

Research on the Relationship and Application of Cryptocurrency and Blockchain

Zhiying Zhou *

Linfield Christian High School, Temecula 92592, The United States

* Corresponding author: zhiyingzhou@student.linfield.com

Abstract. This research paper discusses virtual currency and the blockchain technology that underpins it. Virtual money, frequently referred to as cryptocurrency, is a digital method of payment that is not regulated by traditional financial institutions. It enables individuals to perform peer-to-peer transactions in a secure and efficient manner by using encrypted digital records. Cryptocurrencies like Bitcoin and Ethereum have garnered popularity due to their promise to transform financial institutions by enabling international and decentralized payments. Blockchain technology facilitates the operation of virtual currency. A blockchain is an immutable and decentralized digital ledger which keeps track of every single transaction in an easily accessible and tamper-resistant manner. Each transaction is organized into a block and linked to the one before it, forming a chain of blocks. This paper explores virtual currency and its foundation, blockchain technology. Cryptocurrency, a digital payment method, enables secure peer-to-peer transactions without traditional financial oversight. Prominent examples like Bitcoin and Ethereum offer potential for global and decentralized payments. Blockchain, an immutable digital ledger, supports virtual currency, recording tamper-resistant transactions in linked blocks.

Keywords: Virtual currency, blockchain technology, Cryptocurrency.

1. Introduction

As technological advances in AI and blockchain technology continue to advancement, the world economy is ushering in the digital age, and new business models and payment methods are emerging one after another. The world economy is rapidly transforming as it enters the digital age, fueled by the convergence of artificial intelligence and blockchain technology. Within this dynamic landscape, novel business models and innovative payment methods are reshaping the global financial ecosystem. At the heart of this transformation lies the concept of cryptocurrency - a revolutionary digital payment system that operates independently of traditional banking institutions.

In this research paper, we delve into cryptocurrencies and blockchain technology, discussing their principles, technical characteristics, and applications in various industries. By understanding their interdependence and potential, this research aims at to uncover the transformative power of these revolutionary solution technologies in shaping the future of the global economy.

2. Cryptocurrency

2.1. The Concept of Cryptocurrency

A digital currency is a type of digital payment system that does not depend on banks for transaction verification. It is a peer-to-peer payment system that allows a digital currency is a digital payment system that enables peer-to-peer transaction verification. It does not need a bank as an intermediary to work. Anyone, anywhere can receive and send money via digital currency. Cryptocurrency payments do not carry and exchange actual currency. Cryptocurrencies are not exchanged to carry the actual currency; it only exists as an encoding in a database for a particular transaction. The transaction of transferring the digital currency bitcoin funds is documented on a ledger that is accessible to everyone. Digital wallets are where cryptocurrencies are kept. The use of cryptography for verification of transactions gives cryptocurrency its name. Extensive code is required to store and

transfer encrypted currency data between wallets and ledgers that are publicly accessible. Encryption's goal is to give users security.

There is a way about the transaction of cryptocurrencies that was purposed in 2008. This paper defines an electronic coin as a chain of digital signatures. Each owner transfers the coin to the next by digitally signing a hash of the previous transaction and the public key of the next owner and adding these to the end of the coin. A payee can verify the signatures to verify the chain of ownership [1].

2.2. The Technological Features of Cryptocurrency

2.2.1. Decentralization

The issuance and management of cryptocurrencies are not controlled by any central institution, unlike traditional legal currencies (such as US dollars, euros, etc.), which are issued and managed by central banks or governments. Instead, nodes in the blockchain network jointly participate in the verification and confirmation of transactions. It relies on blockchain technology. Blockchain is a ledger system that is distributed and composed of an ongoing series of data blocks, each containing a specific amount of transaction information. These data chunks are connected together by a cryptographic hash, forming a chain. The decentralization of cryptocurrency allows the transaction process without any intermediaries such as banks or payment processors. Transactions happen directly on the blockchain, reducing transaction time and fees and increasing transaction security. This decentralized nature ensures that cryptocurrency transactions are not controlled by any single institution or government.

