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Blockchain Technology Challenge in the Future: Data Security and Efficiency

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ABSTRACT

The use of blockchain technology in digital data security and efficiency in the future can provide many benefits. However, this technology also has several challenges, therefore it is necessary to continue to develop blockchain technology and find ways to overcome existing challenges. Then with all the advances in blockchain technology whose existence has been felt by most people around the world, can blockchain technology provide efficiency in terms of time and cost? Does blockchain technology guarantee higher data security? Are there challenges faced by blockchain technology? What are the challenges faced by blockchain technology? How to deal with the challenges of this blockchain technology? The purpose of this writing is, It is hoped that this writing can explain about blockchain technology, the use of blockchain technology, how blockchain technology systems work, the challenges of blockchain technology, in digital data security, and the efficiency of blockchain technology in the future. So, it is hoped that this research can provide a better understanding of blockchain technology and the potential development of blockchain technology in the future. In this study, the method we will use is the Systematic Literature Review (SLR) method. It is hoped that by using this method blockchain research can get concrete or justifiable evidence so that the findings will be obtained from the results of the experts that were developed.

INTRODUCTION

increasingly advanced digital era, digital data security and efficiency in data storage are very important. because the digital data stored will be the target of attacks by irresponsible parties. In addition to low data security, the process of exchanging and storing data is also slow because it has to involve a third party. therefore, blockchain technology will be an attractive solution to address challenges in digital data security and efficient data exchange in the future. According to(Utomo, 2021, p. 1)Blockchain technology uses a distributed ledgers system with a high level of security, therefore the transaction process or data exchange will be more secure and tight. Blockchain is a technology based on cryptography that uses a distributed system (Agustina & Rosalia, 2022; Iskamto, 2017, 2021).

According to(Utomo, 2021, p. 2)Blockchain is increasingly popular which is the subject of discussion by various parties, because blockchain is a new technology that provides alternative solutions in data security. And Bitcoin is one of the digital money (Cryptocurrency) created from blockchain technology. According to(Triantonno., p. 1)based on an article in Chartered accountants (2017) that blockchain is a distributed ledger in which records are stored and sorted for each block. So, it can be concluded that the blockchain is a collection of blocks that contain transactions that are linked to one another. Because each block will definitely refer to the previous blocks and so on so that it will form a link.(Chatterjee & Chatterjee, 2017)a transaction or event that has been entered into the blockchain, it is impossible to change or manipulate its contents, because every user or member in the network can monitor every transaction that occurs.According to(Khaerunisa & Enjat Munajat, 2022, p. 3) In Indonesia itself there are still many negative perspectives from blockchain technology as a result of the news of misuse of Bitcoin for illegal transactions. Apart from that, there are still many other challenges that have not been optimal in implementing blockchain technology in Indonesia, such as the quality of human resources for the development of blockchain technology which is still quite low, technical and data management which is still not optimal. But behind these challenges there are positive benefits from blockchain technology, because of blockchain technology, problems in data transaction errors will be minimized because every block that has been input into the system cannot be changed or double input. and a verification system that can be carried out only once by each individual.

However, despite these challenges, (2022, p. 3) Industry professionals predict that although currently blockchain technology is still in its early stages of development, in the future it will become the standard in various industry sectors. They see a big opportunity in the development of this technology.Overall, blockchain technology does have a lot of positive impacts such as reducing expensive fees, only requiring fast data recording time and being more efficient and guaranteeing higher security. although there are still many challenges that need to be faced and can be solved by developing blockchain technology in the efficiency of digital transactions in the future.The understanding of this blockchain research is very broad and really needs further research to describe the development and system of this blockchain. This study aims to examine how blockchain technology can be utilized in industry, explore how blockchain technology systems work, identify challenges faced in its implementation, and explore the potential efficiency of blockchain technology in the future. Thus, this research is expected to provide a more comprehensive understanding of blockchain technology and its impact on the world of the future. as well as the potential development of blockchain technology in the future.

