Analysis of the Implementation of Blockchain Technology in Optimizing Crypto Inventory Through the Supply Chain Management Method

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Abstract

This study examines how the application of the Supply Chain Management (SCM) method to cryptocurrency inventory management can be optimized with blockchain technology. It is believed that blockchain, which is known for being transparent, secure, and effective, will increase operational effectiveness and lower risks in the administration of cryptocurrency inventory. It focuses on five key factors, namely transparency, data security, transaction speed, operational efficiency, and cost reduction. The study looks at the potential effects of each blockchain feature on cryptocurrency inventory management. Questionnaires on cryptocurrency users, miners, and investors are used to collect relevant data, and literature. The findings show how the application of blockchain technology lowers operational costs, increases transparency, and speeds up transactions to dramatically improve the efficiency of crypto inventory management. The findings claim that the application of blockchain technology through Supply chain management (SCM) not only adds value in terms of security and reliability, but also allows cryptocurrency companies to respond to market demand more quickly. This study adds to our understanding of how blockchain technology is used in the digital finance industry, particularly as it relates to crypto asset inventory management.

Keywords: Crypto Setup; Blockchain Technology; Operational Efficiency; Security; Supply Chain Management (SCM); Transparency;

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1. Introduction

The cryptocurrency, which was first introduced through Bitcoin in 2009, has seen significant growth in both adoption and technology. Bitcoin (BTC), created by Satoshi Nakamoto, became the first cryptocurrency to use blockchain technology. The main focus is as a decentralized payment system without third parties such as banks or governments. Until 2013, Bitcoin dominated the market with a low capitalization value, around $10.27 billion.

2014 was a pivotal moment with the emergence of altcoins such as Ethereum (ETH). Ethereum introduced smart contracts that enable the development of decentralized applications (DApps). Other altcoins such as Solana, Cardano, and Binance Coin bring new innovations in transaction speed, energy efficiency, and blockchain interoperability.

Cryptocurrencies are starting to be adopted by large companies and financial institutions, such as PayPal supports crypto transactions, Tesla once accepted Bitcoin as a means of payment. Some countries such as El Salvador even recognized Bitcoin as an official currency in 2021. A significant price spike occurred in 2017 with a market cap of $543 billion, driven by the boom of ICOs (Initial Coin Offerings). In 2021, the market capitalization peaked at $2.26 trillion due to institutional adoption and great interest from retail investors. Figure 1 shows the types and prices of Cryptocurrencies:
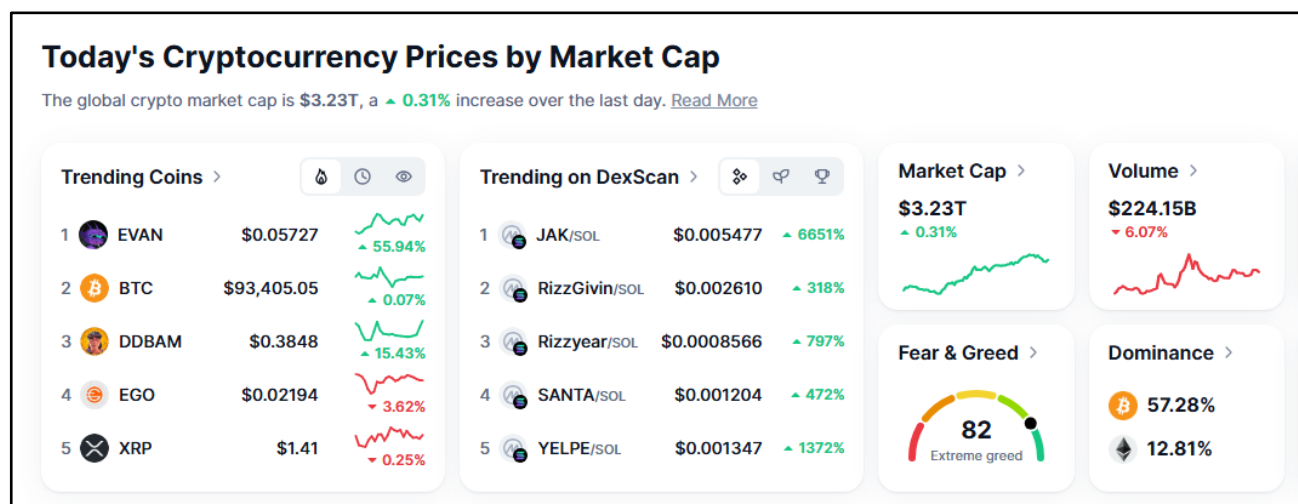

