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An overview of Blockchain Technology: Past & Future

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ABSTRACT

Blockchain technology is a decentralized database system utilizing predefined rules to store and validate data. The most popular implementation of blockchain technology is called the "permission less" blockchain which is managed by a consensus protocol of independent agents. In traditional ledger systems, data is typically recorded and maintained by a single central authority. Despite being around for 8 years, blockchain technology has yet to achieve mainstream adoption and widespread commercial applications. This could potentially be due to the complicated nature of the technology, the lack of clear regulation around it, and the general lack of awareness of the technology itself. It is promising however, that in recent years start-ups and well-established companies have been exploring and investing in the vast potential that blockchain technology can bring about. It is believed that blockchain could revolutionize various industries such as finance, healthcare, energy, and even government systems. Well-known use cases involve digital cash, smart contracts, and asset tokenization. With more industry pioneers pushing the boundaries and introducing innovative use cases, we can expect near future blockchain applications to transcend the digital cash use case and become more widespread. Blockchain technology has the potential to simplify, streamline, and secure payments, contracts, and databases, leading to increased cost efficiency and improved data integrity. Additionally, the use of blockchain technology eliminates the need for manual data entry and document processing, improving security, accuracy, and reliability in many areas. Therefore, this paper shows that blockchain technology presents an innovative solutions to many of today's problems and has the potential to improve many processes in different industries.

Keywords: Blockchain Technology, Digital Cash

CONCEPTUALIZATION

Stuart Haber and W. Scott Stornetta's late 1980s publication of their white paper, titled "How to time-stamp a digital document," established the basic idea behind blockchain technology [1]. In it, they describe a system in which documents are time-stamped and encrypted, thus creating a secure and tamper-proof record of the document [2]. This system provided the first proof-of-concept that laid the foundation of blockchain technology [3]. In subsequent years, advances in cryptography, distributed computing, and game theory allowed for the development of consensus algorithms, allowing for the transfer and recording of digital transactions without the need for a central authority [4,5]. This is the core idea behind blockchain technology, allowing for digital asset transactions to be securely exchanged and stored without the need for third party intermediaries or central authorities [6].Blockchain technology was born in 2008 as a result of research by a group of cryptographers, computer scientists, and economists to address the double spending issue of digital currencies [7]. It is a decentralized, distributed ledger technology that records, stores, and verifies digital transactions. This technology allows for data to be exchanged with great speed, permanence, security, and efficiency [8].By 2012, this technology had evolved to enable users to send, receive, and store Bitcoin securely, making digital currencies more decentralized and pseudonymous. In 2014, Ethereum released its blockchain code, enabling developers to create applications, including smart contracts and tokens, on a blockchain platform [9,10].Since then, blockchain technology has been adopted by many industries such as transportation, finance, healthcare, and many more, with the focus of streamlining data storage and improving security, transparency, and trust of digital transactions [11,12].

Bitcoin is a decentralized digital currency that is powered by a distributed ledger system called the blockchain. The blockchain is essentially a public ledger of all the transactions that have ever taken place in the Bitcoin network, and it is secured by a consensus algorithm known as Proof-of-Work [13]. The blockchain uses cryptography to ensure that no single user can modify or alter the blockchain records. This allows for secure, anonymous and tamper-proof transfers of digital assets, such as Bitcoin.Each transaction is stored in a block, and once the block is verified, it is added to the blockchain, creating an immutable record of the transaction that cannot be changed or altered [14,15]. By doing this, Bitcoin allows for more safety, security, and accountability than traditional payment systems, and it is these features that make it an attractive option for businesses and individuals alike [16].

Scope of Block Chain Technology

The purpose and scope of blockchain technology is to provide a secure and reliable platform for conducting digital transactions and exchanging digital assets. It can be used to store, track and transfer valuable assets, such as money,

stocks, bonds, property and commodities. Blockchain technology also enables smart contracts which allow users to set conditions before conducting a transaction, making it a secure and transparent way to conduct business [17,18]. Blockchain technology is also being used to create digital IDs, allowing individuals to securely store and share personal information, streamlining processes to areas such as healthcare and banking. In addition, blockchain technology is used for supply chain tracking, such as tracking the origin of goods and verifying the accuracy of products and services. Blockchain technology is being used in a wide range of areas [19,20]. These include finance, banking and insurance, healthcare, government and public services, internet of things and machine to machine communication, smart contracts, supply chain management, digital identity and digital asset management [21]. Blockchain technology is also being explored and adopted in many other areas, including energy, voting, construction and legal [22].

Categories of Block Chain Technology

1. Proof of Work (PoW): This type of consensus algorithm requires miners to solve a cryptographic puzzle before they can create and validate a new block. It is the most widely used algorithm and is employed by the original blockchain, Bitcoin [23,24].

