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Minimizing Waste to Reduce Lead Time Delivery at PT. X Through Value Stream Mapping Method

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Abstract

The purpose of this study is to minimize waste in order to reduce lead time delivery at PT X. The method that the author uses in this research is a quantitative method with data analysis techniques using value stream mapping and seven waste analysis. The data collection technique that the author uses is interviews, observations, and company documents. The results of this study succeeded in reducing the lead time from 11 days, 31 hours 35 minutes, to 10 days, 23 hours 35 minutes if the operational unit is on standby. Furthermore, if the operational unit is on standby after 17 days 28 hours 35 minutes, it becomes 10 days 29 hours 35 minutes.

Keywords

Lead Time Reduction; Seven Waste Analysis; Value Stream Mapping; Waste Elimination.

INTRODUCTION

PT X has two types of business activities, namely B2B and B2C activities. For B2C, it is meant to be a daily cash flow, and for the company's operating costs, customers of B2C are mainly MSMEs, end users, and several projects or events that require wholesale suppliers.

For B2B, PT X has 3 customers: PT A, PT B, and PT C (as shown in Fig. 1). Each customer has a different warehouse. However, all these 3 customers have one thing in common: they do not tolerate delivery delays.

Based on the data received from the company, the order processing process for the period 2020-2021:

• Delivery to PT A of 24 shipments, 19 delayed with a delay of 5-47 days.

• Delivery to PT B of 7 shipments; 5 were delayed with a delay of 38-83 days.

Moreover, that is a serious issue that companies need to address soon if they want their business to thrive and be sustainable. It should be noted that the company's customer does not specify a maximum delay limit, which means there is no tolerance for delays.

This zero tolerance is enforced because the items shipped from PT X are food and beverage ingredients that are an important part of the customer's business. Like PT A issuing orders to feed its employees in Jakarta and mines in Papua and Kalimantan. Then PT B for later resale at several airports in Indonesia. At the same time, PT C fills the co-op store in their office setting.

Many factors affect delivery delays, as was the case with PT X, from internal factors such as PT X only has 1 unit of the operational truck to send goods to customers and is also used to scout for goods or goods to factories or suppliers. Another internal factor is if employees are exposed to the COVID-19 virus, which requires a quarantine of at least 14 days, this is enough to hamper PT X's business processes.

From the 42 total orders placed by PT X with suppliers in the form of factories or distributors for May 2020 to June 2021, 11 orders experienced sourcing delays, and 31 other orders were shipped on time by the suppliers.

To minimize delivery delays to B2B customers by reducing lead time in delivering goods to PT X's customers, this can be done using several methods such as Value Stream Mapping, Process Diagram Mapping, and time mapping functions.

From several options, the author chooses to use the value stream mapping method because, in this case, it is necessary to describe the flow of business activities in detail, and it is necessary to separate value-added activities and non-value-added

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activities so that the authors can be more precise in finding waste.

Efforts are made to approach the lean concept, and also value stream mapping has been proven to be successfully demonstrated in all industries (Shou et al., 2017). Lean manufacturing is a way to streamline and increase effectiveness by developing methods to increase production and minimize waste developed by Toyota after World War II (Nadeem et al., 2017). The application of lean will use the seven waste analysis methods to identify existing waste; in addition to using the seven waste analysis methods, the author will also use the value stream mapping method because it reduces waste. Value stream mapping is a series of activities that contain value-added and non-value-added activities needed to provide a product ordered by customers through the mainstream related to the entire supply chain (Md. Abu Sayid Mia, 2017). So it must be understood in advance that the entire business activity from the beginning to the end of the business process takes place so that it is found which processes have a waste of time and can still be reduced to make it even shorter. Due to high customer expectations, companies must adapt quickly to satisfy customers (Sudhakara et al., 2020).

The purpose of this research is to make business processes at PT X more optimal to increase customer satisfaction owned by the company so that it can run a sustainable business as expected, namely to satisfy consumers, one of which is by sending orders on time.

