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A STUDY ON THE CONCEPT, APPLICATION AND FUTURE SCOPE OF BLOCKCHAIN TECHNOLOGY

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Abstract: Blockchain technology is relatively a new area of research. Due to the fact that all transactions are carried out in a decentralised manner without the assistance of a third party, this technology has raised expectations. The lack of information and comprehension of blockchain technology prevents academic study and real-world use. This study is anticipated to add to the body of knowledge already available on blockchain technology. The objectives of this paper are to study the concept of blockchain technology; to identify major areas of application for which blockchain offers a valuable solution and to identify future scope of blockchain technology. Literature review approach was adopted in this paper in order to attain the objectives. This research finds that special features of blockchain technology such as privacy, security, anonymity, decentralization and transparency, make it unique to users in different areas. The paper also observes that blockchain technology is being used in very limited areas. It is expected to evolve in functionality and bring revolution in many industries in terms of time, efficiency and accuracy.

Keywords: *Blockchain Technology, Disruptive, Distributed Database, Cryptocurrency, Transparency*.

I.INTRODUCTION:

Every time new technologies are developed, the way people work and how society functions are both drastically altered. Blockchain offers a similar shocking upheaval to business and society as steam did for the industrialization of economies, which encouraged the displacement of significant portions of the working population and laid the groundwork for a seeming inevitable environmental degradation. Blockchain is a decentralised, digital public ledger that aims to record each data transaction that takes place within its network. The consensus of a majority of the network's users verifies each transaction in the distributed ledger. Information cannot be deleted once it has been entered. Every transaction ever made is contained in a particular, verifiable record on the blockchain. In other words, blockchain offers a secure, trustworthy, and unchangeable platform for numerous entities (including persons and organisations) to communicate, exchange data and assets, and conduct transactions. This guarantees a digital form of verification, avoids fraud, and permits "tustless" peer-to-peer transactions. It has been claimed that this technology will "change market paradigms," be able to "reverse the fortunes of the post-crisis financial sector," and be the one that will "most likely change the next decade of business" in all sectors of the economy. Bitcoin and other cryptocurrencies like Ethereum and Ripple are connected to lock chains. The fact that blockchains can exist without any cryptocurrencies should be emphasised. Blockchains are a by-product of cryptocurrencies. In the twenty-first century, this disruptive technology will have a tremendous impact on how governments, institutions, businesses, schools, and our daily lives are run.

II.Literature Review

Biryukov et al. (2014). Furthermore, privacy leakage in Blockchain can happen even when users only use their public and private keys to complete transactions. Even the user's actual IP address can be tracked. Furthermore, there are serious shortcomings in the current consensus methods like proof of work (PoW) and proof of stake (PoS). PoW, for instance, wastes a lot of electricity, and the PoS consensus procedure may exhibit the phenomena of the rich getting richer. The blockchain technology development process must address these problems.

Eyal & Sirer (2014). Blockchain technology is plagued by technical issues even though it holds immense promise for future internet applications. Scalability is a huge difficulty to begin with. A new block is mined every 10 minutes, and the maximum size of a Bitcoin block is presently 1 MB. As a result, the maximum transaction rate on the Bitcoin network is 7 per second, making it unsuitable for high-frequency trading. Larger blocks, on the other hand, require more storage space and travel through the network more slowly. The desire to maintain such a huge blockchain will inevitably result in centralization. As a result, it is now challenging to strike a balance between block size and security. Second, it has been shown that selfish mining techniques can allow miners to take home more money than they should. In an effort to increase their chances of earning more money later, miners hide their mined blocks. Consequently, branches could frequently happen, preventing blockchain expansion. Therefore, some solutions to this issue must be put out.

Peters et al. (2015); Foroglou & Tsilidou (2015). Blockchain technology enables decentralised transaction processing. Blockchain therefore has the potential to greatly boost efficiency while simultaneously lowering expenses. Although the most well-known blockchain application is Bitcoin, there are many other uses for the technology than cryptocurrency. For instance, because technology enables payments to be made without a bank or other middleman, Blockchain may be used in a variety of financial services such digital assets, repatriation, and online payment. Furthermore, blockchain technology is emerging as

one of the most promising technologies for the next generation of internet interaction systems, such as smart contracts (Kosba et al. 2016), public services (Akins et al. 2013), internet of things (IoT) (Zhang & Wen 2015), reputation systems (Sharples & Domingue 2015), and security services (Sharples & Domingue 2015; Noyes 2016).