This is a detailed explanation of the principle of decentralization. Blockchain-based digital currency is a new type of intelligent system and decentralized business model driven by application innovation. It has now developed to the stage of stable currency and legal digital currency, and is gradually becoming an indispensable factor in the modern economic system and an important aspect of the digital society. It will bring about important changes in various fields such as finance, economy, and society. The emergence of blockchain-based digital currency has spawned new research questions, new management perspectives, and new practical needs. This field is still in development in the initial stage of the blockchain, there are many problems to be solved, and it is of great significance to carry out a systematic analysis [2].

2.2.2. Limited Supply

The supply of fiat money grows over time because central banks can print as much fiat money as they need to carry out their desired economic policies. But the issuance of a cryptocurrency is set according to its protocol, which usually determines its maximum supply at the initial stage. Once the total amount of cryptocurrency reaches the set upper limit, no new currency will be created. Some cryptocurrencies set a decreasing issuance mechanism in their issuance rules. For example, Bitcoin's mining reward is halved over time, causing the production of new Bitcoins to gradually decrease until eventually a cap is reached. Due to the limited nature of cryptocurrency, some people regard it as an investment tool, hoping to gain asset appreciation by holding and accumulating cryptocurrency. Limitedness is an important feature of cryptocurrency design, which makes it a scarce resource and enhances its value store characteristics. However, the limited nature of cryptocurrency may also cause some problems, such as large price fluctuations.

Bitcoin is edging closer to reaching its finite, maximum level of supply, pushing its price up and making it more difficult to mine. As a rule of thumb, the fewer coins available to the general audience, the higher the value of the cryptocurrency becomes. This is especially true when the coin's maximum supply has been reached [3].

2.2.3. Transparency

Transparency refers to the property that its transaction and account information is open and viewable to the public. All cryptocurrency transactions are publicly traceable. Through a blockchain browser or related blockchain viewing tools, anyone can view the transaction history of a specific address and know all the receipts and transfers of the address. Cryptocurrency transactions are based

on digital signatures, and users participating in transactions do not need to provide identity information. This makes transactions in cryptocurrency relatively anonymous, but still publicly available. Unlike the traditional financial system, the transaction records of cryptocurrency are stored on the blockchain, which is a public ledger maintained and verified by many nodes. Each data block in the blockchain contains a certain amount of transaction information.

3. Blockchain

3.1. Concept of Blockchain

Blockchain is an unchangeable ledger that is sharing and serves as an advanced database technology for storing transactions and managing assets in a corporate network. Within a business network, information can be shared. Almost every valuable asset may be tracked and exchanged on a network based on blockchain technology, slashing risk and cost across the entire spectrum. Data is stored in blocks in blockchain databases, these are subsequently connected together.

In blockchain technology, a block refers to a data structure that consists of two parts:

Block metadata and block body. Among them, the block metadata records the metadata information of the block, and the block body records all the transactions that occurred between the generation of the previous block and the creation of this block [4]. Blockchain-based technologies possesses numerous applications, including payment and repatriation processing, supply chain management, electronic identity management, sharing of information, copyright safeguarding, IoT network administration, and healthcare. The blockchain transaction process was extremely fast, which reduces transfer fees. Blockchain can help businesses immediately discover supply chain concerns and track the flow of products in the present moment. For example, Microsoft is experimenting with blockchain to help people control digital identities and data access. Additionally, blockchain can create decentralized databases, protect copyrights and royalties, and regulate IoT network devices. In healthcare, blockchain can be used to manage clinical trial data and electronic medical records.

The blockchain application trend in finance covers electronic currencies, digital identification, and financial security regulatory structure. It may also be extended to the financial industry's supply chain financial markets, management of funds, transaction and establishment, electronic property, financing of trade, and other links, providing reliable platform-based services for all financial project links.

And the blockchain industry in China is also developing rapidly. The report pointed out that blockchain technology has become an important starting point for China to promote digital and real integration. In 2022, China's blockchain industry will continue to maintain rapid growth, with an industrial scale of 4.83 billion yuan, a year-on-year increase of 33.4%. In the first place, the deep integration of blockchain and scene applications is an important force to promote the development of China's blockchain industry [5].

