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Future of Blockchain

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Abstract: Blockchain is a decentralized system that keeps track of distributed data and provides encrypted transaction tracking. It has attracted attention with its unique characteristics, such as irrevocability and security. It will be a part of our everyday life. The future of blockchain will be determined by how effectively blockchain integrates with advanced technologies, such as artificial intelligence (AI), Internet of things (IoT), and 5G networking. This paper attempts to predict the future of blockchain technology.

Keywords: blockchain, distributed ledger technology, Bitcoin, future.

INTRODUCTION

The proliferation of the Internet has profoundly altered traditional businesses, causing some to decline while others are growing. The Internet has generated significant changes in the landscape of various jobs and businesses and has given rise to many new and innovative business models. The digital economy has been shaped by the development of the Internet and cyberspace, giving rise to various technologies such as blockchain technology. Undoubtedly, blockchain is one of the most important technologies that has emerged in the last decade [1].

Blockchain is revolutionizing the digital world by bringing a new perspective to security, efficiency, and stability of systems and data. It is network of computers that is decentralized. Blockchain is one of the most secure ways to make transactions across the world in a very safe and protected manner. We can introduce cutting-edge blockchain technologies from four directions: blockchain system, consensus algorithms, smart contract, and scalability. Future blockchain technology should be scalable and have efficient consensus mechanisms that do not rely on computing. Every blockchain features a consensus to assist the network make decisions and consensus algorithms are at the core of its architecture. Blockchain aims to achieve a decentralized ledger. Because of its decentralization, security, and irrevocable characteristics, blockchain is widely used in cryptocurrencies and other fields. First, let us explain the basics of blockchain.

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

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issues. The BC technology allows participants to move data in real-time, without exposing the channels to theft, forgery, and malice.

According to its name, the blockchain is a combination of the two terms "block" and "chain." So a "blockchain" refers to the way BC stores transaction data in "blocks" that are linked together to form a "chain." "Block" refers to blocks of data, involving transactions, while "chain" refers to chain-like linking of blocks to previous ones until the genesis block is reached. 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 [2]. A typical blockchain architecture is shown in Figure 1 [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. Figure 2 shows how blockchain works [4].

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 [5]:

- 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 in different areas such as depicted in Figure 3 [4].

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.

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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.

BLOCKCHAIN FUTURE TRENDS

There is no doubt that the blockchains that support the currencies will help change our society in countless ways. We will discuss the current problems and opportunities of blockchain in combination with the development of other technologies. As the adoption of blockchain technologies becomes more widespread, industry leaders envision blockchain integrating with advanced technologies, such as artificial intelligence (AI), Internet of things (IoT), and 5G networking. The following sections present novel technologies with the potential to facilitate future development of blockchain.

FUTURE OF INTERNET OF THINGS

The Internet of things (IoT) interconnects embedded devices using sensors through private or public networks, reduces human intervention as much as possible, and realizes seamless communications among people, products, and processes. IoT devices may be simultaneously managed by multiple managers; thus, the centralized network architecture faces the risk of privacy disclosure. Blockchain provides a new idea and solution to IoT challenges considering scalability, cooperation ability, trust relationship, security, and privacy protection. All data transmitted through blockchain are encrypted, and user data and privacy are more secure. As long as the data is written into the blockchain, tampering with it is difficult [8]. Blockchain technology has the potential to provide a secure and scalable framework for communication between IoT devices. With a higher resistance to cyber-attacks than existing IoT security solutions, blockchain will also allow smart devices to quickly and cost-effectively make automated transactions. In a world ruled by gadgets and the Internet of things (IoT), security and integrity are major concerns for users.

FUTURE OF ARTIFICIAL INTELLIGENCE

Blockchain and AI are the two most important and emerging technologies. Blockchain is considered a shared and permanent ledger that will be used for the encryption of data in the future. AI refers to machines capable thinking like humans, mimicking their actions, learning problem solving, rationalizing, and taking actions that have the best chance of achieving a specific outcome. The proliferation of AI and robots has significantly impacted contemporary businesses and human lives. The combination of AI and emerging blockchain-based technologies is expected to generate significant advancements. It is often credited with ushering in the fourth industrial revolution, with their implementation revolutionizing industries such as healthcare, finance, supply chain, and logistics. The implementation of AI-enabled blockchain technology raises several challenges, such as the cost of implementation and the availability of skilled personnel to develop and manage such systems.