LITERATURE REVIEW

Supply Chain Management

Supply chain management describes all coordination in the supply chain, starting from raw materials to customers' hands; thus, supply chain management includes suppliers, service providers, distributors, and customers (Heizer et al., n.d., 2017). So, in other words, supply chain management is planning that aims to make the fulfillment of customer orders more effective and efficient.

Lean Operation

A lean operation, in general, can be explained as a Japanese concept of dynamics in manufacturing and is widely practiced by many organizations and companies to reduce waste, increase productivity, and overcome environmental impacts; this effort has grown over the last few decades (Purushothaman et al., 2020). In other studies, lean can be defined as a system that eliminates waste and focuses on the company's goal of increasing customer satisfaction (Heizer et al., n.d., 2017). In essence, companies or organizations use lean to reduce waste in their activities and to improve performance (Mardin et al., 2019). Furthermore, lean also aims to provide customers with a zero-waste process with continuous performance improvement (Heizer et al., n.d., 2017). Lean operation is quite easy for employees to solve a problem because lean is a human-based system concept that makes it easier for employees to solve problems in their workplace (Mardin et al., 2019).

Lead Time

Lead time cannot be promised due to uncertainty in procurement, production, transportation, and other unforeseen events that cause uncontrollable time, leading to customer dissatisfaction (Stefan et al., 2021). Lead time is also one of the important aspects of a company's business processes because it affects the effectiveness of all of the company's business processes, so the right decision must be made in selecting the lead time (Negi & Wood, 2019).

The length of the lead time also affects customer satisfaction because if it is not minimized, it can result in delays in delivery and others. However, the lead time can still be reduced to several parts to be more efficient and effective.

Seven Waste Analysis

Lean has the aim of perfecting production activities to be efficient and effective, where there is no waste and non-value added activity, which means that every activity or product cannot provide value; the product or activity can be said to be waste (Heizer et al., n.d., 2017). In their book, Jay Hazer and Berry R have summarized a concept from Taichi Ohno, namely the concept of seven waste analysis which contains:

Waste of Overproduction: a condition where it produces more than the number of customer orders which is one of the causes of the bullwhip effect.

Waste of Queues: Waiting time that does not generate values or unnecessary waiting time.

Waste of Transportation: The process of moving goods between warehouses or

factories with inefficient routes that can cause wasting time.
Waste of Inventory: Storage of excessive production raw materials or storage of finished products that can cause waste.
Waste of Motion: Unnecessary mobilization of goods or employees can also cause waste.
Waste of Over processing: Activities carried out in the production process but not really needed, or non-value-added activities will also cause waste.
Waste of Defective Product: Products that are rejected or returned either because of wrong delivery, damage, defects, or warranty claims can result in double work, which is waste.

Seven waste analysis is applied because eliminating waste can impact the use of resources more effectively and efficiently to make business processes more optimal (Widodo et al., 2020). If waste elimination can be carried out continuously, the company will be able to maintain its profits (Heizer et al., n.d., 2017).

Value Stream Mapping

Value stream mapping has been widely defined by experts in recent times who say that value stream mapping is a way to visualize an information flow from a business process (Johari et al., 2018). Value stream mapping also helps management in getting information about the company's business flow and also getting information about non-value added activities and their effects on the company's business processes (Johari et al., 2018). In one study, it was stated that lean manufacturing has tools that are commonly used to help identify waste and find solutions for that waste. The goal is to reduce or even eliminate non-value-added activities so that business processes are more effective and efficient and make customers feel satisfied with what they get (Dinis-Carvalho et al., 2019). In another study, it was also explained that value stream mapping is a tool to help understand processes and provide added value to help companies reduce waste (Heizer et al., n.d., 2017).

Value stream mapping (Fig. 2) uses a series of streams with image symbols that are used to improve the visualization of the flow and also highlight the waste contained in non-value added activities after being separated from value added activities (Seth et al., 2017).

Fishbone Chart

A *Fishbone chart* is an analysis shaped like a fishbone that calculates the factors that affect the quality of a product, such as humans or employees, machines, materials, processes, and the environment (Sui et al., 2018).

