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THE IMPACT OF BLOCKCHAIN TECHNOLOGY ON DATA SECURITY

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Abstract - Blockchain is a decentralised transaction and data management technology. Blockchain is due to its central characteristics, which provide security, anonymity, and data integrity without any third-party organisation in control of the transactions, and thus it creates interesting research areas, particularly in terms of technical challenges and limitations. We conducted a thorough mapping analysis in this study with the purpose of collecting all relevant studies on Blockchain technology. Our goal is to comprehend the current research subjects, difficulties, and future directions of Blockchain technology from a technical standpoint. **In addition, the impact of blockchain technology on data security has been thoroughly examined in this research**. This research goal is to give a conceptual grasp of how blockchain technology can be applied to improve and innovate business operations. The theoretical and practical application of solutions utilising blockchain technology are both covered in the course along with the technological foundations of blockchain operations.

***Key Words*:** Distributed Ledger Technology (DLT), Immutable records, Smart contracts, Cryptocurrency, Supply Chain Management.

1.INTRODUCTION

A powerful database system called blockchain technology enables transparent information sharing inside a company network. Data is kept in blocks that are connected together in a chain and stored in a blockchain database. Due to the inability to delete or amend the chain without network consensus, the data remains chronologically consistent. In order to manage orders, payments, accounts, and other transactions, you can utilise blockchain technology to establish an unchangeable or immutable ledger. Blockchain can be loosely translated as several cryptographically chained blocks[1]. A common picture of these transactions is made consistent by the system's built-in features, which also stop illegitimate transaction submissions. Blockchain is a distributed, immutable ledger that makes it easier to record transactions and track assets in a corporate network. A tangible asset (a house, car, cash, or land) can be intangible (intellectual property, patents, copyrights, branding). A blockchain network can track and sell almost anything of value, lowering risk and costs for everyone involved.

Traditional database technologies present several challenges for recording financial transactions. For instance, consider the sale of a property. Once the money is exchanged, ownership of the property is transferred to the buyer. Individually, both the buyer and the seller can record the monetary transactions, but neither source can be trusted. The seller can easily claim they have not received the money even though they have, and the buyer can equally argue that they have paid the money even if they haven't.

To avoid potential legal issues, a trusted third party has to supervise and validate transactions. The presence of this central authority not only complicates the transaction but also creates a single point of vulnerability. If the central database was compromised, both parties could suffer.

Blockchain mitigates such issues by creating a decentralized, tamper-proof system to record transactions. In the property transaction scenario, blockchain creates one ledger each for the buyer and the seller. All transactions must be approved by both parties and are automatically updated in both of their ledgers in real time. Any corruption in historical transactions will corrupt the entire ledger. These properties of blockchain technology have led to its use in various sectors, including the creation of digital currency like Bitcoin.

2. Body of Paper

The structure of a Blockchain:

As a formal definition, blockchain is a distributed ledger to share transactions or sensitive data across untrusted multiple stockholders in a decentralized network[2]. A block is made up of a header and a body, with the header containing the Merkle root, the Nonce, the timestamp, and the hash of the preceding block. The Merkle root, which is kept in the block body, is the root hash of a Merkle tree. To demonstrate the structure of a Merkle tree, we represent a transaction as TX and use the 3-th block, which only has four transactions, as an example.

A blockchain is logically defined as a network of blocks that are linked together and carry specific information (database) in a secure and real manner (peer-to-peer). In other words, blockchain is a collection of interconnected computers rather than a single, centralised server, making the entire network decentralised.

The blockchain idea might be likened to work completed using Google Docs to further simplify it. You might remember the times when participants would pass around doc. documents and wait for others to make the necessary adjustments. Working on

the same document at the same time is now possible thanks to Google Docs.

Instead of being copied, digital information may now be spread thanks to the blockchain technology. Data security, trust, and transparency are all provided by this distributed ledger.