METHOD

In writing this research, the method we used is Literature Review (SLR) which is a research method used by collecting various sources of information from several journals, scientific articles, and various sources of literature that are relevant to our research topic. Our goal of this research is to gain a good understanding of the Application of Blockchain Technology in Digital Data Security and efficiency in the future. We also use several case studies as part of the data analysis in this study. There are several case studies that we have selected, namely the application of blockchain technology in the financial, accounting, banking, e-commerce, health and education industries, some of which have been successful in implementing blockchain technology in their industrial sectors. This case study is used to strengthen the conclusions we will draw about the efficient use of blockchain technology in the future.

DISCUSSION RESULTS

Use of Blockchain Technology in Various Sectors

Blockchain technology is present as an innovative solution to existing data security problems to address various problems in various sectors. In the financial sector, blockchain can be used to speed up and improve transaction processing systems, so as to ensure the security and reliability of transactions and data, and reduce other transaction costs. In various sectors, blockchain can be used to develop digital currencies such as Bitcoin. In addition, blockchain technology can also be applied in various industrial sectors such as logistics and supply chain, because it can help track assets, optimize the delivery of goods, and can increase transparency and accountability in the entire supply chain.

Blockchain is a technology for storing transactional information electronically without the help of third parties such as banks or governments. According to(Suprayitno & Cempaka Timur, 2022, p. 29) Blockchainsprovides both opportunities and challenges when applied to reducing single points of failure in emergency decision-making systems. Blockchain technology brings solid evidence for convincing decision making. In addition, blockchain can make the network used during emergency decision making significantly antifragile. The concept of antifragile is to further increase the resilience or toughness, in other words this system will get stronger the more people or machines damage it. Blockchain technology enhances capabilities by enabling a version of truth, immutability of data and automated processes. Combining blockchain technology with machine learning algorithms will enable multi-stakeholder systems to continuously improve themselves, react better to future challenges, and perhaps even anticipate potential problems. According to(Suprayitno & Cempaka Timur, 2022, p. 30)Blockchain technology can help ensure the state and effectiveness of operational networks and large ecosystems remain functioning during the decision-making process in emergencies and disasters. Blockchain technology can be programmed to root, isolate, and mitigate attacks aimed at exploiting a single point of failure on any network. According to(Suprayitno & Cempaka Timur, 2022, p. 31)Blockchain technology acts as a guarantor of trust in the procurement ecosystem by enabling greater visibility and collaboration between origin and destination. Around the world, supply chain dependent companies are turning to blockchain technology. Blockchain technology can bring defense supply chains into the future by bridging the gap between the physical and digital worlds and developing a logistics ecosystem driven by collaboration and trust.

According to Princess et al., (2022, p. 176) Blockchain technology is a fast, secure, valid and unquestionable way to carry out transactions, as well as a reliable distributed control mechanism, which eliminates the possibility of breach, both because the data is public and because the encryption method is nearly inviolable. Blockchain technology is a desirable tool for solving online Education problems, such as insecure data. This technology is generally applied in the fields of finance, the internet, and the internet of things (IoT). In addition, blockchain technology has been adopted for product design in the industrial sector. According to Paulus et al., (2022, p. 98) As a decentralized ledger technology, blockchain provides a trusted and secure platform for digitally recording transactions. In this case, blockchain is able to strengthen transparency and accountability, as well as increase efficiency and security in the transaction process. Blockchain systems help strengthen data security by reducing the risk of data manipulation or fraud. In addition, the transaction process becomes faster and more efficient because there is no need to go through intermediaries, so that the costs and time required can be reduced. In this case, the use of blockchain allows users to enjoy the advantages of trusted and secure advanced technology. According to Indonesian Christian University Paulus et al. (2022, p. 99) One of the characteristics that differentiates blockchain from other technologies is the shared ledger that stores transactions between parties. This allows multiple authors to log transactions, making the process of recording transactions more decentralized. In this case, there is no need for trust between participants, because transactions are recorded in an open and transparent manner. In addition, the blockchain system also provides secure and identifiable records, allowing users to validate transactions without having to rely on trusted individuals. Blockchain is also tamper-proof, so recorded transactions cannot be manipulated or changed by certain parties. Overall,

Utilization of Blockchain Technology

Blockchain is a technology for storing transactional information electronically without the help of third parties such as banks or governments. Until now the benefits of blockchain are most often used to secure cryptocurrency transactions such as bitcoin, digital currency, or various other forms of digital assets. According to Triantonno (2022) Blockchain has considerable influence in accounting technology innovation. Fraud accounting is a field of accounting that can utilize blockchain technology in order to prevent fraudulent accounting practices. Larasati (2017) uniting fraud prevention efforts influenced by

the role of internal control, whistleblowing system, and good corporate governance. This means that blockchain must also affect these three things if it is applied as an alternative to preventing accounting fraud such as manipulation of financial statements, impersonation or account concealment.

