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IMPLEMENTATION OF BLOCKCHAIN TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT AT PT VITAPHARM

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Abstract

The digital era 4.0 has impacted various fields, including technology and education. Rapid advancements in information and communication technology have brought about significant changes in almost all aspects of life. From the widespread use of the internet to the proliferation of interconnected smart devices, everything has transformed culture, economy, and society. This research employs a quantitative descriptive method to describe and analyze phenomena without manipulating variables. The collected data is processed as the basis for this study. This research makes a significant contribution to companies in the implementation of blockchain technology, which has a significant impact on supply chain management. Blockchain enhances transparency and security of transactions through an immutable distributed ledger system, reducing the risk of fraud and increasing trust among transacting parties. Based on data processed using Smart Contracts and blockchain-based applications, this research provides a comprehensive overview of inventory management and calculation. Blockchain technology can integrate and making data transparent, improving the efficiency and effectiveness of company performance. Blockchain theory has been confirmed through real-world implementations, such as the application of blockchain-based applications.

Keywords: Blockchain, Supply Chain Management, Transparency, Efficiency, Information Technology

INTRODUCTION

The development of the digital era 4.0 has influenced various fields, including technology and education. Technology has supported advancements in all of these areas. This digital era has fundamentally changed the way we live, work, and interact. Rapid advancements in information and communication technology have brought about revolutionary changes in almost every aspect of life. From the widespread use of the internet to interconnected smart devices, everything has caused significant changes in culture, economy, and society.

Since the early 2000s, centralized systems have been the predominant approach to supply chain management. Nevertheless, these systems have inherent vulnerabilities. Trust issues, such as corruption and the dissemination of inaccurate information, often hinder the effective operation of supply chains. Moreover, the time lag between data transmission and presentation is significant due to the system's inability to provide real-time data.

Blockchain technology is a new option that is gaining popularity, but some businesses haven't fully adopted it due to limited resources. Blockchain databases can only add new information, meaning data once recorded cannot be changed or removed. As a result, the operators and network members are responsible for monitoring every transaction (Suprayitno & Cempaka Timur, 2022).

Improvements in logistics supply chain operations can be achieved through blockchain technology. From small-scale producers to intermediaries such as shipping companies and

distributors, and even end consumers, there are numerous benefits to be gained by each part of the supply chain. Blockchain can be applied in the shipping sector to track the origin of goods and obtain various information that has previously been difficult to acquire due to a lack of transparency. Many argue that blockchain technology has the potential to revolutionize supply chains, although it is still a nascent technology and requires further research and investment.

According to Laksmita (2020), well-integrated supply chain management can enhance a company's competitiveness. However, many believe that the application of this technology in the logistics sector will be transformational. There is limited research on the implementation of blockchain technology in the logistics sector in Indonesia, making it a promising topic for further investigation.

One of the primary challenges in supply chain management is uncertainty. The supply of raw materials can be disrupted by various external factors such as weather changes, government policy changes, or transportation disruptions. This uncertainty can lead to production and delivery delays, which in turn can negatively impact customer satisfaction and company profitability. Additionally, supply chain issues also involve inventory management. Balancing sufficient inventory to meet customer demand while avoiding overstocking can be a difficult challenge.

Companies that face challenges in inventory transparency often encounter difficulties that can negatively impact operational efficiency and information accuracy. For instance, a lack of transparency in inventory processes can make it difficult to accurately track and manage stock levels. This can result in overstocking or understocking, which in turn can affect production and customer service. Additionally, a lack of transparency in inventory processes can also impact a company's financial statements, as errors or inconsistencies in inventory data can lead to inaccurate or incomplete information.

METHOD

The method used in this research is quantitative. This quantitative method aims to determine the role of the independent variable on the dependent variable. While the approach used is an associative descriptive approach, according to Sugiyono in Dewi Y.A. Mahale et al. (2017), an associative descriptive approach, namely research that aims to determine the effect or relationship between 2 (two) or more variables.

The population in this study were all State Civil Servants (ASN) at the Regional Library and Archives Service of Banten Province, totalling 69 people. The sample used in this study is saturated, meaning that the entire population is sampled. The data collection technique in this research was carried out using literature study and field studies through interviews, observation and questionnaires. At the same time, the type of data is primary data. The tests carried out are validity, reliability, correlation coefficient and determination both partially and simultaneously and multiple linear

regression analysis.

RESULTS AND DISCUSSION

Initial Goods Inventory Stock Data

This initial stock data is obtained to see the quantity of goods to be distributed which aims to help several important aspects of inventory management and business operations.