The banking sector is making extensive use of the blockchain architecture. Today, however, this technology aids in the creation of software development solutions for smart contracts, digital notaries, and cryptocurrency record keeping.

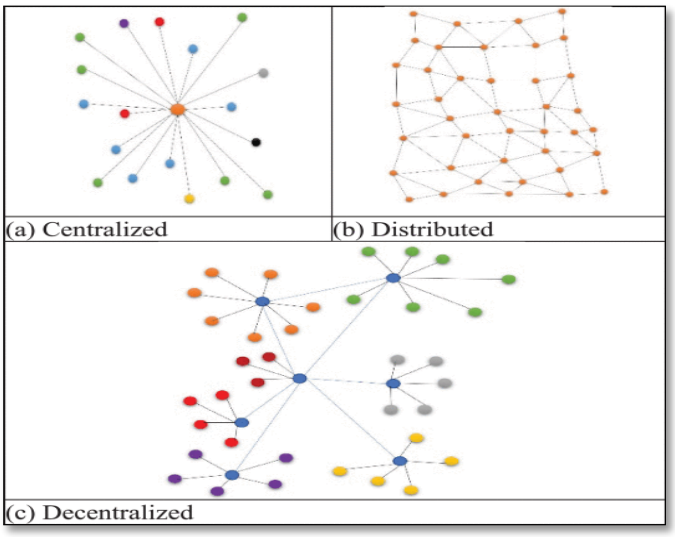

Figure 1. Centralized, Decentralized, and Distributed Ledger

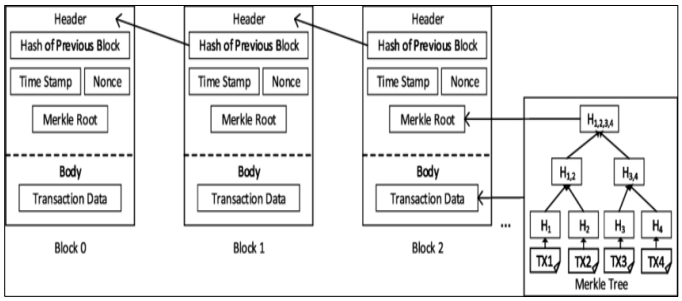

Figure 2. Blockchain Architectur[3]

How does blockchain work:

which is in a chronological order, and each block includes something from the previous block. This is where the name of this technology comes from, they are linked like a chain[4]. While underlying blockchain mechanisms are complex, we give a brief overview in the following steps. Blockchain software can automate most of these steps:

Step 1 – Record the transaction

A blockchain transaction shows the movement of physical or digital assets from one party to another in the blockchain network. It is recorded as a data block and can include details like these:

- Who was involved in the transaction?
- What happened during the transaction?
- When did the transaction occur?
- Where did the transaction occur?
- Why did the transaction occur?
- How much of the asset was exchanged?
- How many pre-conditions were met during the transaction?

Step 2 – Gain consensus

Most participants on the distributed blockchain network must agree that the recorded transaction is valid. Depending on the type of network, rules of agreement can vary but are typically established at the start of the network.

Step 3 – Link the blocks

Once the participants have reached a consensus, transactions on the blockchain are written into blocks equivalent to the pages of a ledger book. Along with the transactions, a cryptographic hash is also appended to the new block. The hash acts as a chain that links the blocks together. If the contents of the block are intentionally or unintentionally modified, the hash value changes, providing a way to detect data tampering.

Thus, the blocks and chains link securely, and you cannot edit them. Each additional block strengthens the verification of the previous block and therefore the entire blockchain. This is like stacking wooden blocks to make a tower. You can only stack blocks on top, and if you remove a block from the middle of the tower, the whole tower breaks.

Step 4 – Share the ledger

The system distributes the latest copy of the central ledger to all participants. Every new block reinforces the prior block's verification, and by extension, the blockchain as a whole. This gives the blockchain its crucial strength of immutability and makes it tamper-evident. By doing this, you and other network users may create a trusted ledger of transactions and eliminate the chance of tampering by malevolent actors.