3.2. The Feature Character of Blockchain

3.2.1. Immutability

Data cannot be tampered with, moved or deleted once it enters the database, which is the immutability of the blockchain. This is a core feature of blockchain technology and one of the important features that distinguish it from traditional databases. Blockchain is a distributed ledger maintained by multiple nodes. Each node maintains a complete copy of the blockchain, including all transactions and data that have occurred. Therefore, if the data of a certain node is tampered with, the data on other nodes remains unchanged and will not be affected. And the following paragraph explains how the hash function works to achieve the immutability. Each of the blocks of information, like facts or transaction details, is carried out with the help of a cryptographic principle or a hash value. Now, this hash value has an alphanumeric string generated by each block individually. Each block contains a hash value or digital signature for itself and the previous one. This, in turn, ensures

that the blocks are retroactively coupled and unrelenting [6]. All in all, if the content of one of the data blocks is modified, its hash value will change, thereby destroying the integrity of the entire chain, and causing other nodes not to accept the modified data block. Blockchain networks use a consensus mechanism to decide which transactions are valid and add them to the blockchain. Only when most nodes reach a consensus to approve a transaction, the transaction will be written into the blockchain, ensuring data consistency and security.

3.2.2. Anonymity

Users do not need to provide their real identity information in transactions carried out on the blockchain. Users can create a wallet by generating a public password and a private password to conduct virtual currency transactions created through the blockchain and use the private code to sign the transaction to complete the transaction. This allows users to use a pseudonym (also known as a "virtual identity") in transactions, thereby remaining relatively anonymous. Participants in transactions are only identified as a long list of encrypted addresses rather than real identities. Such an address is not directly associated with the user's identity information, thus achieving a certain degree of anonymity during the transaction process. Then it comes to the balance between anonymity and transparency because all transaction records will be kept on the public blockchain so that everyone can see this record. But user information needs to be protected. Although virtual currency transactions are relatively anonymous, blockchain technology cannot fully guarantee users' absolute anonymity. Once users associate their virtual currency IP addresses with their real identities in the real world, transaction histories can be traced back to them.

3.2.3. Distributed Shared Ledger

The ledger maintains meticulous records of all transactions. A distributed shareable record is a duplicated ledger which is maintained as a transaction record by participating nodes. In this situation, the blockchain system is the ledger's data structure. The shared ledger enables authorized users to examine, monitor, and analyze a transaction's state throughout its existence. The term "blockchain shared ledger" refers to the fact that all nodes in the network of blockchain nodes work together to maintain and validate a unified and public record. It is a mirrored ledger that is kept as a transaction record by participating nodes. All of the data and transactions records are publicly kept on this ledger, and anybody attached to the blockchain system is able to inspect and confirm these transactions and data.

3.3. Relation between Blockchain and Cryptocurrency

Well-known virtual currencies include Bitcoin (Bitcoin), Ethereum (Ethereum), etc., which are all supported by blockchain technology. The rise of cryptocurrency has promoted the development of blockchain technology, and blockchain technology has also provided a safe and reliable foundation for cryptocurrency. Cryptocurrency and blockchain are interdependent and together form the emerging digital economy and financial sector.

4. Application of Blockchain Technology

4.1. OPSKINS

Industry: Gaming, The financial technology sector, and digital currencies

How to use the blockchain: Cryptocurrency transaction mobile applications, which were pioneered by Bitcoin, are currently gaining popularity. Blockchain is particularly effective in the banking and finance industry. Since it saves money and time for financial institutions of all sizes.

According to a recent ComputerWorld story, the global value of central bank digital currencies (CBDCs) will grow dramatically from \$100 million today to \$213 billion by 2030, once the virtual money gains greater adoption for domestic payments, according to new data from Juniper Research [7]. Players can use Bitcoin as a method of payment in the OPSkins marketplace on the internet to

purchase rare skins, accessories, and even emoticons. Vendors collect bitcoins in a secure online wallet and can keep or trade the cryptocurrency for cash. OPSkins supports well over 2 million online transactions per week.

4.2. CIRCLE

Industry: Financial technology and cryptocurrency.

How to use the blockchain: It employs the blockchain in the following methods: Boston-based Circle manages more than \$2 billion in investments in digital currencies and swaps between friends each month. Circle's investing and payment platform presently supports seven bitcoin and other cryptocurrencies involving Bitcoin, Monero, and Zcash.

4.3. HYPR

Industry: Internet of Things, Cyber Security.