According to Khaerunisa & Enjat Munajat, (2022, p. 266) Blockchain technology shows the potential for revolutionizing accounting practices to make them more efficient (EY, 2020, p. 266). Blockchain has a decentralized system, peer-to-peer transmission, transparency through encryption, permanent and based on digital programming (Lansiti and Lakhani, 2017, p. 266). According to Augusta et al. (2022, p. 2) Blockchain is a record (database) that will continue to grow, called a block, which is connected and secured using cryptographic techniques. Abd Ali et al. (2023, p. 3) A block consists of two important components: the head and the body. The head contains the hash of the previous block, block creation time, and the nonce. Meanwhile, the block body contains a list of transactions stored in that block. Thus, a block can be considered as a package that contains information about transactions as well as additional information needed to ensure the integrity and security of the data stored in it. According to Augusta et al., (2022 p. 3)This blockchain technology is that an organization does not have to be responsible for one server (server) because all data will be applied to the entire network (nodes) so as to avoid changing/adding data without the consent of other members, server down, or the crime of hacking user accounts. Blockchain technology is data security, this makes blockchain ideal for storing data vulnerable to manipulation. Blockchain has the potential to guarantee student identity, privacy, and data security. As previously mentioned, blockchain data is permanent and cannot be changed. Blockchain can streamline records such as digital certificate and intellectual property management, diploma verification, and fast and reliable monthly cash payments. Blockchain makes students unable to falsify grades, majors, and certificates that make it easy for recruiters to ensure that job applicants have the skills needed for the job. Broadly speaking, blockchain technology which is a distributed ledger can increase the transparency of student academic records.

According to Firmanto,(2019) Blockchain is a feature that companies can use to participate in monitoring the income and expenses of other divisions without any restrictions. Blockchain is used to establish anti-fraud relationships between company management and external parties such as investors or owners, IDX (Indonesian Financial Exchange), OJK (Financial Services Authority), BI (Bank Indonesia) for financial institutions, internal auditors, external auditors and other stakeholder parties related to the company. Blockchain as a concept for implementing accounting fraud prevention can be utilized by internal companies.

According to (Sansone et al. (2023, p. 6) Blockchain provides an opportunity for individuals, non-profit organizations and local organizations to make donations directly without the need to go through multiple intermediaries. This can reduce the costs and time required to perform transactions, while enabling highly detailed audits of donation flows. Donations made on the blockchain are recorded on a decentralized ledger that anyone can access and check. In this case, the level of transparency and accountability is very high, because donors can directly follow the flow of their donations and ensure that the donations are actually received by the intended party. In this way, blockchain can be a solution to increase public trust in institutions and organizations that manage donations. According to Li & Chen, (2022, p. 10) Blockchain technology has three main benefits in strengthening supply chains. First of all, blockchain helps facilitate the exchange of information among business processes in the supply chain. It is very important to ensure that the data sent is correct and reliable. Second, blockchain technology enables information tracking with high accuracy, making it easier for users to find out the origin and condition of products, as well as the status of shipments. Lastly, blockchain also strengthens trust and cooperation among stakeholders in the supply chain network. As a result, the use of blockchain in supply chains can increase efficiency and transparency, as well as strengthen trust among stakeholders.

How the Blockchain Technology System Works

The blockchain technology system is the latest technology that uses a distributed network to record transactions in a decentralized manner. According to Putri et al. (2022, p. 3)These features of blockchain technology can produce systems with particular advantages in terms of reliability, trust, security and efficiency. Blockchain technology uses a fast, secure, valid and unquestionable system for conducting transactions, as well as a distributed control mechanism. which causes minimizing violations, both because the data is public and because the encryption method is almost inviolable. How blockchain technology works, every transaction made will be recorded in the form of a block containing information such as date, time, number of transactions, and other data. Every block of transactions created will be verified by the network, namely the users connected to the network. Once verified, transaction blocks will be added to the blockchain into a series of transaction blocks that are connected to one another. Every block in the blockchain will be encrypted using cryptographic technology to secure data and prevent changes or manipulation of data. and the data recorded on the blockchain is stored on multiple computers connected to the network, so that it is not centralized on one server or institution alone.

