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Blockchain in Business

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Abstract: Blockchain is a disruptive technology that brings transformation in business processes. The main reason is to reap major benefits like transparency, decentralization, immutability, and security at reduced costs. A blockchain creates a trusted record using cryptography. Blockchain technology is becoming increasing important in numerous industries such as healthcare, logistics, manufacturing, and business. Blockchain is valuable in business for entities transacting with one another. Across industries around the world, blockchain is helping transform business. This paper provides an introduction to the use of blockchain technology in business.

Key words: blockchain, business.

INTRODUCTION

Traditional business models are no longer sufficient to tackle global competition due their inherent limitations. New developments are continually hitting the business world in recent years. Digital transformation allows business to take strategic decisions and leverage disruptive technologies in the marketplace. Blockchain is one of the major technologies driving business transformation. It is based on a peer-to-peer topology that ensures transactions' transparency, data resiliency, and security while reducing additional costs in running business operations [1].

In essence, blockchain is a massive, decentralized ledger of transactions maintained by many different, decentralized sources. It may be regarded as the chain of blocks that contain data. It is a continuously updated digital record of who holds what. Information about transaction (the time, date, dollar value, and the participants) is encrypted into a "block" that is linked to other blocks to form a chain. From farmers to grocery store, each transaction is recorded on a blockchain. Everyone in a blockchain has access to the same information and there is no one central authority, providing transparency and continuous reconciliation [2].

15.2 OVERVIEW OF BLOCKCHAIN

Blockchain (BC) technology is a permanent record of online transactions. It is a distributed tamper-proof database, shared, and maintained by multiple parties. It is a new enabling technology that is expected to revolutionize many industries, including business. It has the potential for addressing significant business issues. The BC technology allows participants to move data in real-time, without exposing the channels to theft, forgery, and malice.

The term "blockchain" refers to the way BC stores transaction data – in "blocks" that are linked together to form a "chain." The chain grows as the number of transactions increases. Since every

entry is stored as a block on a chain, the care you receive is added to your personal ledger. The first Blockchain was conceived in 2008 by an anonymous person or group known as Satoshi Nakamoto, who published a white paper introducing the concept of a peer-to-peer electronic cash system he called Bitcoin [3].

At its core, blockchain is a distributed system recording and storing transaction records. In a blockchain system, there is no central authority. Instead, transaction records are stored and distributed across all network participants. Rather than having a centrally located database that manages records, the database is distributed to the networks and transactions are kept secure via cryptography. BC eliminates the need for a middleman that traditionally may facilitate such transactions.

Fundamentally, blockchains are distributed digital database that record and maintain a list of transactions taking place in real time. They may also be regarded as decentralized ledgers that sequentially record transactions or interactions among users within a distributed network. They have the following properties [4]:

- Firstly, they are autonomous. They run on their own, without any person or company in charge.
- Secondly, they are permanent. They are like global computers with 100 percent uptime. Because the contents of the database are copied across thousands of computers, if 99 per cent of the computers running it were taken offline, the records would remain accessible and the network could rebuild itself.
- Thirdly, they are secure and tamper-proof. Each record in blockchain is time stamped and stored cryptographically. The encryption used on blockchains like Bitcoin and Ethereum is industry standard, open source, and has never been broken.
- Fourthly, they are open, allowing anyone to develop products and services on them.
- Fifthly, as blockchain is a shared system, costs are also shared between all of its users.

The Blockchain was designed so transactions are immutable, i.e. they cannot be deleted. Thus, blockchains are secure and meddle-free by design. Data can be distributed, but not copied. When it comes to digital assets and transactions, you can put almost anything on a Blockchain. Different scenarios call for different Blockchains. Blockchain is used for different purposes as depicted in Figure 1 [5].