Coindesk (2016). Industry and academia have recently paid close attention to cryptocurrency. The first cryptocurrency, sometimes referred to as Bitcoin, achieved a 10-billion-dollar capital market in 2016. The Blockchain is the main working principle of Bitcoin. In 2008, the concept of Blockchain was developed, and in 2009, it was realized (Nakamoto 2008). Blockchain, which is sometimes referred to as a public ledger, maintains a chain of blocks in which all committed transactions are recorded. The chain grows as additional blocks are placed to it. Fundamental characteristics of blockchain technology include decentralisation, persistency, anonymity, and auditability. Due to the integration of multiple crucial technologies, such as cryptographic hashes, digital signatures (based on asymmetric cryptography), and distributed consensus processes, blockchain may function in a decentralised environment.

Lin et al. (2018); Viriyasitavat et al. (2018). Blockchain is a decentralised, distributed directory that supports smart contracts and enables commercial activities such as payment applications, record management, supply chain automation, traceability, and record keeping. Blockchain is a network of business partners that replicates data in a nearly real-time manner.

Ashima et al. (2021). Technology professionals use the Blockchain, a permanent distributed directory, to keep track of all value exchanges. The company owns the entirety of the Blockchain, excluding the nodes that set it apart from traditional data storage systems. Numerous devices having access to the ledger would be present at each node in the transaction. The transaction ecosystem can become trusted and confident as decentralisation and network-wide autonomy are made possible. Participants first go over each Blockchain-related transaction. A relatively new database that contains decentralised and transparent transaction data is called blockchain technology, also referred to as distributed ledger technology. Since the database is run by a network of computers known as nodes and information can be accessed in real-time, there is no single point of failure. The idea that blockchain technology will have an impact on the market is exactly in line with the sector. It gives customers the option to secretly keep their one-of-a-kind, immutable identification documents, preventing anyone from reading or seeing them.

III.Objectives

1. To study the concept of blockchain technology;
2. To identify major areas of application for which blockchain offers a valuable solution;
3. To identify future scope of blockchain technology.

Concept of Blockchain Technology

Satoshi Nakamoto (2008) first described blockchain in a white paper in 2008, the digital currency bitcoin has been most frequently linked to it. Blockchain was simply defined by Satoshi Nakamoto. Blockchain, according to him, is a chain made up of numerous information-containing blocks. Blockchain is a decentralised electronic database (decentralised ledger) made up of blocks that are used to create an ever-growing list of entries. Each block usually has transactional information, a timestamp, and a hash reference that points to the block before it. As a result, a chain is created by connecting blocks, each of which contains the hash value of the one before it. According to Davidson et al. (2016), blockchain is a catallaxy because it implements secured mechanisms utilising cryptography and is therefore a reliable, safe, and transparent ledger. Blockchain, according to Crosby et al. (2016), is a distributed online database that records every digital event that took place between participating nodes in a network. He gave a general introduction of blockchain technology and discussed various problems that blockchain can answer as well as certain restrictions that need to be addressed in future research. Blockchain was described as a crypto economically secure magic computer by Buterin (2015) that comprises self-executing programmes and records of all previous and present states. Blockchain technology was referred to as the foundation of every digital transaction by Carlozo (2017). Additionally, he claimed that blockchain would present more innovative company strategies.