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The integration of AI and blockchain technology into existing business processes and systems may require significant changes in an organization's culture and procedures. The potential of AI and blockchain technology is limitless [9,10].

FUTURE BLOCKCHAIN APPLICATIONS

Blockchain technology has proved its place as the technology of the future. Many experts predict that blockchain technology has the potential to transform various industries, from finances to healthcare. These applications could serve as the foundation for the next generation of businesses. Future applications of blockchain include [11]:

- *Finance:* Finance is naturally the industry where blockchains will have the most impact. Blockchain technology stands to revolutionize the way money can be handled. In the financial services sector, blockchain technology has already been implemented in many different and innovative ways. Blockchain is a distributed peer-to-peer ledger system that eliminates the need for a centralized management entity such as a bank. Brokers are offering crypto as tradable assets. Banks and financial institutions from all over the world have realized how useful blockchains are for a range of reasons. Today, blockchains are used for sending large amounts of money across the world instantaneously and with minimum fees.
- *Healthcare:* The healthcare industry can use blockchain technology to store and share patient information between different healthcare providers. Imagine a world where all your medical records were readily available wherever you are, and where medicines and prescriptions were handled on a completely safe platform. Blockchain has the potential to make all this happen. It can play a key role within the healthcare sector by increasing the privacy, security, safety, convenience, and interoperability of the healthcare data. It can also limit the number of mistakes made by health care professionals. Blockchain can be used to develop applications to manage patient data, control drug supply, automate medical examination, treatment transactions, and more.
- *Voting:* Transparency and autonomy are two blockchain features that motivated developers to apply this technology to electronic voting systems. Transparency enables the public to monitor the voting process, and autonomy removes the influence of authorities [1]. Voting with blockchain technology could be easier, faster, and more secure than how we vote today. Blockchain technology can end voter fraud. It offers the power to vote digitally, but it is transparent enough that any regulators would be ready to see if something were changed on the network. It combines the convenience of digital voting with the immutability to make your vote truly count. People can vote online easily without revealing their identities.
- *Supply Chain:* Blockchain technology can trace all the steps of a supply chain. Through the use of blockchain technology, manufacturers can identify the sources of goods, deliveries, and production activities all through a supply chain management process. Blockchain technology has already been used in multiple industries as a means of keeping tabs on supply chains and ensuring their efficiency. Blockchain technology can trace all the steps of a supply chain.
- *Cybersecurity:* Blockchain technology can secure our data against unauthorized access and tampering. It is ideal for environments where high security is involved. You can easily identify malicious data attacks with blockchain due to peer-to-peer connections, where data cannot be altered or tampered. And, by eliminating a central authority, blockchain provides a secure and transparent way of recording transactions without disclosing private information to anyone.

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- *Government:* Blockchains are global networks that can have millions of users, each adding data which is secured through cryptography. It is envisaged that governments will develop their own digital money and engage in free market trading. Other applications for government include digital asset registries, wherein the fast and secure registry of an asset such as a car, home or other property is needed; notary services, where a blockchain record can better verify the seal's authenticity; and taxes, in which blockchain technology can make it easier to enable quicker tax payments. The future application of blockchain technology possibly is a nation's digital money. While the exploitation of blockchain technology can yield tremendous benefits, not all nations are on the same page with regard to adopting it. Figure 4 shows a worldwide adoption of blockchain [4].

Some of these future applications of blockchain are depicted in Figure 5 [12].

BENEFITS

Without a doubt, the intrinsic benefits of blockchain technology are difficult to ignore. Blockchain may potentially be used to securely and efficiently transfer user data across platforms and systems. Nobody owns or controls your data but you. Blockchain has the potential to promote transparency, efficiency, and responsibility. This ensures that blockchain technology is used in a way that benefits both people and the planet. The technology is poised to play a key role in shaping a sustainable future. Blockchain talent became one of the most sought-after skill sets globally.