The BC technology currently has the following features [6,7]:

1. *Peer-to-Peer (P2P) Network:* The first requirement of BC is a network, an infrastructure shared by multiple parties. This can be a LAN at a small scale or the Internet at a large scale. All nodes participating in a BC are connected in a decentralized P2P network. Transactions are broadcast to the P2P network. Due to some limitations of P2P networks, some vendors have provided cloud-based BCs.

2. *Cascaded Encryption:* A BC uses encryption to protect transaction data. Blocks are encrypted in a cascaded manner, i.e. the encryption result of the previous block is used in encrypting the current block. The BC is secured by public key cryptography, with each peer generating its own public-private key pairs.

3. *Distributed Database*: A BC is digitally distributed across a number of computers. Each party on a BC has access to the entire database and no single party controls the data or the information. Since BC is decentralized, there is no need for central authorizes such as banks.

4. *Transparency with Pseudonymity*: Each node or participant on a blockchain has a unique 30-plus-character alphanumeric address that identifies it. Users can choose to remain anonymous or provide proof of their identity to others.

5. *Irreversibility of Records:* Once a transaction is entered in the database and the accounts are updated, the records cannot be altered. Records on the database is permanent, chronologically ordered, and available to all others on the network.

There are two types of Blockchains: public and private. Public Blockchains are cryptocurrencies such as Bitcoin, enabling peer-to-peer transactions. Private Blockchains use Blockchain-based platforms such as Ethereum or Blockchain-as-a-service (BaaS) platforms running on private cloud infrastructure. A private BC is an intranet, while a public BC is the Internet. Companies will be disrupted the most by public Blockchains.

APPLICATIONS OF BLOCKCHAIN IN BUSINESS

The applications of blockchain are no longer the pie-in-the-sky dreams. Although the most popular application is probably cryptocurrency, experts claim that blockchain can be used for everything from data management to regulatory compliance. This technology has the potential to disrupt nearly every industry and solve challenges facing any business. Some of these business applications of blockchain are displayed in Figure 2 [8]. The applications include the following [1,9,10]:

- *Smart Contracts:* The foremost application of blockchain in business is smart contracts, which are essentially a kind of self-executing contract where all the terms and conditions from both parties are written in the form of codes. Smart contracts enable a way for organizations to automatically handle large amounts of transactions. They are executed in an automated way and do not need human intervention or paper trails. They are decentralized and secured. They can be divided into two broad categories: smart legal contracts and code-based. Lawyers are using blockchain to create smart contracts.
- *Human Resources:* Blockchain plays a major role in the recruitment process. It aids organizations by saving time required for verifying all the documents and hiring the potential candidate.
- *Marketing:* Blockchain technology improves marketing campaigns. It empowers marketers to keep a real-time track of client information and customer behavior.
- *Customer Engagement:* Blockchain opens new doors for engaging a wider target audience. The combination of blockchain and customer engagement brings provides some advantages.
- *Supply Chain Management:* Supply chains are the organizational and logistical systems by which goods are transported from a factory to the consumer. Blockchain can be used to track goods and materials throughout the supply chain of a manufacturing company. The technology enables companies to track their products/services from manufacturing to transportation, and delivery at the consumer end. Blockchain eliminates supply chain disputes because every supplier and producer can view the chain of ownership on the same ledger. The transparency of blockchains has benefits in supply chain management, visibility, and traceability.
- *Audits:* Blockchain creates an easy-to-follow paper trail for audits. It solves the problem of pulling in records from different sources.
- *Government:* Blockchain could make it easier to transmit personal information *electronically*, vote online, acquire a passport, and prepare legal documents. As with banks, governments' key record-keeping and verifying functions can be enabled by blockchain infrastructure to achieve large administrative savings.
- *Voting:* Votes can be moved along a blockchain in a neutral, accurate, and secure way. Using blockchain alters modern notions of democracy and strengthens the validity of election results. Blockchain's immutability and transparency are both necessary for successful elections.
- *Financial Services:* This industry is beginning to use blockchain to develop new services and save on costs. Blockchain is used mainly in finance for cryptocurrency and decentralized finance. Cryptocurrency is gaining credibility as an alternative payment used by government

central banks and big payment providers such as Mastercard and Visa. Blockchain has its own secure system that is capable of keeping track of the various multi-million dollar transactions that are carried out daily in the banking industry. For example, using blockchain ICBC (the largest bank of China) intends to eliminate the possibility of forgery of various documents. Since money is becoming digital, trading cryptocurrency is a profitable business concept.