Figure 1. Cryptocurrency Prices

In this era of globalization, digitalization is the main key in the transformation of various industrial sectors and companies, including the supply chain management (SCM) sector (Supriadi et al., 2024). *Cryptocurrency has a significant positive impact on the amount of money in circulation in Indonesia. Cryptocurrencies are also widely used by the public, where they use cryptocurrencies as an alternative investment rather than as a currency or other tool* (Jaya et al., 2023). Cryptocurrencies have evolved from a simple means of payment to a complex ecosystem that includes blockchain technology, financial applications, digital art, and virtual reality. With the support of technological innovation and increasing adoption, crypto is expected to continue to be an integral part of the global economy.

Blockchain is a distributed database that is shared at every point on a computer network. As a database, blockchain stores information electronically in a digital format. Blockchain technology has an important role in cryptocurrencies, crpytocurrency is a digital currency that uses a cryptographic system as protection in every transaction process so that it remains secure and cannot be manipulated (Wicaksono et al., 2022).

In a study conducted by (Limarwati & Hardino, 2023) conducting an analysis related to the opportunities and challenges of blockchain implementation in the government sector in Indonesia. The results of the

study show that blockchain has a huge opportunity to be applied in the government sector, including in terms of convenience, security, and flexibility. (Hasan et al., 2024) Exploring how blockchain can strengthen the financial system in college, focusing on the key benefits and challenges that may be faced. The results show that blockchain can reduce the risk of fraud, human error, and strengthen data security. Some of the research that has been done on blockchain has focused on traditional supply chains (logistics, manufacturing, or agriculture), but not much has been attributed to cryptocurrency supplies. Blockchain in the crypto field is usually focused on transaction or security aspects, not inventory management. Previous research has often discussed blockchain and Supply Chain Management (SCM) separately without integrating the two to optimize the management of digital assets such as crypto. Research related to the use of blockchain in inventory systems is directed more towards physical goods than digital assets such as cryptocurrencies. In this study, an analysis will be carried out on the implementation of blockchain technology for digital and volatile crypto assets, so the traditional approach in SCM may not be completely relevant.

2. Literature Review

This literature review provides an overview of the literature on the implementation of blockchain technology in supply chain management (SCM) and crypto inventory management. Some of the review literature that can be used as previous research to support this research is research conducted by (Ramadahni, 2024) that blockchain technology has come a long way in recent years, penetrating into various fields, including healthcare Blockchain technology has had a significant impact on the healthcare industry, but there have been no comprehensive studies assessing the impact. Blockchain technology can provide a strong and reliable information security solution. Blockchain technology uses a data storage system by implementing a decentralized application system that functions to give users full control over their data in the absence of a centralized intermediary (Kusyanti et al., 2023). (Hendriyati Haryani et al., 2023) said that blockchain and gamification are rapidly growing topics in academia and business, representing a paradigm shift from centralized computing to decentralization. The Blockchain process will be useful as a theoretical foundation for researchers who will start research on Blockchain technology for digital education so that the challenges in this research can be solved and the results of digital competencies are clear and undeniable (Rahardja, 2022).

Another study found that the application of blockchain technology can provide an additional layer of security in communication networks, reduce the risk of Man in the Middle attacks, and increase trust in digital exchanges (Firmansyah, 2023). Research conducted by (Setianingsih et al., 2024) explore the role of blockchain technology in strengthening data security and privacy in the financial sector. Blockchain technology is present as one of the potential solutions to overcome this problem, by offering a decentralized, transparent, and immutable financial record system. This study aims to analyze the implementation of blockchain technology in increasing transparency and trust in the Indonesian financial sector (Yulian et al., 2024).

Blockchain technology, with its characteristics of decentralization, immutability, and automation, has the potential to be a solution to these challenges (Jaya et al., 2023).