CHALLENGES

The main challenges faced by blockchain technology include scalability, energy consumption, and regulatory issues. The complexity of blockchain technology, coupled with the prevalence of misinformation, has contributed to a general misunderstanding of how it works. For all its promise, blockchain has delivered surprisingly little. Its impact on the environment and sustainability has always been the topic of conversation.

A lot of businesses still do not understand why they need blockchain. As the blockchain technology grows, so does the need of skillful, highly trained individuals.

CONCLUSION

Blockchain technology has revolutionized the way we store, secure, and transfer data across various industries. Without a doubt, blockchain is one of the most valuable emerging technologies. While blockchain offers astounding developments across sectors, it's still a work in progress. Blockchain is newly born technology, and it needs room for growth. Blockchain technology is poised to take over the way we work. The opportunity for people to deal freely will in fact generate opportunities that were unforeseeable before. Despite Blockchain being at the peak of its popularity, the job market has a lack of blockchain engineers and specialists.

Many industry analysts have been charting possible paths for the future of blockchain. Forecasts for the future of blockchain focus on its increasing integration with emerging technology trends. Blockchain technology has made significant strides in its development and widespread adoption in recent years. There is no sign of it slowing down. It is here to stay. However, for blockchain to continue to present new features and remain relevant, it is critical for blockchain capabilities to evolve and integrate with newer technologies. More information about the future of blockchain can be found in the books in [13-23].

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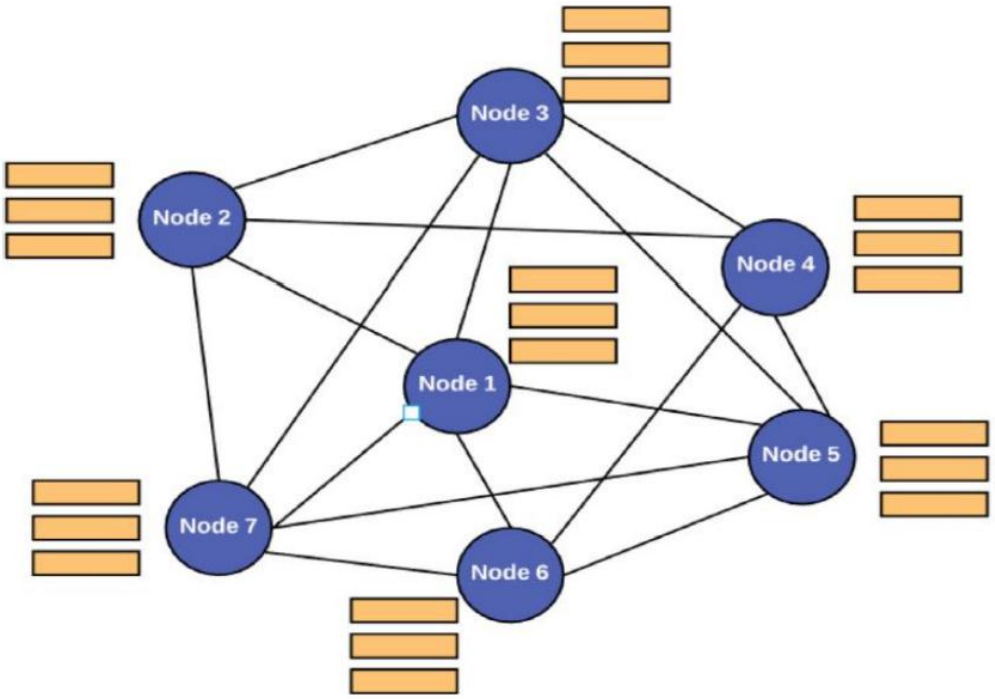

Figure 1. The blockchain architecture [3].