After the fishbone chart has been filled in and refined, the researcher can systematically summarize or conclude the factors that influence an event and propose preventive measures. The steps for improving the fishbone chart in the journal from (Sui et al., 2018) are as follows:
Survey: To understand comprehensively and prepare accurate charts for analysis.
Troubleshooting: The next survey results are described using a fishbone chart.
Cause Analysis: Classify the data according to the importance of the survey and according to the group of reasons.

RESEARCH METHODS

The method used in this study is a quantitative research method. The type of research that will be used in this research is a case study that aims to find out what wastes occur in business processes at PT X that cause delays in sending orders to company customers. This study uses cross-sectional dimensions.

The first step is to map the business processes studied using the value stream mapping method to separate value-added and non-value-added activities from determining which parts can be optimized. The next step is categorizing the waste contained in the business process into 7 waste analyses according to their respective categories. Next, find a solution to overcome the waste and minimize and replace it with value-added activity; it will be able to reduce the current lead time so that it can send orders to customers more on time.

RESULTS AND DISCUSSION

In the current value stream mapping of PT X (Fig. 3 and Fig. 4), if the operational unit is on standby, there is an average lead time of 11 days and 31 hours 35 minutes. Furthermore, it is broken down into value-added activities 7 days, 23 hours, and non-value-added activities 4 days, 8 hours 35 minutes, such as travel, non-work hours, data transmission, information delivery, moving goods, and preparation for the next series.

Efficiency is 64.4%. In PT X's business activities, the purchasing department of the operational division must also go to supermarkets to complete goods that are lacking from vendors to complete ordered goods that vendors do not sell.

Furthermore, suppose the operational unit needs to be on standby. In that case, it has a total lead time of 17 days 28 hours 25 minutes, which is then divided into 2 groups, namely the value-added activity of 7 days 23 hours and non-value-added activity of 10 days 5 hours 25 minutes, different from when the standby unit here has an efficiency level of only 43.76%.

After identifying the waste in the company's business flow and using a fishbone diagram (Tabel. 2), a value stream mapping containing the business flow has been optimized by reducing the identified waste. It can be seen that there are several changes in value-added activities and non-value-added activities, which is a total of 10 days 23 hours 35 minutes which means 1 day 8 hours down from the previous total lead time. The total time is divided into 2, namely 7 days, 19 hours as a value-added activity, and 3 days 4 hours 35 minutes as a non-value-added activity. The level of business process efficiency also increases to 70.97%.

In the value stream mapping from the company after being optimized (Fig. 5 and Fig. 6), if the operational unit is off standby, there is a considerable change in the total lead time. With a total lead time of 10 days, 29 hours 35 minutes, divided into 7 days, 21 hours for value-added activities, and 3 days 8 hours 35 minutes for non-value-added activities. This figure is certainly much reduced from the previous one, which had a total lead time of 17 days, 28 hours, and 35 minutes; besides that, the efficiency level also increased to 70.12% after being optimized. The reduction in non-value-added activity occurs when the company hires a freight forwarder to deliver goods to the customer instead of waiting for the operational unit to arrive and be available.

CONCLUSION

Seven Waste that occurs in PT X's business processes is Waste of overproduction, Waste of queues, Waste of transportation, Waste of inventory, Waste of motion, Waste of processing, and Waste of defective products. Moreover, there are several identified wastes, namely:

a. Waste of queues:
   - Queuing at the cashier of a store or supermarket.
   - Waiting for the president director's response to approve.
   - Waiting for answers and confirmation from vendors and or suppliers.
   - Waiting for their turn to unload at the customer's place.
b. Waste of transportation:
   - Not the fastest route.
   - Routes to supermarkets or shops are random and unplanned, so they are back and forth and ineffective.
c. Waste of inventory: Goods are unloaded and arranged in front of the warehouse.
d. Waste of over-processing: Goods that have been unloaded and arranged in front of the warehouse are put into the warehouse and rearranged,
e. Waste of Defective Products:
   - Goods from vendors or suppliers that are not eligible will be returned.
   - The customer will return items that are not eligible.