Table 1 Initial Goods Inventory Stock Data

NO.	Item Code	Initial stock	Unit
1.	DHS	2000	PCS
2.	DFM	1500	PCS
3.	DEL	1700	PCS
4.	DHC	1000	PCS
5.	DEC	500	PCS

Final Goods Inventory Stock Data

This final stock data is obtained to see the quantity of goods that have been distributed which aims to help several important aspects of inventory management and business operations.

Table 2 Final Goods Inventory Stock Data

No.	Item Code	Last Stock	Unit
1.	DHS	1000	PCS
2.	DFM	750	PCS
3.	DEL	850	PCS
4.	DHC	500	PCS
5.	DEC	250	PCS

Goods Sales Data

Sales data is a collection of information that records sales transactions of goods or services during a certain period which is used to determine the number of items sold so as to reduce the risk of running out of stock.

Table 3 Goods Sales Data

No.	Date	Item Code	Sold Quantity	Unit Price (Rp)	Total Sales (IDR)
1.	24-03-2024	DHS	97	29.500	2.861.500
2.	25-03-2024	DFM	69	37.500	2.587.500
3.	26-03-2024	DEL	79	55.000	4.345.000
4.	27-03-2024	DHC	95	28.500	2.707.500
5.	28-03-2024	DEC	86	64.000	5.504.000
6.	29-03-2024	DEL	61	55.000	3.355.000

Missing Goods Data

In the calculation of the number of missing items, this results in a product difference and an imbalance between the initial stock and the final stock and the number of products sold. Which results in a lack of effectiveness from the Company because it does not know the direction of the missing goods.

Table 4 Missing Goods Data

Item Code	Initial Stock	Last Stock	Quantity Sold	Produck Gap
DHS	2.000	456	1.464	80
DFM	1.500	406	1.000	94
DEL	1.600	901	643	56
DHC	1.750	734	998	18
DEC	1.980	832	1.118	30

Data Analyst

At the needs analysis stage with the Blockchain method, there are problems that must be resolved to develop effective and innovative solutions, it is found that there is no system or platform that is less capable of recording and integrating the initial and final inventory data process.

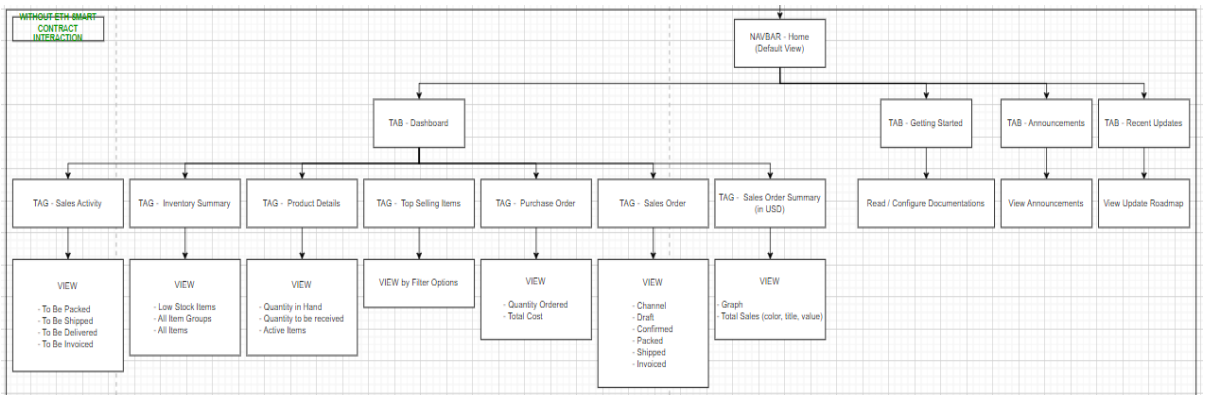

Figure 1 Data Analyst

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It can be seen from the picture above that the recording process system above is not maximized because there is no connection that connects them. So that there are many manipulations and recording differences.

The improvement that will be made is to change the previous system into a system that can integrate the recording of data in Blockchain technology in the form of an application.