- *Healthcare:* Blockchain could be a solution to the woes of beleaguered industries like healthcare. Medical errors are the third leading cause of death in the United States due to communications challenges between providers. Traditional data-sharing methods leave patient records vulnerable to theft. Blockchain technology eliminates this risk by creating secure "blocks" of data. Blockchain could be the key to unlocking the value of data availability and exchange across providers, patients, insurers, and researchers. Smart contracts could give patients more control over their data. Figure 3 shows a typical use of blockchain in healthcare [11].
- *Cybersecurity:* Blockchain's strong encryption and other security safeguards make it another tool in the security toolbox. Cybersecurity includes the protection of confidential intellectual property**.** Using the blockchain in the intellectual property registry will help authors to get maximum information about copyright on their content. Blockchain in cybersecurity is displayed in Figure 4 [12].

BENEFITS

Because blockchain removes middlemen and automates processes, it has the potential to save businesses costs, speed up e-commerce, and enable new lines of business. It also has a significant role in lowering carbon emissions. Implementation of blockchain technology in business environment establishes transparency, decentralizes processes, improves security, achieves scalability, increases accountability, reducing investment costs, etc. These benefits are further explained as follows [13]:

- *Decentralized Process:* Every participant in the network owns their data, can access the information history, and confirm new transactions. This is helpful when businesses must interact as peers but no one wants responsibility for maintaining the system.
- *Transparency:* The blockchain is transparent and unchangeable. The transactions occur in consensus with the participating parties. It is convenient, trustworthy, and transparent. Blockchain benefits derive from the trust it fosters, its built-in privacy, and its transparency.
- *Digital and Automated Records:* The transactions are digital and automated, thereby reducing paper-based transactions.
- *Automated Validation and Verification:* Blockchain utilizes consensus protocols to validate transactions and does not rely on a single point of authority.
- *Improved Efficiency and Speed:* Blockchain transactions do not need intermediaries leading to a faster turnaround.
- *Security:* Blockchain is highly secure due to its digital signature and encryption. The data is stored in a number of places and immune to hackers.
- *Trust:* Trust makes it possible to do business with unknown parties. Blockchain spreads trust everywhere. Whether it is between people or organizations, relationships flourish when there is more trust.
- *Cost Reduction:* Cost management and reduction are benefits of blockchain technology. The value of blockchain is in driving cost reduction to enabling entirely new business models and revenue streams. It eliminates cost for mediators or intermediaries.

CHALLENGES

Despite its potential and benefits, we are still in the early days of the blockchain. Businesses that implement blockchain come across various challenges that demand different solutions. The challenges include [2,14]:

- *Energy Use*: Verifying transactions to add to the blockchain is energy-intensive because of the computer power required to do all the computations.
- *Processing Speed:* Because of all the computations involved, the processing time is slow.
- *Interoperability:* Currently there are many blockchains that do not interact with each other. Blockchain has the difficulty of resolving the "coopetition" paradox to establish common standards.
- *Lack of Standards:* The lack of common standards and clear regulations is a major limitation on blockchain. Standards can be established with relative ease if there is a single dominant player or a government agency that can mandate the legal standing. Leaders should act now to maintain their competitive edge and take advantage of the opportunity to set industry standards.
- *Lack of Adoption*: Blockchain, especially public blockchain, requires a large number of participants for most of its benefits to be realized.
- *Cost:* The immaturity of blockchain technology increases the switching costs.
- *Threat:* Many people view blockchain as a threat to the current legacy of corporations and companies that require centralization. Since blockchain technology is decentralized, it can be used by anybody who have been granted permission.