To reduce lead time on delivery, the author optimizes business processes by eliminating waste that can be eliminated and cutting non-value added activities in PT X's business processes. And the lead time in business processes when the standby unit is reduced from the previous 11 days 31 hours 35 minutes, to 10 day 23 hours 35 minutes. And if the unit is not on standby before 17 days 28 hours 35 minutes, it becomes 10 days 29 hours 35 minutes. This is supported by the results of the calculation of the lead time efficiency which was originally in the initial state when standby was only 64.4% and increased in the future state to 70.97% and in the initial condition of the non-standby unit there was also an increase which previously only increased by 43.76%. to 70.97% in the future state.

REFERENCES

Dinis-Carvalho, J., Guimaraes, L., Sousa, R. M., & Leao, C. P. (2019). Waste identification diagram and value stream mapping: A comparative analysis. *International Journal of Lean Six Sigma*, *10*(3), 767–783. https://doi.org/10.1108/IJLSS-04-2017-0030

Hasan, N. (2018). *Supply Chain Lead Time Analysis for Possible Reduction : Case Study in an Oil and Gas*. 1–96.

Heizer, J., Render, B., & Munson, C. (n.d.). *OPER AT IONS M A NAGEMEN T Sustainability*

and Supply Chain Management TWELFTH EDITION.

Ivanov, D., Tsipoulanidis, A., & Schönberger, J. (2019). *The Magic Supply Chain and the Best Operations Manager*. 3–16.

Johari, M. K., Adly Ishak, F., Johari, K., & Dolah, R. (2018). A case study of LEAN application for shortest lead time in composite repair shop Related papers A case study of LEAN application for shortest lead time in composite repair shop. In *International Journal of Engineering and Technology* (Vol. 7, Issue 4). www.sciencepubco.com/index.php/IJET

Liu, A., Zhu, Q., Xu, L., Lu, Q., & Fan, Y. (2021). Sustainable supply chain management for perishable products in emerging markets: An integrated location-inventory-routing model. *Transportation Research Part E: Logistics and Transportation Review*, *150*. https://doi.org/10.1016/j.tre.2021.102319

Malik, A. I., & Sarkar, B. (2019). Coordinating supply-chain management under stochastic fuzzy environment and lead-time reduction. *Mathematics*, *7*(5), 1–28. https://doi.org/10.3390/math7050480

Mardin, G. A., Frank, A. G., Tortorella, G. L., & Fetterman, D. C. (2019). Lean production and operational performance in the Brazilian automotive supply chain. *Total Quality Management and Bisnis Excellence*, *30*(3–4), 370–385. https://doi.org/10.1080/14783363.2017.1308221

Md. Abu Sayid Mia, Md. N.-E.-A. Md. L. R. M. K. U. (2017). Footwear Industry in Bangladesh: Reduction of Lead time by using Lean Tools. *Journal of Environmental Science, Computer Science and Engineering & Technology*, *6*(3). https://doi.org/10.24214/jecet.c.6.3.25159

Nadeem, S. P., Garza-Reyes, J. A., Leung, S. C., Cherrafi, A., Anosike, A. I., & Lim, M. K. (2017). Lean manufacturing and environmental performance – Exploring the impact and relationship. *IFIP Advances in Information and Communication Technology*, *514*, 331–340. https://doi.org/10.1007/978-3-319-66926-7_38

Negi, S., & Wood, L. C. (2019). Transportation lead time in perishable food value chains: An Indian perspective. *International Journal of Value Chain Management*, *10*(4), 290–315. https://doi.org/10.1504/IJVCM.2019.103269

Purushothaman, M. babu, Seadon, J., & Moore, D. (2020). Waste reduction using lean tools in a multicultural environment. *Journal of Cleaner Production*, *265*, 121681. https://doi.org/10.1016/j.jclepro.2020.1216

Seth, D., Seth, N., & Dhariwal, P. (2017). Application of value stream mapping (VSM) for lean and cycle time reduction in complex production environments: a case study. *Production Planning and Control*, *28*(5), 398–419. https://doi.org/10.1080/09537287.2017.1300352

Shou, W., Wang, J., Wu, P., Wang, X., & Chong, H. Y. (2017). A cross-sector review on the use of value stream mapping. In *International Journal of Production Research* (Vol. 55, Issue 13, pp. 3906–3928). Taylor and Francis Ltd. https://doi.org/10.1080/00207543.2017.1311031