How blockchain technology is being used: the Internet of Things (IoT) is predicted to be the next wave of blockchain applications. The Internet of Things has millions of software applications and various security risks, and as the number of IoT gadgets grows, hackers have a higher opportunity of obtaining data. By using the technology's openness and virtual incorruptibility, the incorporation of blockchain into IoT adds greater safety, preserving systems "smart" and avoiding data breaches. With a decentralized identification credential solution, HYPR mitigates cybersecurity vulnerabilities in IoT devices. The startup makes IoT devices essentially invulnerable by removing passwords from centralized servers and employing both fingerprint and password-free systems alternatives.

4.4. SHIPCHAIN

Industry: Shipping sector, Supply Chain.

How to use the blockchain: Due to the high number of logistical businesses overcrowding the field, one of the main challenges in the transportation sector is a lack of interaction and openness. Many challenges in supply chain management and logistics can be solved by blockchain. Blockchain can increase trust in the sector by validating the origin of data. The technology might help expedite and automate logistics procedures, potentially saving the sector billions of dollars annually. Blockchain is a safe and cost-effective option for the logistics business. Ship Chain is a completely integrated blockchain-based platform that delivers end-to-end shipping services. The logistical ecology safely tracks and documents every single movement of commodities from the time they leave the manufacturer to the time they reach their destination. The logistics network automatically records and monitors every move, developing a transparent ledger. Ship Chain, based in Los Angeles, wants to employ blockchain technology to update the \$8.1 trillion supply chain business.

5. Market of Cryptocurrencies

Virtual currencies are traded on trading platforms that allow users to buy or sell virtual currencies. Some well-known trading platforms include Binance, Coinbase, Kraken, Bitfinex, etc. The virtual currency market has a high degree of price volatility, and its price will rise or fall sharply in a short period of time. This is due to the relatively small size of the market, news events, policy changes and other factors.

It is precisely because of this volatile virtual currency market that attracts a large number of speculators, who hope to make a profit by buying low prices and selling them when prices rise. However, speculation also brings market instability and risk. Taking bitcoin as an example, the price of one bitcoin was less than 14 cents in 2010, soared to US\$1,242 in 2013, an increase of 8871 times, and fell back to US\$66 in 2015 [8]. The virtual currency market is also a financing channel for emerging blockchain projects. Many blockchain projects are financed by issuing tokens (Tokens), which can be traded in the market.

NFT: NFT (Non-Fungible Token) is an abbreviation for non-homogeneous tokens. It is a digital asset based on blockchain technology and is used to represent unique, non-interchangeable items or digital content. NFT represents specific uniqueness and uniqueness, so each NFT has its own independent value. For example, if someone wants to promote the application of NFT in the news media industry, it is necessary to combine the current resources and future development direction of the industry with the characteristics of NFT. Blockchain, digital art, and NFT are gradually infiltrating all aspects of our lives, and the entertainment industry is one of them. NFT games based on blockchain technology are rapidly revolutionizing the traditional gaming experience, attracting more and more gamers. In the field of games, NFT can be used as digital proof of ownership of achievements and items in the virtual world. Players can trade such items through the in-game market or any form of open market [9].

KODAK coin- Kodak is a well-known American company primarily known for producing cameras and photographic equipment. However, in early 2018, the company announced plans to launch its own cryptocurrency, called "Kodak Coin," to be accompanied by a photo rights management platform called "Kodak One." Kodak Coin is said to be designed to provide photographers and the photography industry with more secure and transparent copyright protection and a fairer income distribution mechanism. While Kodak's plan attracted a lot of attention when it was announced, it has also faced some skepticism and criticism. The inherent dangers with such as plan was the potential development of a pricing bubble in Kodak shares as the market struggles to ascertain a fair value for the planned cryptocurrency strategy. However, cryptocurrencies are highly risky products [10].

6. Conclusion

The world economy is undergoing a transformation with the convergence of artificial intelligence and blockchain technology, ushering in the digital age and giving rise to new business models and payment methods. At the forefront of this transformation is the concept of cryptocurrency, a revolutionary digital payment system that operates independently of traditional banking institutions.