According to Putri et al., (2022, p. 3)although the application of blockchain technology is about digital currency (Bitcoin), its use is no longer limited to Cryptocurrency or the economic field. This means that blockchain technology systems can be used in various fields such as the financial industry, accounting, banking, e-commerce, health and education. According to Putri et al. (2022, p. 4)because of blockchain technology, in the education sector, student learning can be carried out across regions and time. This will certainly increase the efficiency of any educational platform or organization to be able to record the trajectory of student learning data, blockchain-based learning records, prevent and minimize disruption and deletion, and offer good assurance. So, from data based on this Blockchain Technology, it can effectively prevent hard fraud, fake academic data, and other violations in various industrial sectors. According to(Indonesian Christian University Paulus et al., 2022, p. 12)that CPA Canada (2017) mentions that blockchain provides an opportunity to streamline financial reporting and audit processes. it can be illustrated by the reconciliation of accounts, trial balances, Journal entries, ledgers and supporting spreadsheet files which are made available to auditors in various electronic and manual formats. thus, it will be very time-consuming when planning an audit.

Swan (2015, p. X) stated blockchain is a public ledger that records all Bitcoin transactions that have ever been made. Every 10 minutes, miners add a new block to the blockchain to record the latest transactions so that the blockchain continues to evolve over time. Thus, blockchain allows Bitcoin users to verify transactions quickly and accurately without having to involve third parties, such as banks or other financial institutions. In this case each block added to the blockchain has information about Bitcoin transactions that occur on the network. This information includes data such as sender, receiver, amount of Bitcoin transferred, and transaction time. Therefore, blockchain allows Bitcoin users to verify transactions and track the flow of funds transparently and accurately without having to involve third parties, such as banks or other financial institutions. Today, blockchain technology is used not only to record Bitcoin transactions, but also for other applications such as decentralized data storage, digital identity, and even to facilitate faster and more secure financial transactions outside of the Bitcoin network.

According to Wilda & Harris (2022, p. 4) the working system of a decentralized public blockchain with high capabilities makes it easy for tourists to access transactions easily, these transactions can be spread evenly so that anyone can see these transactions. According to Rahardja et al., (2020, p. 2) the application of blockchain technology to enhance the security of e-commerce systems is an urgent need.

Because in processing transactions with digital media, of course there are several problems such as high intermediate fees, low payment efficiency, centralized security risks. E-commerce transactions have their own records which are sometimes inefficient and expensive. According to Swan (2015, p. 12) blockchain is like an application layer that runs on top of the existing Internet protocol stack, adding a new level to the internet to enable economic transactions, whether direct digital currency payments. So, in this way of working, the blockchain technology system can enable transactions to be made between two parties without the need to go through a third party intermediary. Apart from that, blockchain can also be used to build applications that can verify identities, store medical records or conduct electronic voting.

Blockchain Technology Challenge

Blockchain technology has enormous potential to change transaction processes in various sectors, but blockchain technology also has several challenges that must be overcome first before this technology can be widely applied and there are some that need to be developed in blockchain technology. there are several challenges to blockchain technology in various industry sectors. According to(Utomo, 2021, p. 23)Due to limited knowledge about using blockchain technology it will be quite complicated to implement it, because blockchain is not a simple system. Knowledge of blockchain technology is of course still very limited. According to Utomo (2021, p. 25)That every application of new technology always requires a lot of costs, because it is not just the cost of procuring the technology, but other additional costs. such as training costs for the company's staff who will spearhead the operation of the blockchain technology. and it is also necessary to consider whether the application of this technology is carried out in stages or not, because the longer the process of implementing blockchain technology, the greater the additional costs that need to be incurred.