Blockchain functions through a standardised process. A transaction request from any user (node) in a peer-to-peer (P2P) network initiates the process. The transaction is then published to every network user. The P2P network's nodes then validate the transactions using the hashes as part of the verification process. The transaction data are kept in a new block when the verification is finished. The new block is then permanently and irrevocably joined to the blockchain using the hashed value of the data from the preceding block. Every blockchain has a first block known as the Genesis block that serves as the chain's cornerstone. Each freshly formed block is then linked to the blocks that came before it in the chain, connecting each block ultimately to the genesis block. Each block also contains a cryptographic hash in addition to the data it contains. Every block in the chain contains the preceding hash as well as its own. Each block and its contents are individually identified by the hash, which functions much like a fingerprint. Therefore, any modification to the block's content will cause the associated hash to change (Beck, 2018). Since they serve as the primary assurance for blockchain security, hashes are essential to the operation of the blockchain. This technique makes the blockchain technology one of the most secure options in the industry nowadays (Karame & Capkun, 2018). When information within a block is altered, the block's hash will change, but the hash of the following block won't. As a result, all of the blocks after that are marked as invalid blocks. As a result, any modification to a single blockchain block renders all

subsequent blocks in the chain invalid. (Karame and Capkun 2018).

The blockchain is secure because to the usage of hashes. However, with the use of extremely fast computers, hackers might alter the data in a single block, causing the hashes of all the succeeding blocks in the chain to be recalculated in a matter of minutes. Numerous algorithms, including the consensus algorithm, have been developed to address this problem. (Moubarak et al., 2018). Prior to the transactions being added to the blockchain, the consensus process comprises their verification. As a result, there is no longer any concern about the blocks or the data contained in them being altered as the blockchain expands. The consensus procedure occurs in specific time intervals that are predetermined. These periods describe the intervals between the start of a transaction and the moment it is added to the blockchain. The block size, transaction volumes, and chosen consensus algorithms all influence the confirmation time. Today's industry uses consensus algorithms that have variable qualities that have been established.

Applications of Blockchain Technology

Cryptocurrencies: Cryptocurrencies are first application of blockchain technology and constitute a major application area for the blockchain technology. A cryptocurrency is a medium of exchange like Taka but is digitally created and stored using encryption techniques to control the creation of monetary units and to verify transactions. Cryptocurrency is unique because it has no intrinsic value, no physical form and its supply is not determined by central bank. With the innovation of Bitcoin in January 2009 blockchain had its first real-world application. Other cryptocurrencies have been developed, after the release of bitcoin. For example, Namecoin was released in In April 2011, Litecoin in October 2011. Here, main focus is on the use of cryptocurrencies as a payment solution. Suppose that user X wants to transfer money to user Y. When this transaction happens, it is represented as a block which is transmitted to every node/user of the P2P network. Then, the users have to verify validity of the transaction. The users have to solve a puzzle in order to be the first to validate the transaction. This puzzle requires the use of certain computational power. The puzzle solving procedure is called “mining” and the first miner who will find the solution gets a bitcoin reward, so miners are competing to be the fastest to solve the puzzle.

E-government: E-government services to citizens, businesses and public bodies are expanding rapidly in recent years. The integration of blockchain into government would allow governments to simultaneously increase the number of services offered while improving the overall quality and processing times of existing services. Blockchain also helps to handle transactions involving digitization of assets (e.g. money, stocks and properties rights) and decentralized exchange (peer to peer exchange). Introducing blockchain based electronic voting systems can establish transparent voting system and secure that nobody can manipulate an election because everyone is capable to read and verify the votes. Hou (2017) analyzes a blockchain system that verifies the origin and genuineness of data during transmission in the e-government and public services, implemented in China. Using blockchain technology in public sector provides the following advantages:

- Digital ID management
- Secured document handling
- Transparent tax system
- Access to updated public information
- Greater amount of transparency and accessibility between the government and citizens

Land registration: Existing land registry system involves a lot of intermediaries which increases risk of fraud, time delay, and excessive human intervention. Blockchain technology can be applied in land registration to overcome these problems. The land information such as the physical status and related rights can be registered and publicised on blockchain where signers can sign the document and other users can verify it when needed. Any changes made on the land, such as the transfer of land or the establishment of a mortgage can be recorded and managed on blockchain. Besides, in the blockchain land registry platform, a digital, decentralized ID as a seller and buyer can be created which makes ownership transfer simple and quicker than the traditional method. Though blockchain ensures authenticity of transactions in land registration system, great care must be taken to ensure that the information being inputted on the blockchain is in fact true and accurate. Considering its benefits, some developed countries e.g., United States, Netherlands, UK, Sweden have taken steps to integrate blockchain technology into countries existing land registration system.