Cryptocurrencies are digital payment systems that enable peer-to-peer transactions without the need for intermediaries like banks. Transactions are recorded on a public ledger called a blockchain, which is a decentralized and immutable data structure maintained by multiple nodes. This decentralization ensures that cryptocurrency transactions are not controlled by any single institution or government.

Key features of cryptocurrencies include limited supply, transparency, and anonymity. The supply of cryptocurrencies is often capped to create a sense of scarcity, making them attractive as investment assets. While transactions in cryptocurrencies are relatively anonymous, they are still publicly traceable, adding a layer of transparency to the system.

Cryptocurrencies have applications in various industries, such as gaming, finance, supply chain, and government. They offer faster and cheaper payment processing, enhanced security, and decentralized identity solutions. For example, OPSkins uses Bitcoin as a payment method for buying virtual items, Circle oversees cryptocurrency investments and exchanges, and HYPR enhances security in IoT devices using blockchain.

The virtual currency market, where cryptocurrencies are traded, is known for its high price volatility. Speculators are attracted to the market, hoping to profit from price fluctuations. Additionally, the emerging Non-Fungible Token (NFT) market has gained popularity, representing unique digital assets on the blockchain.

Blockchain technology is not limited to cryptocurrencies; it has vast applications in various sectors like finance, supply chain, cybersecurity, and identity management. For instance, Ship Chain aims to modernize the supply chain industry, while the Illinois Blockchain Initiative seeks to enhance identity security by storing sensitive information on a decentralized blockchain ledger.

Although cryptocurrencies and blockchain technology show promising potential, they also face challenges and risks, such as market instability and regulatory issues. Nevertheless, the transformative power of these technologies in reshaping the global economy cannot be ignored. As our world moves further into the digital age, understanding and harnessing the potential of cryptocurrencies and blockchain technology will play a crucial role in shaping the future of the financial landscape.

References

- [1] Nakamoto, Satoshi. A Peer-to-Peer Electronic Cash System. Bitcoin.org, <https://bitcoin.org/bitcoin.pdf>. Accessed 22 July 2023.
- [2] Li Juan-Juan, Yuan Yong, Wang Fei-Yue. Blockchain-based digital currency: The state of the art and future trends. *Acta Automatica Sinica*, 2021, 47 (4): 715 - 729.
- [3] De Best, Raynor. "Low supply cryptocurrency 2023. Statista, 15 June 2023. Retrieved from <https://www.statista.com/statistics/802775/worldwide-cryptocurrency-maximum-supply/>. Accessed 23 July 2023.
- [4] He Pu, Yu Ge, Zhang Yan-feng and BAO Yu-bin. Survey on Blockchain Technology and Its Application Prospect [J]. *Computer Science*, 2017, 44 (4): 1 - 7.
- [5] The report shows that blockchain technology has become an important starting point for digital and real integration. *Guangming.com*, https://tech.gmw.cn/2023-08/09/content_36756237.htm. Accessed 9 August 2023.
- [6] Raisinghani, Neeraj. What is Immutable Ledger in Blockchain and Its Benefits. *SoluLab*, 28 June 2023, Retrieved from <https://www.solulab.com/what-is-immutable-ledger-in-blockchain-and-its-benefits/>. Accessed 23 July 2023.
- [7] Maynard, Nick. CBDC Transactions to Exceed \$213 Billion by 2030 Globally, as New Payment Models Accelerate Financial Inclusion. *Juniper Research*, 13 March 2023, Retrieved from [https://www.juniperresearch.com/pressreleases/cbdc-transactions-to-exceed-\\$213-bn-by-2030](https://www.juniperresearch.com/pressreleases/cbdc-transactions-to-exceed-$213-bn-by-2030). Accessed 9 August 2023.
- [8] Yin Zhentao. Virtual Currency Market Risk. <http://www.nifd.cn/Uploads/Paper/ed267c5a-bb18-488b-826e-111e605d161e.pdf>. 2018 - 04 - 01.
- [9] PwC. Interpretation of PricewaterhouseCoopers NFT Development Report (1): Application Scenarios. *Weiyang.com*, <https://www.weiyangx.com/401783.html>. Accessed 9 August 2023.
- [10] Corbet Shaen, et al. KODAK Coin: a blockchain revolution or exploiting a potential cryptocurrency bubble? *Applied Economics Letters*, 2019, 8.