According to Utomo, (2021, p. 25)The cost of maintaining and developing blockchain technology must also be a big and main consideration. because maintenance and development costs are ongoing and in the long term. According to Utomo, (2021, p. 26)It turns out that quite a number of computer experts who have studied blockchain remind that the issue of personal data and security in blockchain technology is not completely perfect. still needs further development. According to Yuki, (2021, slide 4) The fact on the ground is that so far there are still many companies that have not taken advantage of developments in blockchain technology, because blockchain is still tied to cryptocurrency, which means that the blockchain used is still a public blockchain. According to Suprayitno & Cempaka Timur (2022, p. 22) Bank Indonesia as the payment authority in Indonesia has determined that cryptocurrencies are not recognized as legal tender in Indonesia. this is in accordance with the provisions in Law no. 7 of 2011 concerning Currency which states that currency is money issued by the Unitary State of the Republic of Indonesia and every transaction that has the purpose of payment, or other obligations that must be fulfilled with money, or other financial transactions carried out in the territory of the Unitary State of the Republic of Indonesia must using Rupiah currency.

Even though blockchain technology has a lot of potential in various sectors, there are still certainly some challenges in its implementation. In the Financial Sector, the challenge of using blockchain technology is that regulation and security of financial data are still issues that need to be addressed. This is one of the main challenges in implementing blockchain in the financial sector is overcoming regulatory and security barriers. due to regulations that are still unclear and regulations that are of course different in each country. this could limit the application of blockchain within the financial industry sector globally. Apart from that, the issue of security level is still an issue that continues to be discussed, because the risk of cyber attacks can damage privacy and can be a serious threat in implementing blockchain technology. Another bound challenge is the scalability issue of using blockchain technology. within the logistics and supply chain industry sector, requires blockchain technology to assist in tracking assets and increase transparency. but limited scalability is a problem that needs to be addressed. Because if this problem cannot be resolved, it will hinder the application of blockchain technology on a larger scale. Blockchain technology also still has limitations in terms of the number of transactions.

Blockchain technology also has a limited capacity to process all transactions. The number of transactions a blockchain can process depends on the block size and time required. So, when many transactions are happening simultaneously, it will take longer to mine blocks, which can result in delays and higher transaction fees. This blockchain technology transaction also requires a fairly expensive fee to process it. these costs can be a problem in sectors with low profit margins such as agriculture or the small and medium sector. Because blockchain is a new technology and is still in the process of being developed. Therefore, there are many people or organizations who do not yet understand how blockchain can be used effectively in various sectors, and it may still take time for everyone to adapt to this technology. So, these challenges will always exist when blockchain technology continues to develop and be applied in various sectors. However, with efforts to find the right solutions, of course, blockchain technology can overcome these challenges and provide enormous benefits for various industrial sectors and society as a whole.

Future Efficiency of Blockchain Technology in Various Sectors

Blockchain technology has developed rapidly in recent years and offers a lot of potential to improve efficiency, security and transparency in various sectors in the future. With its decentralized, encrypted and trustworthy characteristics, blockchain can be implemented to solve problems and improve processes in various sectors, such as finance, healthcare, logistics, trade and others. In this context, we will discuss the future efficiency of blockchain technology in various sectors, as well as why blockchain technology must be adopted to provide great benefits to people and industries around the world.

In 2016, a blockchain-based decentralized system called "MedRec" was developed to manage electronic health records (EHR)(Liu et al., 2019, p. 2). The MedRec system was developed with the aim of addressing security and privacy issues in exchanging medical data between health institutions. In addition, the MedRec system also provides benefits in the fields of data economics and medical research. The system provides access to large amounts of medical data for researchers, and also gives patients and healthcare providers the option to publish certain metadata. Thus, the MedRec system has the potential to enhance collaboration between researchers and healthcare providers in improving the quality of healthcare.(Liu et al., 2019, p. 2)proposes a blockchain-based medical data sharing scheme to increase the diagnosis rate. The scheme uses a private blockchain owned by the hospital to store patient's personal health data, while the blockchain consortium is used to maintain the security index. However, it should be noted that the implementation of the scheme requires considerable computational and communication costs. The use of blockchain technology in the exchange of medical data has great potential in increasing the efficiency, security and privacy of medical data, as well as enhancing collaboration between researchers and healthcare providers. Nonetheless, the implementation of blockchain technology in medical data exchange still requires considerable computational and communication costs.