The next generation of blockchain technology will address these challenges. The issues need to be resolved before BC goes mainstream.

CONCLUSION

Simply put, a blockchain is a database or ledger that is distributed across a private or public computer network. It is an immutable decentralized way to securely store data in blocks that are linked to each other using cryptography. It is a revolutionary change in how things work. Blockchain has the potential to transform many industries.

There are many industries that are already utilizing blockchain technology to their advantage. If you are interested in blockchain, you should consider becoming a certified blockchain engineer. More information about blockchain in business can be found in the books in [15-18].

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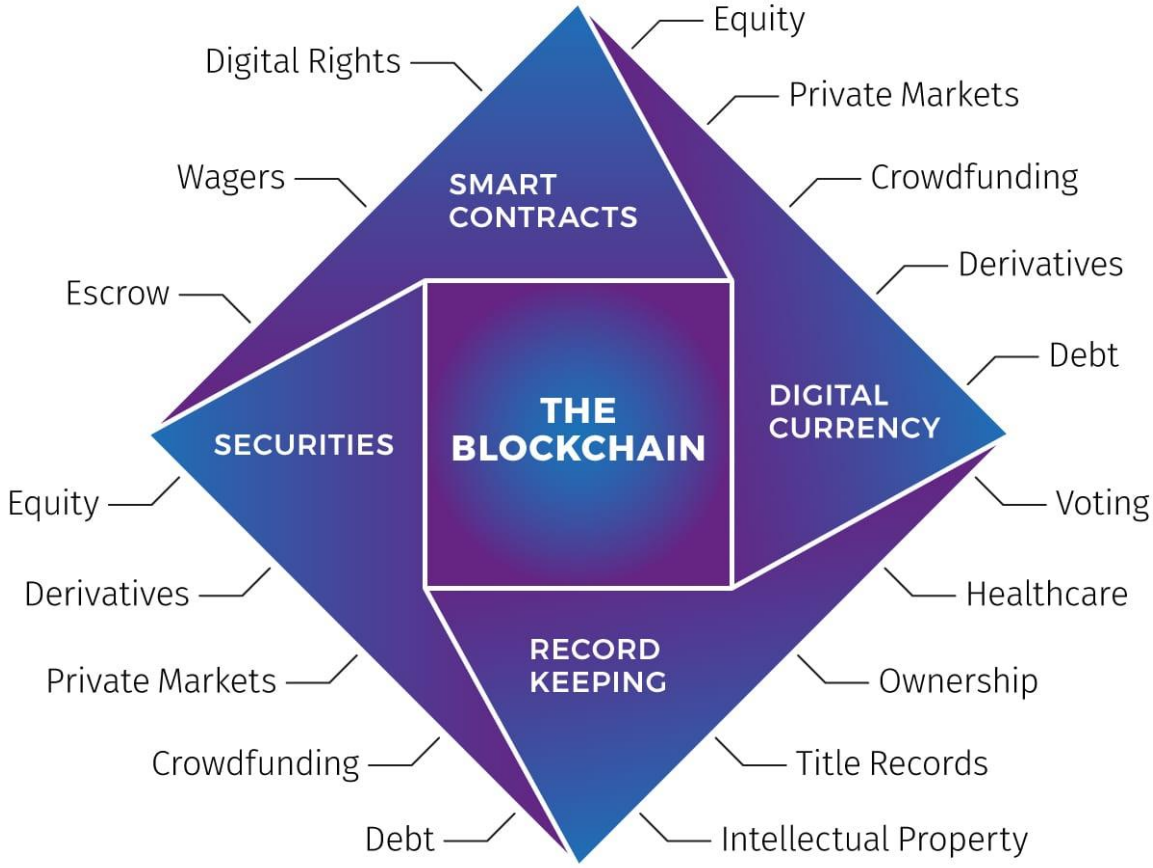

Figure 1 Different purposes of blockchain [5].