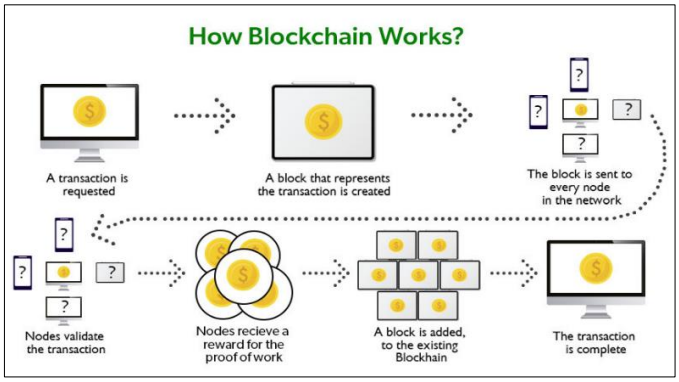

Figure 3. How Blockchain Working[5]

Benefits of Blockchain

- **Greater trust:**

With blockchain, as a member of a members-only network, you can rest assured that you are receiving accurate and timely data, and that your confidential blockchain records will be shared only with network members to whom you have specifically granted access.

- **Greater security:**

Consensus on data accuracy is required from all network members, and all validated transactions are immutable because they are recorded permanently. No one, not even a system administrator, can delete a transaction.

- **More efficiencies:**

With a distributed ledger that is shared among members of a network, time-wasting record reconciliations are eliminated. And to speed transactions, a set of rules — called a smart contract — can be stored on the blockchain and executed automatically.

Blockchain security:

When building an enterprise blockchain application, it's important to have a comprehensive security strategy that uses cybersecurity frameworks, assurance services and best practices to reduce risks against attacks and fraud. In most blockchains or distributed ledger technologies (DLT), the data is structured into blocks and each block contains a transaction or bundle of transactions. Each new block connects to all the blocks before it in a cryptographic chain in such a way that it's nearly impossible to tamper with. Currently, Blockchain is one of the most secure data protection technologies. The rapid advancements in digital technology have also introduced new challenges around data security. Organizations need to secure their data by implementing strong authentication and cryptography key vaulting mechanisms. Blockchain systems are effective in preventing bad mouthing and whitewashing attack, but they are limited in detecting ballot-stuffing under Sybil attack, constant attacks and camouflage attack[6].

Blockchain technology is functioning enough to address the challenge of how to secure the data and prevent malicious cyber-attacks. Reports say the global blockchain technology market is likely to be around $20 billion by 2024. Blockchain has been revolutionary, is used in many industries like healthcare, finance, sports and more. Unlike the traditional approaches, this technology mainly motivates many Blockchain development companies to re-architects and reformulates the security concerns. Blockchain offers a true sense of bringing trust factors in the data.

Impact:

1. This method eliminated the flaws in data security:

The high level of security offered by a distributed ledger system offers benefits to establishing a secure data network. Business offering services in consumer products and services adopt blockchain technology to secure record consumer's data. As Blockchain is one of the major technological breakthroughs of this century, it is allowing to remain competitive without requiring the trust of anyone third party. The technology is evolving new opportunities to disrupt business services and solutions for consumers. In the future, this technology will emerge with evolving global services in various sectors as the front-runner.

2. Provides encryption and validation:

Blockchain technology is proficient enough to manage everything so that data has not been altered in any way. Blockchain is encrypted by nature that makes it possible to provide proper validation. Smart contracts can be used with Blockchains to ensure that certain validation happens when certain conditions are met every time. If in any case, someone does change a data, all the ledgers on all the nodes in the network verify that change is done.