Then in the agricultural industry sector, this sector is considered an industry that is less digitized and less profitable from the internet due to lack of connectivity. Several initiatives have been carried out in recent years such as using Information and Communication Technology (ICT) to address traceability issues, food safety, and build trust between stakeholders in the supply chain. The use of ICT increases the effectiveness and efficiency, storage, analysis and use of data in agriculture, enabling all stakeholders to easily get the latest information and make more effective decisions in everyday agricultural activities(Sekhar Bhusal, 2021, p. 2). However, parties operating Information and Communication Technology (ICT) are not fair enough in the collection and use of data where they are motivated to use the data according to their own interests.(Sekhar Bhusal, 2021, p. 2). In addition, long-standing ICT technologies have centralized management, centralized databases for storing agribusiness data, with risks such as single-point failures, cyberattacks, asynchronous inaccuracies, censorship, data

corruption and scientific fraud.(Sekhar Bhusal, 2021, p. 3). Therefore, blockchain technology exists as an effective solution to overcome existing problems, making it difficult or even impossible to manipulate data by distributing data management capabilities to a large number of distributed parties. Blockchain will be a transformative technology in the agricultural industry because it can deal with various problems encountered, such as inefficiencies in traditional supply chains, food safety, product safety and quality, high transaction costs, market manipulation by intermediaries, and consumer distrust of products. However, for blockchain technology to be widely adopted in agriculture, it is necessary to address several issues such as cost, scalability, performance, data privacy, technical maturity, and security.

The human population continues to increase, and environmental quality is a challenge for every city that has a large population and the idea for this problem is a smart city. A smart city is a city that uses Information and Communication Technology (ICT) to improve the quality of life of its residents and optimize resource management. The Smart city concept integrates various technologies and infrastructure such as the Internet of Things (IoT), big data, smart transportation systems, efficient governance, and renewable energy to create an efficient, sustainable and environmentally friendly city. Smart City aims to improve the quality of life of citizens, protect the environment, reduce traffic congestion,(Ahmad et al., 2021, p. 1). In an era where urban populations are continuously increasing, effective waste management is critical to maintaining environmental health and sustainability. However, effective waste management can be a challenge due to the complexity and volume involved. Fortunately, a potential solution to this problem has been found through blockchain technology which can speed up the process, increase transparency, and make it easier to trace waste from source to landfill. Waste management systems in smart cities usually focus on electronic, medical, domestic and agricultural waste. However, blockchain projects that have been developed for waste management have implemented various services such as asset tracking, shipment monitoring, token transfer, waste sorting,(Ahmad et al., 2021, p. 2). It can also be interpreted that blockchain can be used in waste management to increase efficiency and transparency in the waste management process.

Indonesia consists of many waters, so the fisheries sector is one of the important sectors in the Indonesian economy. The role of the Indonesian fisheries sector is quite significant in meeting the needs for animal protein food for the Indonesian people, as well as in supporting exports of fishery products to various countries. However, the fisheries sector in Indonesia is still facing various challenges, such as fishing exceeding the regeneration capacity of fish populations, illegal fishing, and climate change which affects the availability of marine resources. Therefore, innovation and technology are needed that can help optimize fisheries management in Indonesia, including the use of blockchain in fisheries management that is more efficient and sustainable.(Patro et al., 2022, p. 1). And in fisheries supply chains dealing with a wide variety of fish species that are highly diverse globally, stakeholders within them face significant problems in managing fragmented product data, recording product data during product transformation, managing data gaps, and adhering to data compliance. This shows that the complexity and challenges in managing product data in the fisheries supply chain are very high(Patro et al., 2022, p. 2). In recent years, blockchain has also been used in the fisheries sector to increase transparency, security and efficiency in the supply chain of fishery products, from production to consumption.

Digital Data Security of Blockchain technology in the future

Digital data security is a major challenge in today's digital era (Johnson et al., 2021). Threats such as cyberattacks, hacking and identity theft are increasingly complex, so it is important to find solutions that are effective in protecting digital data. One of the promising solutions is blockchain technology. Blockchain technology is a distributed system consisting of a chain of interconnected blocks, where each block contains transactions or data (Thompson et al., 2021). The main uniqueness of blockchain technology lies in its security and transparency. Data stored in the blockchain cannot be changed and is permanently recorded. The consensus applied in the blockchain makes it difficult for malicious parties to manipulate or delete existing data. The use of blockchain technology in digital data security in the future provides important benefits (Davis et al., 2022). First, blockchain provides a high level of security by utilizing strong cryptographic algorithms. The data stored in the blockchain is encrypted and can only be accessed by authorized parties. Second, blockchain offers data transparency and reliability.