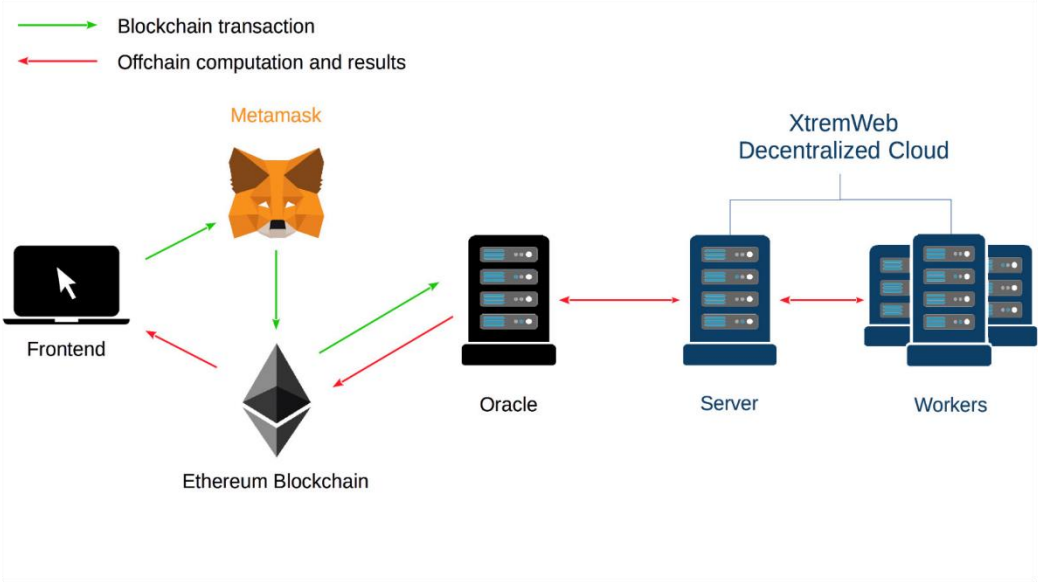

Figure 2 Blockchain technology in the form of an application

At this stage, coding and testing are carried out in order to be able to store data and develop user interfaces (UI) and frontends to display data as a whole in the Smart Contract implementation.

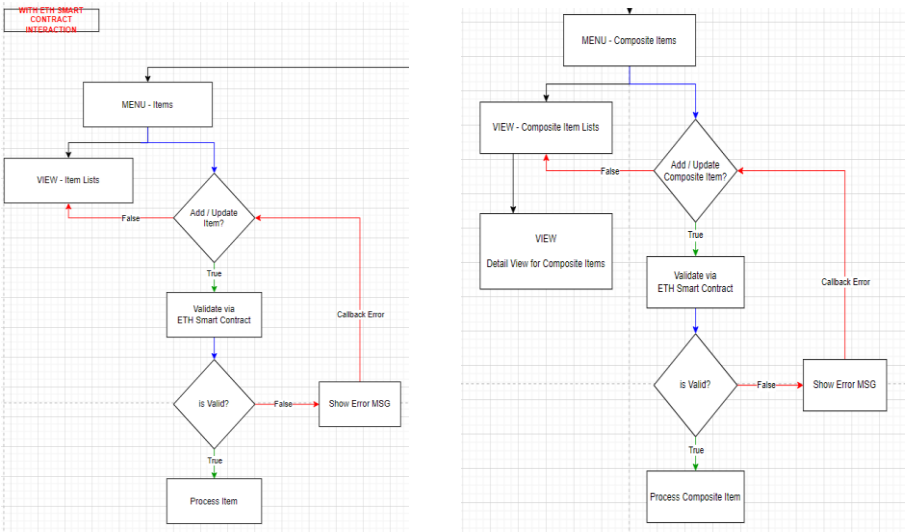

Figure 3 The Smart Contract implementation

From the picture above, it shows that there are differences in the system framework with the previous system which is characterized by the existence of validate via eth smart contract which

means that there is a need for the involvement of all parties in the data recording process.

1. Validate via ETH Smart Contract

The process of verifying and executing a condition or transaction using a smart contract on the Ethereum network that runs on the Ethereum blockchain that automatically executes certain actions when pre-defined conditions are met. System testing is done by adding smart contract methods to the system framework through blockchain technology-based applications.

