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Bitcoin As Innovative Technology: Security, and Decentralization

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Abstract

Bitcoin is one of the greatest innovations in modern financial technology. Bitcoin allows financial transactions to be conducted without the presence of financial institutions and is run by a decentralized peer-to-peer network. Due to the security and decentralization associated with Bitcoin, this digital currency has attracted the interest of many people around the world. However, behind all of its technological sophistication, Bitcoin also faces several challenges in Indonesia. Some of the problems that Indonesia faces include regulation, volatility, scalability, security, education, environment, and the legality of Bitcoin. The novelty of Bitcoin continues to evolve with the emergence of many new cryptocurrencies that try to address the problems found in Bitcoin, such as Ethereum and Ripple. Nevertheless, Bitcoin remains one of the most stable and popular cryptocurrencies in the world today. The purpose of our paper titled "Bitcoin as an Innovative Technology: Security, Decentralization, and Applications in the Future" is due to the fact that for the past three years, Bitcoin has caused a great sensation in both the real and virtual world, even though Bitcoin has been around since 2009, discovered by someone named Satoshi Nakamoto. Everyone is talking about Bitcoin. Therefore, our group wants to conduct research through a Systematic Literature Review on the future prospects of Bitcoin as a currency in the virtual world.

Keywords: Bitcoin, Innovative Technology, Security,

1. Introduction

The development of technology and information in the era of globalization has affected aspects of human life, including social behavior. This makes economic development very necessary to be improved. In the world of banking, the development of technology and information begins with the aim of supporting the welfare of society in economic growth, without forgetting the principle of caution. Economic development wrapped in technology has led to many activities being carried out via the internet, including electronic money as an online payment tool, as stated in Bank Indonesia Regulation Number 11/12/PBI/2009 concerning Electronic Money. Bitcoin exists as an online payment tool using an open peer-to-peer payment network. Bitcoin is not intended to resemble any physical currency issued by a bank, nor is it the currency of any country. Bitcoin is the world's first digital currency that uses the concept of cryptocurrency (Iskamto, 2023, 2023, 2024). The purpose of this group to create a paper is because it is a Course Learning Outcome 1 assignment as a substitute for the second semester mid-term exam in the Technology Literacy course taught by lecturer Dedi Iskamto. This group took the title "Bitcoin as an Innovative Technology: Security, Decentralization, and Future Applications" because in the last 3 years bitcoin has been very popular in the

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real world and the virtual world, everyone is talking about bitcoin. Therefore, our group wants to conduct research through a Systematic Literature Review regarding the future prospects of bitcoin as a currency in the virtual world. In its development, Bitcoin still has many shortcomings. There are several problems faced by Bitcoin. Some of them are price volatility that fluctuates and can change significantly in a short time, vulnerable to security attacks, regulations that have not been officially regulated by the government, scalability and accessibility difficulties for those who do not have an internet connection or adequate devices. Some of the latest findings related to Bitcoin are increasing adoption among financial institutions, the growth of the NFT market, several countries that have begun to implement regulations on the use of Bitcoin, increasing transaction capacity and the use of Bitcoin for long-term investment.

2. Method

This study uses Systematic Review as the main approach to collect data and information related to research questions, topics, or online lending phenomena. Systematic Review is a research method that systematically identifies, evaluates, and interprets all relevant research results related to the research topic. In this study, Systematic Review is used to gain a comprehensive understanding of Bitcoin, by analyzing and combining all existing related research. In this way, this study can provide accurate and reliable information about Bitcoin, as well as provide appropriate recommendations for policies or practices related to Bitcoin.