3. Provide safe data storage:

Blockchain is the best way to secure the data of the shared community. Utilizing the capabilities of the blockchain nobody can read or interfere with any sensitive stored data. It is helpful to handle the data that is distributed across a network of people. Moreover, the technology could also be useful in public services to keep public records decentralized and safe. Apart from that business model can save a cryptographic signature of a data or huge form of data on a Blockchain. This would allow users to remain to ensure that the data is safe. Blockchain is used in distributed storage software where huge data is broken down into chunks. This is available in encrypted data across a network in a way that means all data is secure.

4. Unfeasible to Attack:

Talking about blockchain it is unfeasibly hard to hack or attack. Blockchain is decentralized, encrypted, and cross-checked which allows the data to remain strongly backed. As blockchain is fully loaded with nodes and to hack most of the nodes concurrently it is impossible. Being one of distributed ledger technology it's most fundamental attributes are data immutable. It offers a whole new level of succeeding security where any action or transaction cannot be altered or counterfeit. This technology valid every transaction to get the confirmation by multiple nodes on the network.

5. Easy money transfers:

Online money transfers are now possible as a result of digitalization and the relocation of the majority of activities online. This is supported by many platforms and applications

and is simple to use. End-to-end and overall secure payments are made. Your registered cell phone number receives OTPs. That is time-consuming and more expensive. It is now simpler, more affordable, and quicker thanks to blockchain technology. It doesn't take long to move money from one account to another.

6. Safer and smoother financial exchanges:

The exchange of cryptocurrencies is a common activity today. Exchanges for cryptocurrencies have proliferated as the technology has grown in acceptance and popularity. Numerous platforms that support the decentralised bitcoin trade have been introduced. You have more control over your cryptocurrencies and other relevant matters thanks to it. The transactions are quite quick and cost less than the other options you have. Giving you the majority of the control over your money, you can conduct financial transactions with ease and comfort. Additionally, it helps you handle your financial transactions more effectively while saving you time.

7. Providing transparency in insurance

Blockchain technology provides a platform for insurance companies and clients to engage and transact in a secure manner. Smart contracts are widely used, which makes the job very organised and manageable. All consumer claims are documented and stored with supporting documentation. It prohibits customers from filing duplicate claims for the same incident. Additionally, client claims are handled and investigated more quickly than ever. They quickly and carefully transfer the necessary funds to his account while maintaining the highest level of security.

8. To make real estate transactions easier:

Blockchain technology facilitates greater access to financial data and ownership in real estate transactions. Before, transferring and establishing ownership involved a lot of paperwork and other processes. Giving you a more convenient and safe way to transfer ownership can help you complete the transactions quickly and without any problem. In these transactions, blockchains enable the reduction of paperwork and other formalities.

9. To make voting hassle-free:

Voting can also be done on blockchains. You can cast your vote with ease if your personal identity information is available on a blockchain. The administration may rest easy knowing that each voter only receives one vote, and that vote will be counted. It improves accessibility and organisation for the officials in charge of counting the votes.

The objective of the Study:

This study's main goal is to examine how blockchain technology will affect data security and storage in the future. Additionally, the goal of this study is to determine whether or not this technology is effective in halting the rise of cybercrime. One of the key motivations for conducting this research is to determine how dependent we will be on technology in the future. Blockchain aims to make it possible to share and record digital information without editing it. A blockchain serves as the basis for immutable ledgers, or records of transactions that cannot be changed, removed, or destroyed. This research goal is to give conceptual grasp of how blockchain technology can be applied to improve and innovate business operations. The theoretical and practical application of solutions utilising blockchain technology are both covered in the course along with the technological foundations of blockchain operations.

Research Methodology:

The design of this study is theorical. No data and survey have been used in this research. In this study, looking at the current scenario only, what will be the impact of blockchain technology on data security and how this technology will affect data security in the coming time, this analysis has been done. Blockchain technology works by creating an environment that is secure and transparent for the financial transactions of virtual values such as Bitcoin. Hash codes of each block keep records safe in the blockchain. This is mainly because irrespective of the size of the information or document, the mathematical hash function provides a hash code of the same length for each block. So, attempting to change a block of information would generate a completely new hash value.