Power industry: Due to utilities' use of more modern technologies and power generation methods during the past few years, the power industry has been undergoing significant transformations. Because of the fluctuation in power supply and demand, as well as the various types of power grids, managing the power grids is becoming exceedingly difficult. By reducing transaction costs and operating the grid more effectively, blockchain as a technology can speed up this global energy change. (Mengelkamp et al. 2017). Utilization of blockchain technology in energy trading process can be summarised as follows:

i. Power generation: Blockchain technology provides full knowledge about the overall operation status of a power grid in a real-time perspective which helps to develop dispatching plans that would maximize profits.
ii. Power Transmission and Distribution: Blockchain system overcomes the main challenges faced in the traditional centralized systems through decentralization of the automation and control centers.
iii. Power Consumptions: Blockchain could be beneficial in this side by managing the energy trading between the prosumers and the different energy storage systems as well as the electric vehicles. According to Munsing et

al . (2017) blockchain technology helps to conduct transparent transactions in the energy market between consumers and prosumers (active consumers that both produce and consume electricity) at local energy grids consisting of renewable energy resources. This also helps to reduce the time and effort required by removing the intermediaries from the market.

Education: A block stores data on a student's grade point, research experience, talents, online learning history, individual interests, classroom learning style, past experience with small-scale academic projects, overall educational background, etc. All types of educational data can be matched on the blockchain ledger with the user's individual ID. The world's miners check, validate, and maintain the data contained in blockchain that has been linked with users' IDs. The distributed ledger on the blockchain is reliable and unchangeable. Since the information recorded in the blocks cannot be altered, the authority and dependability are both guaranteed, reducing degree fraud. In addition to managing degrees, Blockchain technology offers enormous potential for use in formative assessment, designing and implementing learning activities, and monitoring the entire learning process. The University of Nicosia is the first institution to administer student credentials obtained from MOOC platforms using blockchain technology (Sharples and Domingue 2016). Blockchain technology is being used for degree management by Sony Global Education, Holberton School, Massachusetts Institute of Technology (MIT), and University of Melbourne.

Healthcare: Blockchain technology, which is decentralised and distributed, has several uses in the healthcare industry. By frequently exchanging medical information among numerous important parties, including patients, physicians, healthcare service providers, pharmacies, insurance companies, and researchers, among others, blockchain technology contributes to improving the quality of healthcare services. The UK is using Medical Chain (2019), a blockchain architecture, to retain patient data. Blockchain technology has the potential to improve the transparency, auditability, and accountability of doctors and researchers by managing clinical trials and trial subject consent. Blockchain technology can assist the pharmaceutical sector in overcoming the rising hazards associated with unapproved and counterfeit pharmaceuticals. In addition to this, blockchain technology in healthcare can be utilised for managing the drug supply chain, storing medical histories, controlling access to healthcare data, and exchanging patient data globally in cases of foreign medical services.

Supply chain: Cost and risk are decreased throughout the supply chain thanks to blockchain. By allowing all players in the supply chain to access the same information, blockchain improves supply chain transparency. Blockchain technology in the supply chain provides product provenance identification and makes process tracking easier. The transparency, dependability, and efficiency of the entire supply chain business are significantly increased by features of blockchain, such as data accessibility and immutability (Perboliet al. 2018). Blockchain can help with product management, shipping inefficiencies, and ensuring food traceability. It can locate the origin of defective components and guarantee supply chain integrity. Everledger, a blockchain supply chain programme, creates a global diamond record and guarantees ownership of these precious stones.