3. Results and Discussion

Blockchain and Bitcoin

Blockchain is a technology based on the principle of distributed ledgers and cryptography which is very useful for verifying transactions or data assets through a peer-to-peer network. (Blockchain Application et al., 2022) One of the advantages of this technology is the security and reliability of data obtained from the ability to replicate and verify data from one server to another in the network, thus ensuring the authenticity and integrity of the data in the ledger. (Ausop et al., nd-b) In addition, blockchain technology can also be applied in various sectors such as libraries, public services, archives, and population registration administration and state transactions. However, adequate preparation of supporting factors is needed to maximize effectiveness and efficiency in its implementation.The application of blockchain technology requires preparation of various supporting factors in order to produce maximum results in the applied field. This is because blockchain technology has special characteristics and follows certain standards. However, if prepared properly, blockchain can provide great benefits for libraries, public services, archives, population registration administration, and state transactions. In its use, this technology ensures the security and reliability of data contained in the distributed ledger, thereby preventing errors and misuse of data that can occur in conventional systems. Therefore, the application of blockchain can help increase effectiveness and efficiency in various sectors, as long as the preparation of supporting factors is adequate. (Nugraha, 2020). Meanwhile, Bitcoin is a digital consensus network that allows online payments without intermediaries. This digital currency has a decentralized nature that allows users to have full control without any central authority or intermediary. In Bitcoin, users can make transactions directly without the need for third-party services such as banks. In addition, Bitcoin also allows users to buy various goods on the internet using the digital currency. Bitcoin is recognized as a unique, durable, and agreed legal tender by users.

Bitcoin is the first digital currency that uses the concept of Cryptocurrency, which is designed as an intermediary exchange using cryptographic techniques to secure transactions and control the administration of its currency units. In Bitcoin, users can secure transactions and ensure the security of their own assets,

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without having to rely on third parties such as banks. This makes Bitcoin an attractive alternative to the traditional financial system which still requires many intermediaries and additional costs. (What's The Difference Between Bitcoin and Traditional Currencies?, nd) In its development, Bitcoin has become increasingly popular and is recognized as one of the attractive forms of investment with a high level of risk.

History of Bitcoin

The history of Bitcoin began with the first public appearance of Bitcoin in January 2009, when someone or a group of people using the name Satoshi Nakamoto launched the open source code of Bitcoin software. (History and Development of Bitcoin, nd). The first block of the bitcoin blockchain can be interpreted as a statement, suggestion, or simply as a date stamp:"The Times 03/01/2009 Chancellor on the verge of second bank bailout" This was one of the main headlines in the Times that day. It is possible that Nakamoto simply picked the first headline he saw in the next paper. However, ardent cryptocurrency advocates agree that it has special significance. At the time, the 2008 financial crisis was still ongoing and Bitcoin was likely a response to the anger and frustration with the state of our financial system at the time. The Bitcoin code was probably created in 2007, and the first evidence of its existence was in August 2008 when the domain name "bitcoin.org" was registered. A few months later, a crypto mailing list received a report titled "Bitcoin: A Peer-to-Peer Electronic Cash System" and "Satoshi Nakamoto" as the author.

Basic Concept of Bitcoin

Bitcoin is a digital currency or cryptocurrency created in 2009 by someone using the pseudonym Satoshi Nakamoto. The basic concept of Bitcoin is a decentralized payment system that is not controlled by a central party, such as a bank or other financial institution. Instead, Bitcoin transactions are processed peer-to-peer through a distributed network of computers called the blockchain. Decentralization is a core principle of Bitcoin, allowing transactions to be automatically processed and recorded on the blockchain without the need for intermediaries or third parties. By not being controlled by a central party, Bitcoin gives users complete control over their assets and allows transactions to be made without geographical or time constraints.nonymity is also an important characteristic of Bitcoin. The identity of a Bitcoin user is not revealed in transactions, instead, a Bitcoin address is used as a substitute for the user's identity. This makes Bitcoin transactions more secure and maintains the privacy of its users. Although anonymity in transactions is a feature that many Bitcoin users want, with the rise of cybercrime and illegal activities that take advantage of anonymity, there are efforts to monitor and regulate Bitcoin transactions by governments and international financial institutions. Transparency is another feature of Bitcoin. Although the identity of the user is not revealed in transactions, Bitcoin transactions are recorded publicly on the blockchain, which allows for transparency and auditability. Every Bitcoin transaction is recorded on the blockchain, and every user can view and verify the transaction. This feature allows Bitcoin users to track and check every transaction made with their assets.I mited supply is also a unique feature of Bitcoin. There will only ever be 21 million Bitcoins, making them much rarer than fiat currencies that can be printed endlessly. This makes Bitcoin a deflationary asset, unlike fiat currencies that experience inflation. The process of mining is used to validate transactions and create new Bitcoins. This process involves using computing power to solve complex mathematical problems and verify transactions on the blockchain. The mining process also ensures the security and reliability of Bitcoin transactions, giving users confidence in the Bitcoin system as a whole. Overall, Bitcoin is an innovation that changes the way we view payment and financial systems.