Findings:

This is advantageous for private (permissioned) blockchains exclusively as users can register their identity on the blockchain network only once and the registered identity attributes will be hashed and stored in the entire blockchain node[7]. With a wide variety of applications, the blockchain used to establish secure networks. For secure data exchanges, blockchain development services securely are the best to challenge the traditional approaches. Adoption of Blockchain technology can improve the relationship between technology and users' privacy. Blockchain technology's digital landscape is a package of security and transparency. Blockchain brings techniques to tackle data management issues, mainly related to security, privacy, and verification. An examination of how Blockchain can provide security in current IT user environments will be based on the key conclusions from the research findings and suggestions from the papers that have been examined. Besides, a gap in the research discussing the practical immutability functions in the electronic health records was found as the data written in the blockchain cannot be removed[8].

3. CONCLUSIONS

After conducting this research and carefully examining how blockchain technology functions, we have drawn the conclusion that in the future, this technology will advance data security to a new level, increasing people's reliance on the internet. Despite its delayed adoption, blockchain technology will soon be widely employed. Every transaction is recorded permanently and immutably thanks to blockchain technology. It is impossible to commit fraud, hack, steal data, or lose

information using this unbreakable digital record. This research has tried to demonstrate that blockchain technology's many concepts and features might be broadly extensible to a wide variety of situations. These features apply not just to the immediate context of currency and payments, or to contracts, property, and all financial markets transaction, but beyond to segments as diverse as government, health, science, literacy, publishing, economic development, art, and culture, and possibly even more broadly to enable orders-of-magnitude larger-scale human progress. In a society that contains both centralised and decentralised models in the future, blockchain technology might be highly complementary. The blockchain is a concept that, like any new technology, first causes disruption but, over time, may encourage the growth of a bigger ecosystem that combines the traditional way of doing things and the new invention. Blockchain technology may thus eventually be a part of a bigger ecosystem that uses both centralised and decentralised approaches. The rising data problem can be solved by incorporating blockchain technology with object storage solutions (like ECS). Any tech-savvy firm would find it too expensive to manage and deploy infrastructure in order to gather and extract value from the data. Although alternatives like blockchain-based storage solutions and public clouds sound alluring at such a low price, they are still very much in their infancy.

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REFERENCES

1. Swan, Melanie. Blockchain: Blueprint for a new economy. " O'Reilly Media, Inc.", 2015.
2. Ahmed Afif Monrat, Olov Schelén, Karl Andersson A survey of blockchain from the perspectives of applications, challenges, and opportunities IEEE Access, 7 (2019), pp. 117134-117151
3. R. Nair Greeshma, Sebastian Shoney, "BlockChain Technology Centralised Ledger to Distributed Ledger", Volume: 04 Issue: 03 | Mar -2017.
4. Yuanfeng Cai and Dan Zhu. Fraud detections for online businesses: a perspective from blockchain technology. Financial Innovation, 2(1):20, 2016.
5. "Know More About Blockchain: Overview, Technology, Application Areas and Use Cases" Lets Talk Payments, http://letstalkpayments.com/an-overview-ofblockchain-techno.
6. M. Crosby, P. Pattanayak, S. Verma and V. Kalyanaraman, "Blockchain technology: Beyond bitcoin", Appl. Innov., vol. 2, no. 6, pp. 71, 2016.
7. Pouyan Esmaeilzadeh, Tala Mirzaei The potential of blockchain technology for health information exchange: experimental study from patients' perspectives." J. Med. Internet Res., 21.6 (2019), Article e14184
8. H.M. Hussien, et al. A systematic review for enabling of develop a blockchain technology in healthcare application: taxonomy, substantially analysis, motivations, challenges, recommendations and future direction." J. Med. Syst., 43.10 (2019), p. 320

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