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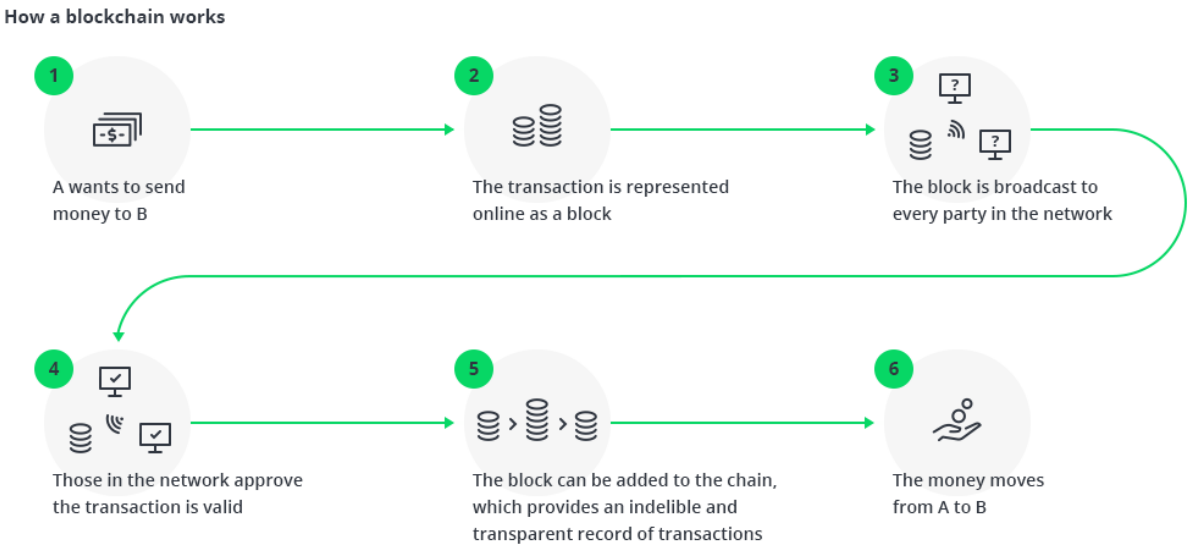

Figure 2. How the blockchain technology works [4].

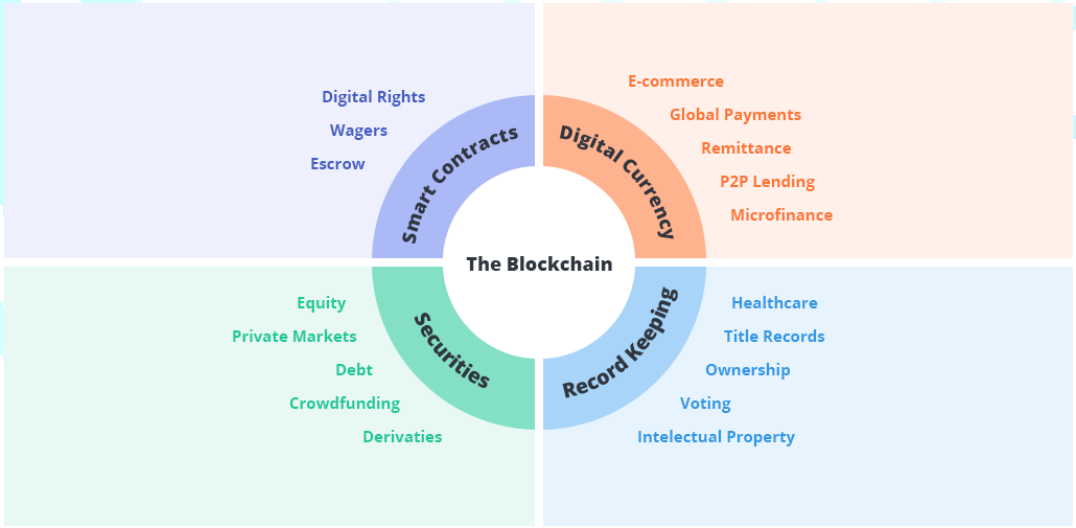

Figure 3. Potential uses of blockchain [4].