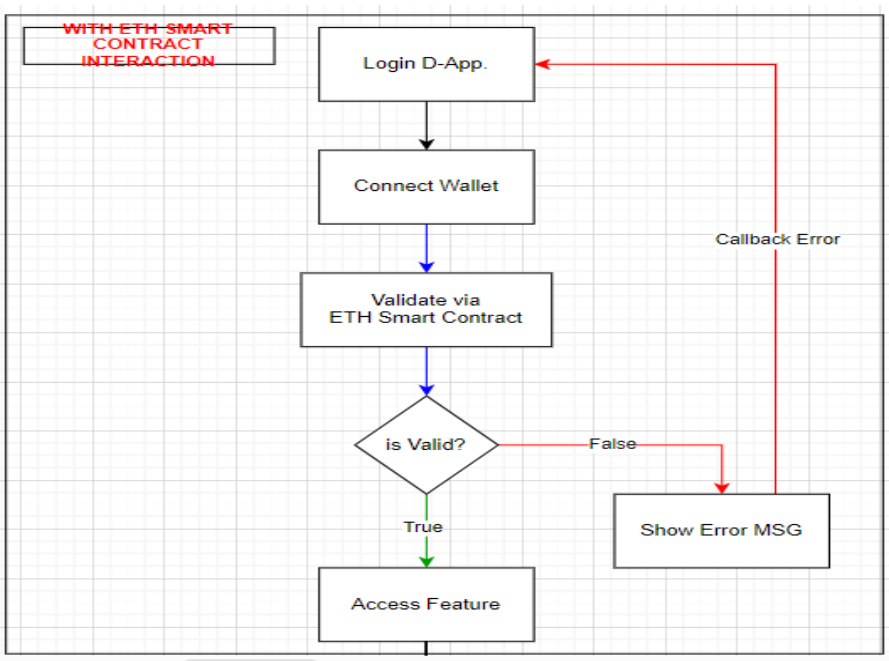

Figure 4 System framework through blockchain technology-based applications-1

The picture above is the result of testing the Smart Contact system in the form of a prototype flow that adds Validate via ETH Smart Contact which aims as a liaison between related parties in order to approve or not a transaction or event. And the addition of Call back errors when there is a transaction or event that is not agreed upon by all parties involved.

The application of the system that has been made is in the form of an application for companies which can only be accessed and approved by related parties such as suppliers, companies, and distributors.

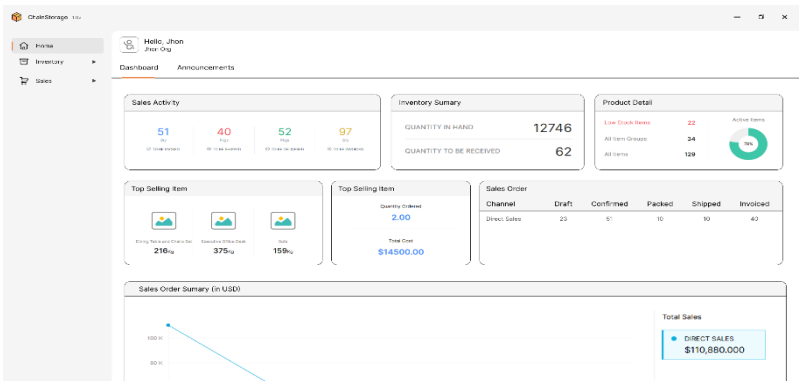

Figure 5 System framework through blockchain technology-based applications-1

The picture above shows the initial appearance of the blockchain application which has several features such as sales activity, initial goods inventory, final goods inventory, product details, items that are sold a lot and also know the total sales for the desired period.

DISCUSSION

This research explores the application of blockchain technology in the supply chain management of PT Vitapharm. The objective is to investigate how this technology can enhance efficiency within the supply chain. Data obtained from this research reveal several significant findings regarding the implementation and benefits of blockchain technology in the company.

Data transparency and accuracy

Before the implementation of blockchain technology, PT Vitapharm encountered issues with inventory data inaccuracies, often resulting in stock shortages or excesses. However, following the implementation of blockchain, inventory data has become more accurate and accessible to all relevant parties in real-time. Each entry in the blockchain system is verified by all parties in the network, reducing the risk of human error and ensuring data integrity.

With this transparency, PT Vitapharm can more easily trace the origin of products and ensure that every stage of the supply chain adheres to established standards. This is crucial in the pharmaceutical industry, where product safety and quality must be strictly maintained.

1. Operational effectiveness

The research findings indicate that after the implementation of blockchain technology, PT Vitapharm was able to reduce its cash-to-cash cycle time, increase the speed of goods delivery, and accelerate inventory turnover. For instance, the time required to verify goods shipments and receipts was significantly reduced, from several days to merely minutes.

Furthermore, blockchain enabled PT Vitapharm to reduce administrative costs associated with transaction verification and recording. By automating these processes, the company was able to save time and human resources previously used for these manual tasks.

2. Data Security

Prior to adopting blockchain, PT Vitapharm faced data security challenges, including the risk of information leakage and cyberattacks. Data stored in traditional systems was vulnerable to unauthorized access and manipulation. However, with blockchain technology, each transaction is encrypted and recorded in a distributed ledger across the network, making it virtually impossible for hackers to alter data without detection.

3. Cost Saving

This research demonstrates that PT Vitapharm achieved significant operational cost savings after implementing blockchain technology. For example, by reducing reliance on manual verification processes, the company was able to decrease labor costs previously allocated to such tasks. Furthermore, by minimizing errors in inventory records and reducing the risk of lost or damaged goods, the company was able to save costs associated with resolving these issues.

CONCLUSION

This research makes an important contribution to the application of blockchain technology to supply chain management at PT Vitapharm. By using an immutable distributed ledger system, blockchain increases transparency and security of transactions, reduces the risk of fraud, and increases trust between transacting parties. The implementation of this technology at the company resulted in more efficient inventory management, with well-stored and transparent data, and more accurate inventory calculations. The results of this study confirm that blockchain technology has great potential in digital transformation and offers innovative solutions to various challenges in the industry.

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