2. Proof of Stake (PoS): This consensus mechanism requires validators to stake a certain amount of tokens in order to create blocks. These validators are also rewarded for their participation in network maintenance and are penalized for misbehaviour [25,26].

3. Practical Byzantine Fault Tolerance (PBFT): This consensus model uses a combination of consensus algorithms and Byzantine fault tolerance protocols to allow for quick and secure transactions. With PBFT, a group of predetermined validators take turns proposing and voting on the authenticity of a new block [27].

4. Delegated Byzantine Fault Tolerance (DBFT): It permits users to delegate their authority to a selected group of validators [28]. This delegation is voted on by the network as a whole, and validators who have the most votes have the authority to create new blocks. This system is designed to be more efficient than PBFT while still providing high levels of security [29].

5. Federated Blockchain: This consensus mechanism requires users to agree to the operations of a blockchain and the members of the federation. The federated members process transactions and agree to them before the network will allow them to be validated [30].

Blockchain technology removes the need for this central authority by using a decentralized network of computers, or "nodes", to validate every transaction with a cryptographic process. This subsequently reduces the cost and complexity associated with maintaining records and managing policies or regulatory requirements [31].

In terms of banking, blockchain technology can be used to facilitate international payments and remittances by providing a quick, secure and cost effective solution for the transfer of funds. By leveraging blockchain technology, banks, merchants, and money remitters can execute faster and safer transactions while reducing reliance on government financial systems [32]. In addition, banks can improve their customer experience by leveraging blockchain technology to provide an easy and secure way to open and manage bank accounts while also streamlining the process of applying for credit and loans.

In terms of contracts, blockchain technology can be used to improve the safety, reliability, and accuracy of document and data exchange by providing a self-executing system for contract registration and settlement [33]. Blockchain technology can also reduce the time lag for contract execution and improve cost efficiency due to its automated process. This can have beneficial implications for insurance and real estate sectors, thus reducing the need for document processing and eliminating the risks associated with manual data entry [34].

In terms of database systems, blockchain technology can be used to store structured data, such as medical records and land registrations. By using blockchain, these records become immutable, thus providing a higher level of security and privacy for individuals. In addition, blockchain technology can also reduce costs and errors associated with data integrity and data duplication. Blockchain technology presents great potential to transform a wide range of industries and services, particularly banking, contracts and database systems [35,36]. By leveraging the technology, financial institutions and businesses can reduce transaction costs, ensure more secure and efficient document exchange, and provide a higher level of data integrity [37].

Blockchain Technology Practices

Digital Payments: Blockchain technology can be applied in digital payments to provide a reliable, secure platform on which payments can be made with greater efficiency and transparency. The technology allows users to send electronic

payments directly to each other without the need for a financial intermediary, reducing transaction fees and processing times. Additionally, the distributed ledger ensures that all payments and transactions are secure, transparent and immutable [38].

1. Supply Chain Management: Blockchain technology can be used to optimize processes and increase transparency throughout the supply chain. It allows for transparent tracking of items from the time they are received until their delivery by recording information about supply chain participants and enabling easy auditability [39].

2. Smart Contracts: Blockchain technology enables smart contracts, which are digital agreements between two or more parties that are enforced without needing any third party. Smart contracts can be used to enforce a wide range of agreements, such as insurance contracts, escrow services, and more [40,41].

3. Identity Management: Blockchain technology is well-suited for identity management as it allows individuals to store and manage their identities securely. This can help mitigate identity theft, as users can specify who has access to their personal data [42].

4. Healthcare: Blockchain technology can help streamline operations in the healthcare industry by securely storing and transferring patient medical records, including medical histories and prescriptions. Additionally, its trustless nature can help ensure that only authorized parties can access these records [43].

5. Banking and Finance: Blockchain technology can be used to facilitate secure, immediate payments between two or more financial institutions. It can also be used to settle large transactions in seconds, reducing overhead costs and fraud [44].

CONCLUSION

Bitcoin is the first and most successful application of blockchain technology, offering users a secure, global and decentralized digital cash system. Bitcoin was designed to eliminate the need for a financial intermediary, such as a bank or credit card network, to facilitate digital payments. Transactions are processed through the peer-to-peer network of Bitcoin users and validated on the blockchain, immutable and public ledger.

An important factor for Bitcoin's success is its decentralized design, which makes it immune to government interference or manipulation, and thus provides an effective store of value for its users. Furthermore, Bitcoin enables users to make quick and cheap transactions, with transaction fees far lower than those imposed by third-party payment providers and much lower than traditional banking fees. All of these features have enabled Bitcoin to become the most popular and successful application of blockchain technology so far.

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