Figure 2 Some business applications of blockchain [8].

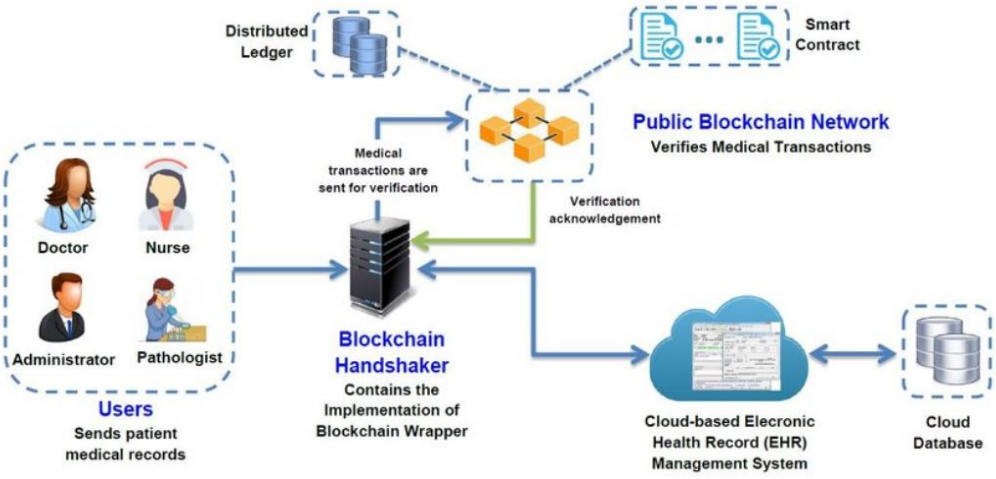

Figure 3 A typical use of blockchain in healthcare [11].

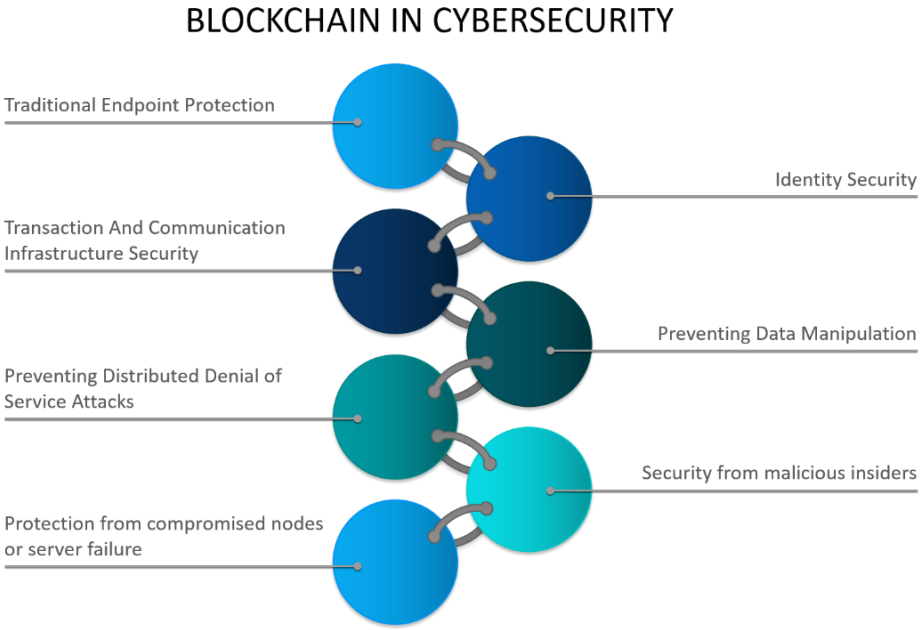

Figure 4 Blockchain in cybersecurity [142].