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Bitcoin allows users to have full control over their assets and make transactions easily and quickly without any time and geographical restrictions. With unique and innovative features, Bitcoin continues to grow and become one of the assets that attracts the attention of investors and users around the world.

Bitcoin Security and Decentralization

Bitcoin is a decentralized currency secured by cryptographic algorithms and blockchain technology. Transactions on the blockchain are verified and processed by a network of nodes or miners, who reach a consensus on the validity of transactions. The decentralized nature of bitcoin makes it resistant to censorship, fraud, and manipulation. The security of the blockchain makes bitcoin difficult to change or corrupt. With bitcoin operating without being tied to any central authority such as a central bank or government, it allows the bitcoin network to operate peer-to-peer without the need for a central authority to validate each transaction. However, each transaction using bitcoin will be verified by miners or a network of nodes with new bitcoins rewarded to miners. The advantage of bitcoin decentralization is that no single party can control or manipulate transactions. This makes bitcoin more secure and transparent because transactions are recorded publicly and can be monitored by anyone. (Bitcoin for Individuals - Bitcoin, nd) In addition, decentralization also allows the transfer of value between users directly, without the need for a third party such as a bank or other financial institution, so that transaction costs can be cheaper and more efficient. Although bitcoin's decentralization allows users to make transfers without the need for a third party, bitcoin is still vulnerable to security attacks. Some forms of attacks on bitcoin include: 2) 51% attack: a 51% attack occurs when a group of bitcoin miners have control over 50% of the computing power connected to the bitcoin network. In this case, the miners can easily manipulate transactions or produce invalid blocks. 3) DoS attack: a Denial-of-Service (DoS) attack occurs when an attacker tries to stop access to the bitcoin network by flooding the network with many invalid or irrelevant transactions. 4) Phishing attack: A phishing attack is an attack that aims to obtain sensitive information such as a user's password or private key. 5) Attackers can use fake emails, fake websites or applications to trick users into providing their personal information. 6) Double-Spending attack: A double-spending attack occurs when someone user tries to send the same Bitcoin coins to two recipients Whichdifferent. This can be done by manipulating the blockchain or transaction

Bitcoin Technology

Bitcoin is a technology and digital currency that bases its security on cryptography and peer-to-peer networking. Here are some of the main technologies used in Bitcoin: Blockchain: Bitcoin ownership and transactions are protected by blockchain technology. Blockchain is a computer software that contains a database that acts as a global ledger with a distributed computer system across a network of computers of all bitcoin users according to an agreed peer-to-peer protocol. A technology that allows bitcoin transactions to be stored in a decentralized and encrypted manner. Each blockchain block contains many transactions, and each block is connected to the previous block, creating a chain of transactions that cannot be tampered with or manipulated.