Banking: Currently, financial institutions are testing blockchain-based transactions. The use of blockchain technology in banking has certain comparative benefits, including decentralised trust, improved security, lower costs, and greater effectiveness. A number of the biggest names in banking, including Goldman Sachs, J.P. Morgan, Citibank, Wells Fargo, and others, have set up their own blockchain research facilities and are working with blockchain platforms. To conduct its first international transactions, Standard Chartered Bank employs "Ripple," an enterprise-level blockchain technology (Guo & Liang, 2016). Blockchain improves the efficiency of clearing and settling financial assets after transactions by allowing banks to perform transactions that would previously take two days in only ten seconds. Additionally, by connecting nodes in a blockchain rather than using a central bank to handle payments, blockchain applications could assist banks in facilitating real-time payments and foreign exchanges (Tsai et al. 2016). Additionally, it permits continuous transaction processing. The ability to store data in blocks using a temper-proof structure allows them to increase data mobility and cut down on the time needed for KYC procedures. Additionally, it eliminates any documentation delays brought on by duplication and permits fully automated transactional operations, from payment to settlement. Blockchain data is secure, comprehensive, correct, and trustworthy.

Future Scope of Blockchain Technology

1. Cybersecurity is where blockchain technology is primarily going in the future. Despite the Blockchain ledger being open and distributed, the data is still secure and verifiable. Data is encrypted using cryptography to eliminate security flaws like unauthorised data tampering.
2. Centralised systems run the major hazards of data loss, hacking, and human error. Similar to how it is used in cybersecurity, blockchain technology can be utilised to increase the security and hacker resistance of cloud storage.
3. For establishing a dispersed network of IoT devices, companies like IBM and Samsung are utilising blockchain technology. The ADEPT concept aims to do away with the central location for managing device-to-device communication for things like software updates, error handling, monitoring energy usage, etc.
4. The difficulties of fierce competition frequently bother business owners. Publishers and promoters suffer with

digital marketing, inefficient payment systems, domain fraud, etc. because of bad players. Blockchain technology's transparency and dependability features are helpful in addressing supply chain issues. The use of blockchain technology has improved the management of advertising-related transactions.

5. Utilising blockchain technology can monitor hiring, spending, and releases at every stage of the supply chain while reducing delays and human error. Through traceability, blockchain can help ensure that products are both legal and fair trade-certified. Blockchain has the ability to reduce reputational damage and economic losses associated with illicit or grey market goods.
6. When compared to other services and payment methods, Bitcoin has a considerably higher value, which saw a significant increase in 2017. Cryptocurrency has grown to become one of the most valuable assets on the market, holding a substantial position. The demand for Bitcoin will once more rise, despite the fixed cap of 21 million units. Global governments will probably create their own digital currencies and participate in an open market as a result. The adoption of digital currency by many countries may be a good indicator of the future potential of blockchain technology.
7. The concept of blockchain can also help in managing massive volumes of data, which can be quite advantageous for government organisations. Blockchain adoption will produce a productive data management system with the ability to improve how these entities function.
8. Despite the fact that demand for these professionals is at an all-time high, there is a shortage of blockchain engineers and specialists on the job market. Long-term gains can be had by making an investment in Blockchain technology now. Now is the perfect time to start learning about blockchain technology.

IV.Conclusion

The present research on blockchain technology is increasing, still it is in infant stage. In this study, the researcher tried to provide an overview and substantiated analysis of future potential applications of blockchain techniques. It makes a little contribution to the limited literature that considers the application of blockchain in different domains. The outcome of this research will provide future researchers fundamental knowledge to integrate blockchain in their development of future technological solutions. Considering the potential impact of blockchain technology and the scarcity of knowledge about it, efforts should be made to improve the awareness of scholars and business practitioners. With potential application ranging from wider banking and business to voting and international trade, blockchain could redefine many aspects of our life. Future research should examine the development and impact of blockchain. The benefits and barriers to its adoption will require better understanding. Some applications of blockchain have capacity to radically alter aspects of society. The legal and ethical ramifications of such developments need adequate research before and during their implementation. Therefore, further critical research is needed to exploit its capabilities and overcome the limitations when applied in a large scale. In the upcoming years, blockchain technology's application possibilities will broaden, and the benefits of doing so will entice businesses and organisations all over the world to invest in it. Despite being in its infancy, blockchain technology has the potential to be adopted by a wide range of sectors in the future.

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