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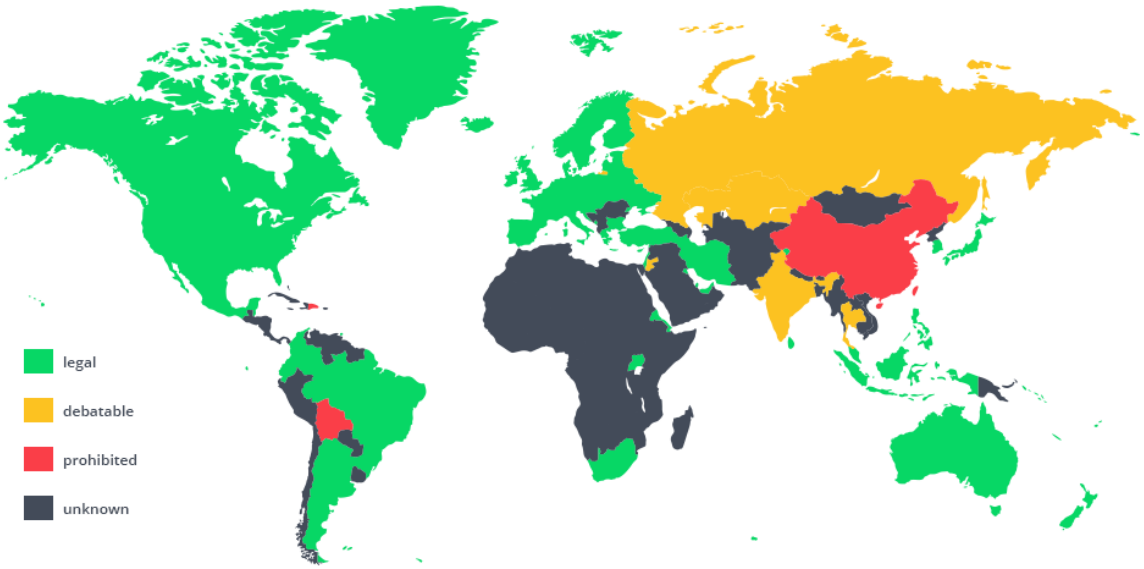

Figure 4. Worldwide adoption of blockchain [4].

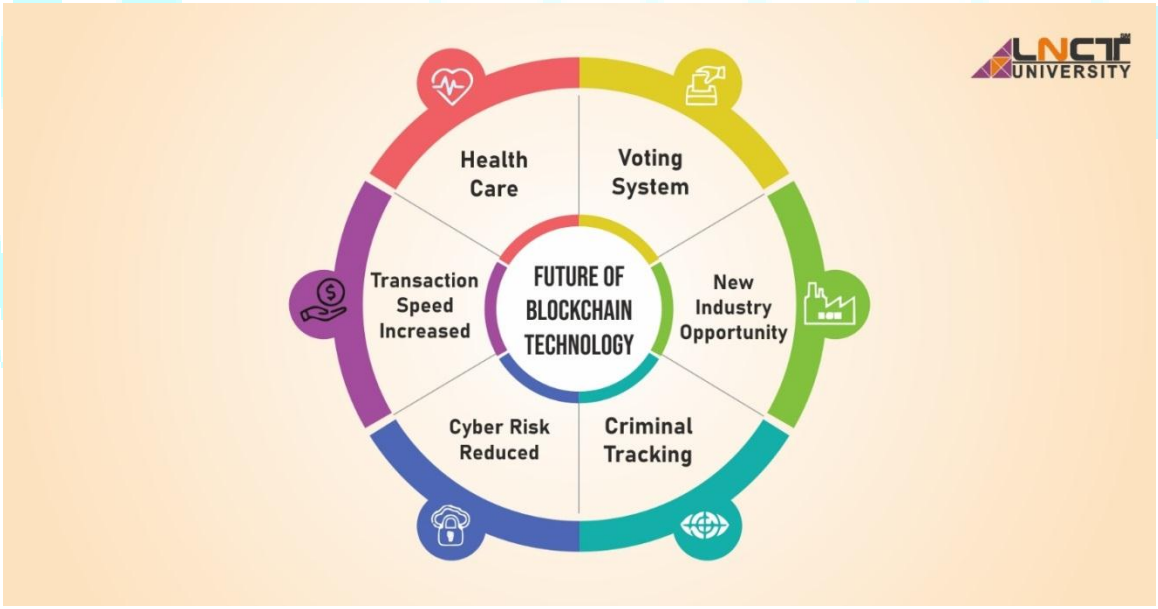

Figure 5. Some future applications of blockchain [12].