1. Supply Chain Management (SCM)

   The supply chain or commonly called the supply chain is developing very quickly and has become a large ecosystem, especially in managing the data produced. Reliable and efficient data management is needed from producers so that consumers can trust the desired results. The application of blockchain technology in the supply chain of crypto assets aims to store decentralized data of all transactions from producers to consumers. The implementation of blockchain technology in the supply chain has been widely carried out. One of them is smart contracts, commonly used for tracing and tracking the ownership of component details from the original equipment manufacturer to suppliers and end users (Annisya & Haryatmi, 2021).

2. Blockchain Technology

Blockchain has recently been talked about and become a trend in various fields, Blockchain began to develop in the 2010s which was marked by a digital currency bubble (cryptocurrency), and the most popular currency at that time was bitcoin, because it was adopted specifically by a person/group under the pseudonym Satoshi Nakamoto for the purpose of digital currency. Thus, blockchain technology has become a new trend among archivists in developed countries, and in Indonesia itself, the concept of blockchain technology continues to dominate discussions and debates in the world of digital finance, especially bitcoin (Wira & Suryawijaya, 2023). The characteristics that make it ideal to apply in crypto inventory management are:

1. Decentralization: An effective and reliable way to maintain data security and integrity is through the integration of blockchain technology with information security solutions. Users of blockchain technology benefit from increased security because decentralized systems are difficult to change or remove by third parties (Elan Maulani et al., 2023).
2. Optimization: blockchain technology brings significant benefits through the automation of payment processes, inventory monitoring, and order management through Supply chain management (SCM), companies can achieve higher efficiency and a better level of transparency in their business operations (Supriadi et al., 2024).
3. Immutability: Data authenticity guarantees that data is not manipulated or altered without the knowledge or consent of the authorities. Data integrity ensures that data is not corrupted or lost during the process of storing or transmitting data(Wira & Suryawijaya, 2023).

3. Smart Contracts in Blockchain Technology

A smart contract is an electronic instruction that executes its own program and is written in computer code. The purpose of smart contracts is to reduce the presence of third parties (middle men). So that it can reduce costs and avoid fraud or adverse events. In the context of supply chain management, smart contracts can automate several processes in crypto inventory management and then integrate into the blockchain to meet the needs of a system in performing several processing with blockchain protocols (Jaya et al., 2023).

1. Inventory tracking: Smart contracts can keep a record of ownership of crypto asset movements automatically and transparently. So as to increase trust and reduce the risk of fraud. This can allow all parties involved in the crypto supply chain to view the ownership history and movement of crypto assets.
2. Payment settlement: this automatically makes payments when a cryptocurrency changes hands, increasing efficiency and reducing the risk of fraud. This can help reduce overall operational costs.
3. Identity management: smart contracts can verify the identities of parties involved in crypto transactions, which can help reduce the risk of regulatory violations for companies involved in crypto inventory management.

In conclusion, smart contracts are a technology that plays an important role in optimizing crypto inventory management. In this case, researchers can explore how smart contracts can be used to overcome existing challenges and improve efficiency, transparency and security in the supply chain management of crypto inventory.

4. Implementation of Blockchain Technology in Crypto Supply SCM

1. Efficiency: to protect the integrity of related information in inventory tracking, payments and contracts. Blockchain technology helps optimize operational efficiency, reduce costs, and increase trust between parties involved (Witjaksono, Gunawan et al., 2023).

2. Transparency: Because data is stored in a distributed network and can be accessed by everyone who has network access, blockchain creates transparency in both data and transactions. This ensures the accuracy and reliability of the data and transactions recorded while reducing the possibility of misuse or fraud (Elan Maulani et al., 2023).

3. Security: A robust information security solution is provided by blockchain, which stores data in blocks that validate each other. It is difficult to share or change data without the consent of each network node. Therefore, blockchain technology can help in protecting personal information from hackers and cyberattacks (Elan Maulani et al., 2023).

3. Methods

Scope and Focus of Research
This study uses a qualitative method with a descriptive-analytical approach, aiming to describe the implementation of blockchain in crypto inventory management through Supply Chain Management (SCM). The object of this research is blockchain technology as a mechanism for optimizing cryptocurrency inventory in the digital supply chain. The scope of this research is the analysis of the function of blockchain in inventory management, the relationship between blockchain and SCM in the context of crypto inventory, and factors affecting implementation, such as digital asset volatility and supply chain efficiency.