Stefan, H., Matthias, S., Manuel, S., & Anita, O. (2021). The lead time updating trap: Analyzing human behavior in capacitated supply chains. *International Journal of Production Economics*, *234*(January), 108034. https://doi.org/10.1016/j.ijpe.2021.108034

Sudhakara, P. R., Sałek, R., Venkat, D., & Chruzik, K. (2020). Management of non-value-added activities to minimize lead time using value stream mapping in the steel industry. *Acta Montanistica Slovaca*, *25*(3), 444–445. https://doi.org/10.46544/AMS.v25i3.15

Sui, J. H., Yu, Y. F., Du, Q. F., & Jiang, D. W. (2018). Study on the quality of FRP fishing vessel based on improved Fishbone Chart. *IOP Conference Series: Materials Science and Engineering*, *292*(1). https://doi.org/10.1088/1757-899X/292/1/012095

Widodo, S. M., Astanti, R. D., Ai, T. J., & Samadhi, T. M. A. A. (2020). Seven-waste framework of waste identification and elimination for computer-based administrative work. *TQM Journal*, *33*(4), 773–803. https://doi.org/10.1108/TQM-04-2020-0072

List of Tables

Table 1. Value Stream Mapping Symbol

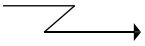
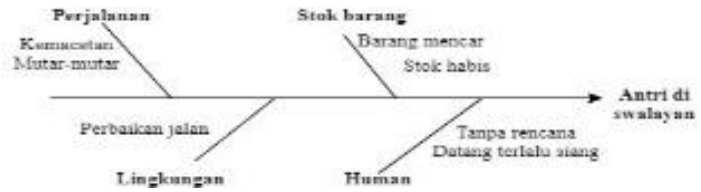
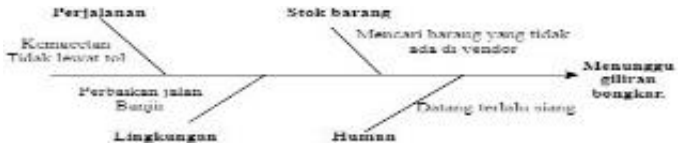
Symbol	Explanation
	Information delivered directly
	Information submitted online
	Suppliers who supply the goods needed
	Business processes that occur internally in the company such as departments or products
	Delivery of goods from the supplier or delivery to the customer
	Movement of goods or products within the company
	First in first out symbol
	Delivery from supplier or to customer
	The go see symbol that occurs when checking
	The place to write the time on the top line is value added activity and the bottom line is non value added activity

Table 2. Breakdown Waste with Fishbone Diagram

Flow	Fishbone Diagram
Waste of Queues : Queue at the supermarket	
Waste of queues : Waiting for unloading	

