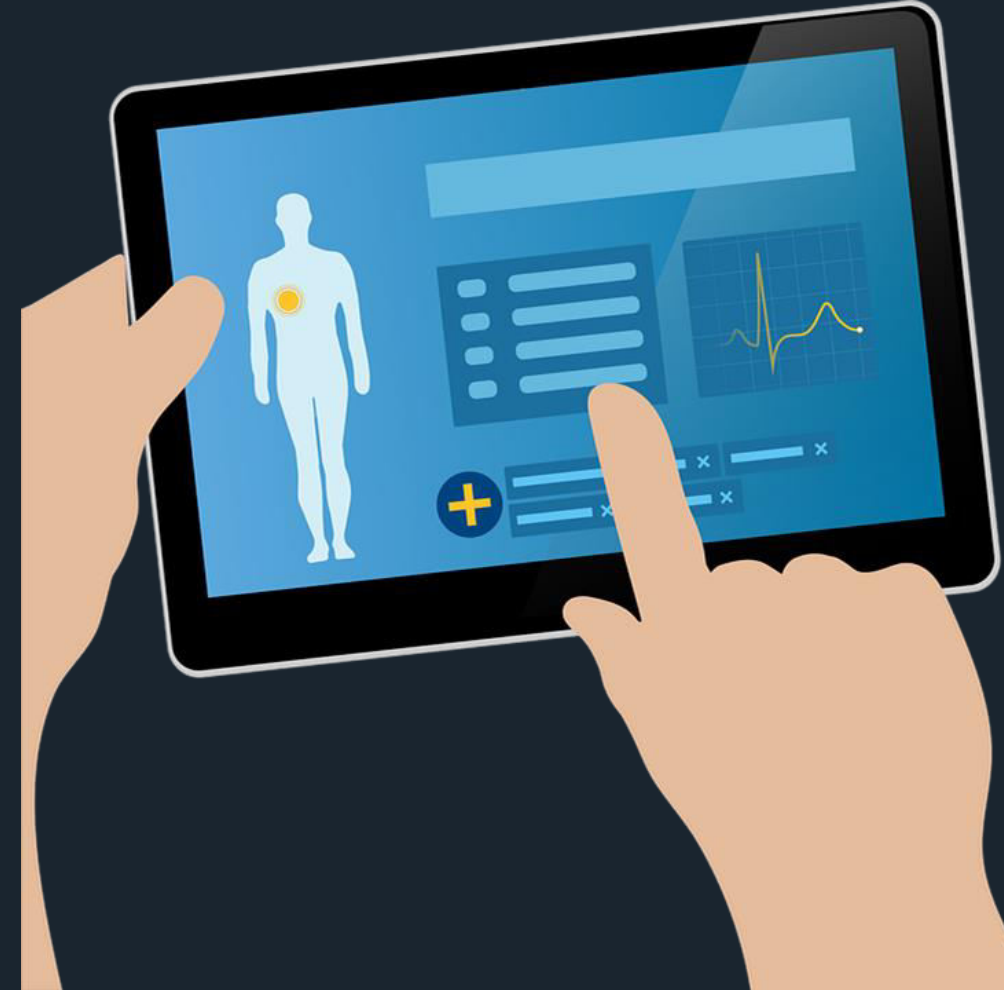
PRIVACY

Privacy is the right of an individual to avoid personal information from being disclosed to others; the claim of people to be free of surveillance or intrusion by other individuals, organisations, or the government. Health care organisations, insurance companies, and others will require access to the data if EHRs are to function properly. Every patient will have a unique identity on the blockchain network, and his clinical data will be linked to this identity as an EHR digital asset at various phases. Combining blockchain technology with an access control mechanism looks to be a feasible option for building a secure system.



INTEROPERABILITY

The potential to share the information is referred to as interoperability. To be genuinely interoperable, two EHR systems must be able to share and then use data. It's challenging to create a common interoperability format for transferring data because of these variances. Sometimes because EHR systems are frequently heavily tailored to an organization's particular workflow and preferences, they are not compatible when developed on the same platform. Blockchain can provide a truly interoperable network.



CONCLUSION

- Blockchain is decentralized, distributed ledger, and immutable since it uses distributed ledger technology to operate. Even though EMRs have several benefits, identifying and successfully addressing or avoiding their risks is essential for the future of healthcare.
- One of the obstacles that can be overcome with the use of blockchain is privacy. Other challenges include interoperability, data security, and immutability.
- Smart contracts and blockchain work together to secure the confidentiality and privacy of patient data. Once implemented, the blockchain-based electronic health records will act as a unified and integrated backbone for the healthcare system industry.



SUGGESTIONS:

- There is the need of organizations being future-ready to provide a transformational consumer experience. Regular cyber threat attacks on EHRs and the rising importance of customer satisfaction in terms of privacy and interoperability issues are some of the challenges which are there in EHRs.
- In the healthcare sector, blockchain technology will be a step forward in terms of empowering end users. While integrating such technology may appear inconvenient and pricey at first, it is in the long term in the best interests of public health. With the broad adoption of blockchain technology, the real value in business will come from working together on a single platform to enable genuine interoperability possibilities that have never existed before. The healthcare business is on the verge of advancement thanks to blockchain technology.

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