Data Source
The data sources taken in this research instrument are questionnaires and literature studies. In this questionnaire statement used to get responses, researchers sent a series of questionnaires to respondents asking them to share their opinions on the utilization of blockchain technology and cryptocurrency supply in modern times. Primary data sources in research refer to the sources used to collect the information and data needed in the research. The data used in this study refers to various things such as interviews with suppliers who provide goods, services or suppliers in various companies that collaborate with blockchain such as TokoCrypto, CoinBase, Binance and various companies that provide crypto assets by reviewing whitepapers on these companies. Provides questionnaires for crypto coin users such as traders, crypto miners, and crypto investors. And the data were analyzed and combined with a literature review. Secondary data in this study includes various data collected by other parties previously and used by researchers to analyze additional research. Examples include scientific journals, research reports, and various platforms that provide crypto assets.

Data Collection Methods
In this study, the qualitative approach regarding the application of blockchain technology in Supply chain management (SCM) does not use the concept of variables explicitly as in quantitative research. However, we can find and determine the main themes or variables that are the focus of the research to direct the research and analysis.

1. Variable X (blockchain technology) encompasses five main aspects, namely transparency, data security, operational efficiency, transaction speed, and cost reduction. Each of these aspects is analyzed and seen how they affect the various elements of crypto inventory management in supply chain management (SCM).
2. The Y variable (crypto inventory management in SCM) covers five aspects, namely: inventory efficiency, fraud risk reduction, transaction speed, inventory data accuracy, responsiveness to demand, and system integrity.
3. Hypothesis: links each aspect of blockchain technology to the corresponding elements in crypto inventory management, providing a further framework.

Research sample
A small portion of the population chosen as the research topic is a research sample. So that the results of the research can be applied to a wider population. The research sample is the part of the population that

is selected to represent the entire population in the study. The sample in this study is Cryptocurrency users. The sample should reflect the main characteristics of the population so that the results of the study can be generalized. In this study, the purposive sampling method was used to ensure that the most relevant and high-quality literature was included in the analysis. Purposive sampling, also known as judgmental, selective, or subjective sampling, is a technique in which researchers select samples based on their assessment and research objectives.

The results of the data obtained from the respondents' statements will be discussed and combined based on the findings obtained from the literature review. By using this purposive sampling method, the research can obtain the most relevant and credible literature samples to answer research questions about the application of blockchain technology in crypto inventory management through the supply chain management (SCM) method.

Data Analysis

1. The frequency distribution conducted by the researcher to calculate the frequency of respondents based on demographic characteristics such as age, gender and experience of using crypto.
2. The data used in this analysis comes from the results of a questionnaire shared with respondents who are crypto coin users such as traders, miners, and crypto coin investors. Each variable is measured on a Likert scale from 1 (strongly disagree) to 5 (strongly agree).
3. Calculate the mean using the median, and the standard deviation for each variable using Excel formulas such as (AVERAGE, MEDIAN, and STDEV. S).
4. The percentage graph used to illustrate the distribution of answers is a bar chart and a pie chart.
5. Calculating frequency To calculate the frequency of occurrence of a value or a range of values, you can use the formula (COUNTIF or FREQUENCY). For example, if you want to count the number of times the value "A" appears in column B from row 2 to row 10.

4. Result

The results will outline the study's findings on the use of blockchain technology to improve cryptocurrency inventory management, based on a questionnaire provided to respondents. The results of this study will also be examined by integrating empirical findings with related scientific works to provide a more thorough understanding of the variables studied.

Increase transparency (X_1)

Table 1. Percentage of Respondents Results (X_1)

Responses	X_1	Persentase
Strongly disagree	0	0.00%
Disagree	2	4.76%
Neutral	5	11.90%
Agree	32	76.19%
Strongly Agree	3	7.14%

The majority of respondents confirmed that blockchain technology can increase transparency in effective and trusted inventory management, real-time monitoring and verification of transactions is made possible by this openness. In the crypto business, a high level of openness also contributes to the development of trust among the participants. These findings are consistent with the literature stating that blockchain improves data openness and accuracy. The literature claims that blockchain technology promotes information transparency and protects transaction data from tampering. Respondents stated that blockchain offers great benefits in terms of security and transparency. As a result, the results of this study show that there will be more transparency in every transaction made in Supply Chain Management.