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Cryptography: Cryptography comes from the Greek language. Crypto means "secret or hidden" while graphy means "writing". So cryptography is secret writing or secret signature, digital signature. From a scientific point of view, cryptography is the intersection of natural science, mathematics, computer science, and electrical engineering. Encryption is based on specially created encryption algorithms that are used to validate and authenticate transactions that occur. Cryptography refers to encryption, which is text that is converted into characters/symbols. In cryptography, characters, symbols, or ciphers are used for encryption. The readable characters in the bitcoin owner's cipher are just random numbers and letters that are 33 characters long or even longer, which makes it difficult to decipher. Bitcoin uses cryptography to secure transactions and control the creation of new bitcoins. Cryptography is also used to protect the private keys used to access bitcoins. Peer-to-peer network: Peer-to-peer is connecting from one computer to another in a large network of all Bitcoin users. Bitcoin uses a peer-to-peer network that allows transactions to be carried out directly between users without an intermediary. Each node in the network has a complete copy of the blockchain that is automatically synchronized with other nodes. Mining: Bitcoin allows users to mine, which involves using computing power to process transactions and validate new blocks in the blockchain. When an instruction moves 1 Bitcoin from person A (subtract) to person B (add), miners scramble to validate it by solving complex algorithmic formulas to ensure the instruction is correct. This process also allows users to earn new Bitcoins as a reward for their efforts. The reward is not from existing Bitcoins. The Bitcoin algorithm has been designed to produce 21 million Bitcoins by the year 2124. Wallet: A Bitcoin wallet is an application or device used to store Bitcoin and send transactions. A wallet can be software installed on a computer or mobile device, or hardware provided by a third party. Bitcoin wallets are protected by a private key known only to their owner.

The Uniqueness of Bitcoin

The uniqueness of Bitcoin compared to conventional currencies First of all, Bitcoin is decentralized and not controlled by a central party such as a bank or other financial institution. Unlike conventional currencies that are controlled by a central bank or government, Bitcoin users have full control over their assets. This gives Bitcoin users greater freedom and flexibility. Furthermore, Bitcoin also provides better anonymity for users. The user's identity is not revealed in transactions, only the Bitcoin address is used as a substitute for the user's identity. This provides better security and privacy for users, even though the transactions are recorded publicly on the blockchain. Although the user's identity is not revealed in transactions, Bitcoin transactions are recorded publicly on the blockchain. This allows for transparency and auditability, so that anyone can verify transactions. So, even though they are anonymous, Bitcoin transactions are still recorded openly on the Bitcoin network. Another unique feature is the limited supply. There will only be 21 million Bitcoins that will ever exist, making it rarer than fiat currencies that can be printed endlessly. This makes Bitcoin harder to devalue and safer from inflation. The mining process is used to validate transactions and create new Bitcoins. This process involves using computing power to solve complex mathematical problems and verify transactions on the blockchain. This provides greater security and trust in Bitcoin transactions. Lastly, Bitcoin is not tied to any government, so it is not affected by the monetary or political policies of the government. This provides greater freedom and flexibility for Bitcoin users. Overall, it shows that Bitcoin has unique features that set it apart from conventional currencies and provide greater freedom

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and flexibility for Bitcoin users. Therefore, Bitcoin is increasingly popular as an alternative to conventional currencies in trading and investment.

Future Potential

Based on research and analysis indicates that bitcoin has the potential to develop in the future including (Nabila, nd). 1). Bitcoin can fundamentally change the way we transact. 2) McKinsey & Company They say that blockchain technology, which underlies Bitcoin, can help reduce transaction costs and increase efficiency, which in turn can trigger new business growth and increase global prosperity. (Company M, nd). 3) Bitcoin can maintain its position as the largest and most recognized digital asset in the world. 4) Forbes shows that since its inception in 2009, Bitcoin has grown dramatically and even survived many bubble bursts. Bitcoin has become more stable and continues to be accepted as a legitimate form of payment. (Forbes, nd). 5) Research firm Glassnode that the number of long-term Bitcoin investors has increased significantly, indicating that there is a long-term belief in Bitcoin's growth. (Schultze-Kraft R, 2020). According to the report, "the number of long-term Bitcoin holders hit a new record high, indicating that investors believe in the asset's long-term potential and are not distracted by short-term market volatility."