Every transaction or change in data is recorded and can be seen by all parties involved, thereby reducing the risk of data manipulation or falsification.

In addition, the blockchain also allows automatic verification and validation of data (Wilson et al., 2021). By using smart contracts, business rules and security protocols can be applied automatically, reducing dependence on third parties and increasing efficiency. Blockchain technology also has the potential to provide security solutions across sectors, such as data security in health, finance, logistics, and others. However, there are some challenges that need to be overcome in using blockchain technology for digital data security in the future, such as scalability, privacy, and dependence on large computing resources. To overcome this problem, research and development continues.

Potential Development of Blockchain Technology in the future

Developments that are so fast produce new technology products, one of which is the blockchain. Blockchain is designed to reduce problems from rapid technological developments, where the problems are problems of trust, security, and authenticity. These problems can be eliminated with the democratization of data, where an individual can control their own data, assets and transactions. Blockchain can make that happen with the way it works which eliminates third parties in transactions. The potential for developing blockchain technology in the future is enormous and of course it can be applied in various industrial sectors. One of the developments in blockchain technology in an industry is the development of smarter and more efficient power grids. Blockchain technology can certainly optimize energy management and distribution more efficiently. by ensuring network security and stability, as well as improving quality in energy management which is much more rapid. By utilizing this blockchain technology, all systems or networks can interact with each other automatically and in a decentralized manner, thus enabling much more secure and efficient data storage and transmission.

Blockchain is a familiar technology in cryptocurrencies. Another application of blockchain is in the creation of a distributed ledger of transactions. The ledger is stored in a distributed block chain and can be accessed openly to ensure accountability, so it cannot be manipulated and intervened by certain authorities. In the future, the potential use of blockchain technology is very broad, including; Financial systems: blockchain technology is expected to be used to increase security and efficiency in financial systems, including payment, insurance, and banking systems. Logistics and supply chain: blockchain technology can be used to increase transparency and efficiency in logistics and supply chain, including delivery routes, goods conditions and locations. Government : Blockchain technology can be used to increase transparency and accountability in government, including voting systems, land registration and financial management. Other technology sectors: blockchain technology is expected to be used in other technology sectors, such as the internet of things (IoT), artificial intelligence (AI), and virtual reality (VR) to improve security and interconnection between devices.(Admin, 2023)

Despite the promise of blockchain technology, there are still some challenges to be overcome in its use. One of the challenges is scalability, or the ability of the network to access large amounts of transaction data. In addition, the debate on regulation is also a challenge in the application of blockchain. Some banks and governments are still unsure about blockchain technology, this uncertainty makes investment in the field of blockchain still rare because of the magnitude of the doubt. Therefore the application of blockchain applications is still rare in Indonesia. In an effort to take advantage of the potential of blockchain technology, it is hoped that the Indonesian government will soon issue clear regulations regarding the application of blockchain technology

CONCLUSION

Blockchain technology is the latest innovation in reducing data security risks that can be compromised. With a decentralized system and high security, blockchain provides efficiency and maintains data security properly. This is what makes blockchain increasingly popular as a reliable and efficient data

security solution. In the Chartered Accountants article (2017) it is explained thatblockchain is a ledger that contains transactions and these form blocks, each block will refer to the previous blocks so as to form a chain. This makes data cannot be manipulated because every member in the network will be able to monitor every transaction that occurs. The use of blockchain is often found in several sectors such as finance, accounting, banking, e-commerce, health, and education.
In Indonesia the use of technologyblockchains are rare or few to discover respectively. Several negative perspectives, unclear regulations, and understanding of blockchain technology are the reasons why blockchain is still difficult to implement in Indonesia. And considering that behind the several advantages of blockchain, there are still various challenges in its application. For example, blockchain which is a complex and complicated system will be quite difficult for sectors to implement, then knowledge of blockchain technology is still limited, and the costs required for implementing this technology are also quite large, not only for procuring the technology, but training costs. for the staff dealing with blockchain and technology maintenance is also huge. Therefore,

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