5. Discussion

Improve Data Security (X_2)

Table 2. Percentage of Respondents Results (X_2)

Consent Level	Percentage of Respondents	Number of Respondents
Strongly disagree	0%	0
Disagree	0%	0
Neutral	28.57%	12
Agree	61.90%	26
Strongly Agree	9.52%	4

Table 2 shows that the average respondent agrees with the improvement of data security. Data security is a rapid development of blockchain, as blockchain has a decentralized nature that is likely to evolve over time, this inspires researchers to learn more about how cryptography can be used to improve transaction systems in digital technology. So that it can reduce the risk of cyber attacks and data manipulation. Strong cryptographic technology and decentralization on the blockchain can improve data security. Effective defenses against cyberattacks and data manipulation are provided by its decentralized structure, cryptographic security, and the capacity to record transactions permanently. Data is always safe when access is restricted to individuals who have been granted cryptographic authorization. This is in line with the literature that shows that blockchain is an effective solution to data security problems in digital transactions.

Improving Operational Efficiency (X_3)

Table 3 shows the results of the study to see the extent to which blockchain technology improves operational efficiency The state of crypto inventory in Supply Chain Management (SCM) offers clear advantages for businesses in supply chain management. Businesses can simplify procedures and cut costs by using smart contracts for automation, improved inventory control, fewer administrative errors, and real-time visibility. Smart contracts can be used to automate inventory updates as transactions occur, reducing operational time and costs.

Table 3. Percentage of Respondents' Results (X_3)

Consent Level	Percentage of Respondents	Number of Respondents
Strongly disagree	0%	0
Disagree	0%	0
Neutral	16.67%	7
Agree	71.43%	30
Strongly Agree	11.90%	5

Transaction speed (X_4)

Table 4 shows that respondents agree that blockchain improves transaction speed in crypto inventory management. The loss of the need for intermediaries, which usually slows down the transaction process, is a key factor in this acceleration. However, while transaction speed is considered positive, there is potential to further improve this aspect to be more competitive in an increasingly fast-paced business environment.

Table 4. Percentage Results (X_4)

Responses	Respondents	% Total
STS = 1	0	0.00%
TS = 2	1	2.38%
N = 3	10	23.81%

S = 4	28	66.67%
SS = 5	3	7.14%

By eliminating the need for intermediaries that slow down the transaction process. Blockchain uses smart contracts to enable a good response speed to changes in market demand.

Cost Reduction (X_5)
Many things, including large initial implementation costs, lack of standardization, technological complexity, and size of operations, may contribute to this. However, businesses can maximize the cost benefits of integrating blockchain technology in Supply Chain Management (SCM) with the right tactics, including thorough cost-benefit analysis, pilot projects, collaboration with technology providers, incentives for standardization, spending, and ongoing monitoring.

Table 5. Percentage Results (X_5)

Consent Level	Percentage of Respondents	Number of Respondents
Strongly disagree	0%	0
Disagree	16.67%	7
Neutral	38.10%	16
Agree	38.10%	16
Strongly Agree	7.14%	3

From the results of the recap, Table 5 explains that Blockchain allows for cost reduction and increased operational efficiency by eliminating the need for intermediaries and simplifying the transaction process. This is in line with the literature that states that blockchain can reduce operational costs and increase efficiency in various business contexts, where operational cost efficiency processes are automated and authenticated quickly.

Descriptive Statistics

Table 6. Descriptive Statistical Analysis

Variable	Mean	Median	Standard Deviation
Transparency (X_1)	3.85	4.00	0.60
Data Security (X_2)	3.80	4.00	0.58
Operational Efficiency (X_3)	3.95	4.00	0.53
Transaction speed (X_4)	3.79	4.00	0.59
Cost Reduction (X_5)	3.35	4.00	0.84

Respondents' perceptions
Transparency (X_1)
Based on Table 6, the average score of 3.86 shows that most participants agree that blockchain technology can improve the transparency of cryptocurrency inventory management. Transparency makes it easy to monitor and verify transactions in real-time, which is essential for reliable and effective inventory management. Among the participants in the cryptocurrency market, the high level of transparency also increases trust. This makes Supply chain management (SCM) able to utilize blockchain as a means of transaction.