Challenge

Despite its great potential, Bitcoin also faces a number of challenges, including: Regulation: The development and use of cryptocurrency (bitcoin) is increasingly widespread in Indonesia. (Made et al., nd) The increasing intensity of the growth of cryptocurrency users will also create new challenges for cryptocurrency (bitcoin), namely regulation. Bitcoin and cryptocurrency in general are still considered an unregulated area in many countries. Many countries in the world still do not have the same attitude in creating cryptocurrency. Some countries choose to be open and implement rules for the use of bitcoin, as well as countries that firmly oppose the proliferation of bitcoin because it has criminal potential and does not meet the requirements for the use of bitcoin. must be a currency. Therefore, many governments and regulators are still trying to find ways to regulate and control activities related to cryptocurrency, including Bitcoin. This can affect the adoption and growth of Bitcoin in the future. Volatility: Bitcoin is very volatile and its value can rise and fall very quickly. Although volatility can provide great profit opportunities for investors, it also has the potential to cause great losses for those who do not understand the risks of investment. Scalability: Bitcoin requires a lot of time and costs to validate transactions on the blockchain, especially when there are many transactions taking place at the same time. This can affect the speed and efficiency of Bitcoin usage. Security: Some people in the scientific community argue that the issue of personal data security in the blockchain system is not completely safe. Bitcoin and other cryptocurrencies are vulnerable to cyber attacks and crimes such as hacking, fraud, and theft. These security issues can affect public trust in Bitcoin and can hinder the adoption and growth of Bitcoin in the future.

Education: Limited knowledge of Bitcoin. Although Bitcoin has been around for several years, many people still do not fully understand what Bitcoin is and how to use it. This lack of understanding of the technology could hinder the adoption and growth of Bitcoin in the future. Environment: Bitcoin mining requires a lot of energy and can have a negative impact on the environment. (Liputan 6, 2021) This mining process uses special hardware that requires a lot of power, which can increase carbon emissions and increase environmental impact. Legality of Bitcoin: To prevent people from participating in bitcoin transactions and

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virtual currency investments, the government through Bank Indonesia has banned bitcoin investment. On February 16, 2014, Bank Indonesia declared bitcoin virtual money and other virtual currencies as illegal offerings. The Chairman of the OJK Supervisory Board, Wimboh Santoso, also prohibited all financial actors from trading or mining Bitcoin. . Bank Indonesia has imposed strict sanctions on banks or payment services that serve Bitcoin transactions (Sajidin, 2021). Overall, Bitcoin still faces a number of challenges, but with the right innovation and solutions, these problems can be overcome to achieve the full potential of this technology.

4. Conclusion

Bitcoin is a digital currency that is not regulated by a central authority such as a central bank or government. Its security and decentralization are the hallmarks of Bitcoin, making it less susceptible to censorship, fraud, or manipulation because transactions are recorded publicly and can be viewed by anyone. In addition, decentralization also allows for the transfer of value between users directly without going through a third party, making transaction costs cheaper and more efficient. However, Bitcoin is still vulnerable to cybercrime such as 51% attacks and double-spending attacks. Bitcoin also has the advantage of anonymity, which makes it more secure and private. The identity of the user is not revealed in the transaction, making anonymity attractive to many Bitcoin users. However, illegal activities and cybercrime that take advantage of Bitcoin's anonymity have led governments and international financial institutions to try to regulate and monitor Bitcoin transactions. In addition, Bitcoin's supply is limited, unlike fiat currencies that can be printed endlessly, making it a deflationary asset and unlike fiat currencies that tend to experience inflation. The mining process is used to validate transactions and create new Bitcoins, and this ensures the security and reliability of Bitcoin transactions so that users can trust the Bitcoin system as a whole. With its innovative and unique features, Bitcoin continues to grow and become one of the assets that attracts the attention of investors and users around the world.

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3