Data Security (X_2)

Data security was also rated positively by respondents with an average of 3.81 and a median of 4, signifying a fairly high level of trust in the security provided by blockchain. A standard deviation that is almost the same as X1 (0.59) indicates consistency in the assessment.

Operational Efficiency (X_3)
Operational efficiency received the highest rating with an average of 3.95 and a median of 4. The lower standard deviation (0.53) indicates that the majority of respondents agree that blockchain improves efficiency in managing crypto inventory.

Transaction speed (X_4)
With an average of 3.79 and a median of 4, the transaction speed was rated quite good by the respondents. A standard deviation of 0.60 indicates that there is little variation in the assessment of transaction speed, although it is considered positive overall.

Cost Reduction (X_5)
The cost reduction had the lowest average (3.36) and a median of 3, suggesting that the cost reduction through blockchain may not have been fully felt by respondents. A higher standard deviation (0.84) indicates a greater difference in respondents' assessment of cost reductions.

6. Kesimpulan

The purpose of this study is to study how the application of blockchain technology in Supply Chain Management (SCM) strategies affects how well it optimizes crypto inventory management. As a conclusion from the questionnaire analysis and literature review, it can be said that: The overall implementation of Blockchain (X) Technology has a significant positive impact in optimizing crypto inventory management (Y). Blockchain transparency (X_1) improves the efficiency of crypto supply (Y_1) by making it easier to monitor and verify transactions in real-time. Blockchain data security (X_2) reduces the risk of fraud in crypto inventory management (Y_2) through the use of strong and decentralized cryptography. Blockchain Operational Efficiency (X_3) improves the accuracy of data available on crypto inventory (Y_3) by simplifying the verification and auditing process. Blockchain Transaction Speed (X_4) improves responsiveness to demand in crypto inventory management (Y_4) by eliminating the need for intermediaries that slow down the transaction process. Cost Reduction Through Blockchain (X_5) improves system integration in crypto inventory management (Y_5) by reducing operational costs. The study shows that blockchain technology can offer many great advantages in crypto inventory management, but there are still some issues that must be overcome to maximize the potential of the technology.

Cover

This research looks at how the application of blockchain technology in Supply Chain Management (SCM) can improve the transparency, security, efficiency, speed, and cost of crypto inventory management. The results show that, by addressing current issues and taking full advantage of this technology, the crypto industry can achieve significant progress in the future.

Limitations and avenues for further research

Sample expansion
To improve the generalization of the research results, the research sample was expanded to include

more crypto users from different backgrounds and industries. Future research is suggested to involve collecting primary data through interviews, surveys, or questionnaires to crypto users, traders, and other industry players. This will provide deeper and relevant insights regarding the implementation of blockchain in the Supply Chain Management (SCM) of crypto inventory.

Comparative Studies

Conducting a comparative study of blockchain implementations in different industries will help understand how the technology can be applied and help other industries. Research comparing different blockchain platforms used in crypto inventory management can provide additional information about the strengths and weaknesses of each platform, as well as how each platform affects operational efficiency and security.

Long-Term Exploration

Given how fast blockchain technology is evolving, it is important to conduct long-term studies to track how the advancements and modifications of this technology affect cryptocurrency inventory management over time.

Integration with other Technologies

Furthermore, research can investigate how blockchain technology can be combined with other technologies such as AI or IoT in supply chain management to determine how these two technologies can optimize crypto inventory management.

References

Annisya, & Haryatmi, E. (2021). Implementasi Teknologi Blockchain Proof of Work Pada Penelusuran Supply Chain Produk Komputer. *Jurnal RESTI (Rekayasa Sistem Dan Teknologi Informasi)*, *5*(3), 446–455. https://doi.org/10.29207/resti.v5i3.3068

Elan Maulani, I., Herdianto, T., Febri Syawaludin, D., & Oga Laksana, M. (n.d.). Dwi Febri Syawaludin. *Medika Oga Laksana Jurnal Sosial Dan Teknologi (SOSTECH)*, *3*(2), 2023.

Jaya, U. B., Arwin, M., Aulia, D., & Uzliawati, L. (n.d.). *Implementasi Blockchain Dalam Bidang Akuntansi dan Supply Chain Management: Studi Literatur*. 2.

Supriadi, I., Maghfiroh, R. U., & Abadi, R. (2024). Digital Revolution in Supply Chain Finance: Overcoming Challenges And Building Innovative Strategies. *Klabat Accounting Review*, *5*(1), 47. https://doi.org/10.60090/kar.v5i1.1059.47-62

Transparansi Dan Keamanan, M., Witjaksono, G., Zea Amanda, A., & Judijanto, L. (n.d.). *Teknologi Blockchain Dalam Supply Chain Management*.

Wicaksono, A., Eka Violita, C., & Kamila, E. R. (2022). *Bitcoin Sebagai Instrumen Investasi Yang Menguntungkan*. *4*(1).

Wira, T., & Suryawijaya, E. (2023). *Memperkuat Keamanan Data melalui Teknologi Blockchain: Mengeksplorasi Implementasi Sukses dalam Transformasi Digital di Indonesia Strengthening Data Security through Blockchain Technology: Exploring Successful Implementations in Digital Transformation in Indonesia*. *2*(1), 55–67. https://doi.org/10.21787/jskp.2.2023.55-67

Firmansyah, D. (2023). *Penerapan Teknologi Blockchain Untuk*. *1*(1), 73–80.

Hasan, S. A., Al-Zahra, W. N., Auralia, A. S., Maharani, D. A., & Hidayatullah, R. (2024). Implementasi Teknologi Blockchain dalam Pengamanan Sistem Keuangan pada Perguruan Tinggi. *Jurnal MENTARI: Manajemen, Pendidikan Dan Teknologi Informasi*, *3*(1), 11–18. https://doi.org/10.33050/mentari.v3i1.546

Hendriyati Haryani, Wahid, S. M., Fitriani, A., & Ariq, M. faris. (2023). Analisa Peluang Penerapan Teknologi Blockchain dan Gamifikasi pada Pendidikan. *Jurnal MENTARI: Manajemen, Pendidikan Dan Teknologi Informasi*, *1*(2), 163–174. https://doi.org/10.34306/mentari.v1i2.250

Kusyanti, A., Trisnawan, P. H., Brawijaya, U., Korespondensi, P., & Asuransi, K. (2023). *Implementation of Blockchain Technology Using Smart Contract*. *10*(7), 1563–1570. https://doi.org/10.25126/jtiik.2024118016

Limarwati, D., & Hardino, R. Y. (2023). Analisis Implementasi Blockchain Pada Sektor Pemerintahan: Peluang Dan Tantangan. *Seminar Nasional*, 12–25.

Rahardja, U. (2022). Penerapan Teknologi Blockchain Dalam Pendidikan Kooperatif Berbasis E-Portfolio. *Technomedia Journal*, *7*(3), 354–363. https://doi.org/10.33050/tmj.v7i3.1957

Ramadahni, K. (2024). Penerapan Teknologi Blockchain dalam Sistem Manajemen Kesehatan Elektronik. *Jurnal Sosial Teknologi*, *4*(2), 116–119. https://doi.org/10.59188/jurnalsostech.v4i2.1097

Setianingsih, R., Negeri, U. I., & Utara, S. (2024). Analisis Teknologi Blockchain Berperan dalam Meningkatkan Keamanan dan Data Privasi di Sektor Keuangan Terhadap Implementasi. *Jurnal Ilmiah Nusantara (JINU)*, *1*(4), 3047–9673.

Yulian, C., Irwanto, R., Angtonius, F., Siahaan, P. Y., Ng, J., Informatika, F., Mikroskil, U., Jalan, A., Nomor, T., Sei, K., Ii, R., Area, K. M., & Utara, S. (2024). *Analisis Implementasi Teknologi Blockchain dalam Meningkatkan Transparansi dan Kepercayaan di Sektor Keuangan di Indonesia saat ini . Pada dasarnya , Blockchain adalah sistem terdesentralisasi yang memungkinkan dan berhasil mendapatkan peningkatan yang cukup signifikan pada sektor keuangan mereka . 4*, 9–31.