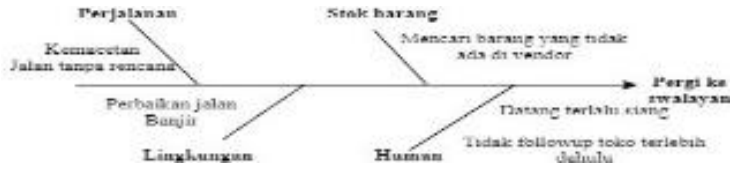
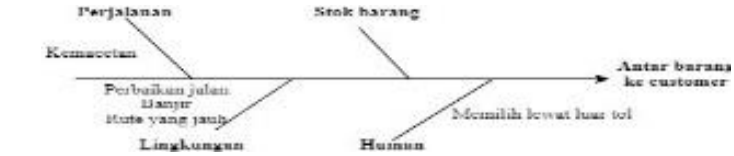
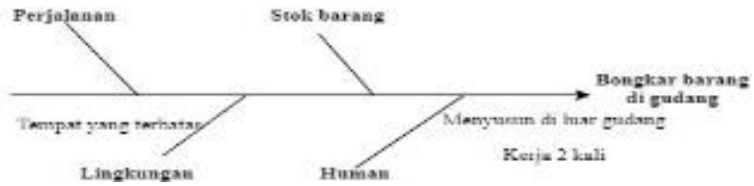
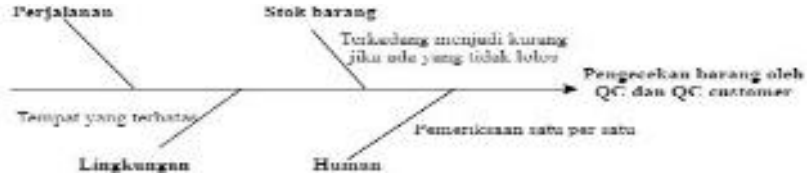
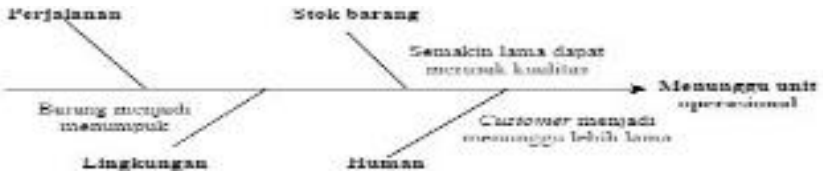
Waste of transportation : Go to supermarket	
Waste of transportation : Deliver goods to Customers	
Waste of Inventory : Arrange goods in warehouse	
Waste of Defective Product : Checking by QC	
Waste of queues : Waiting for operational unit	

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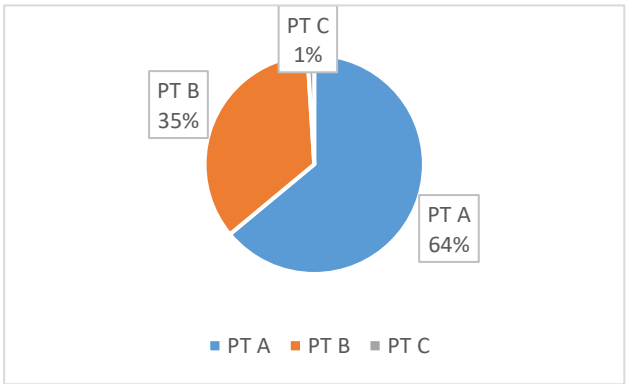
Figure 1. B2B Customer Contribution to PT X . Revenue



Source : Internal Data PT. X

Figure 2. Values Stream Mapping Framework

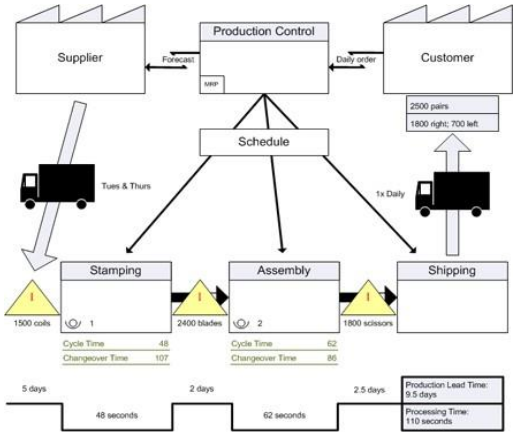


Figure 3. Current Values Stream Mapping Unit Standby

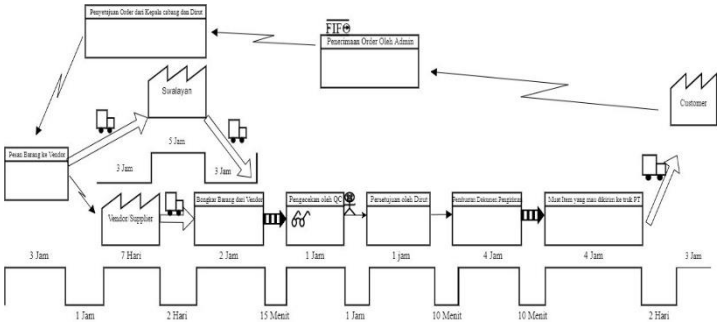


Figure 4. Current Values Stream Mapping Unit Not Standby

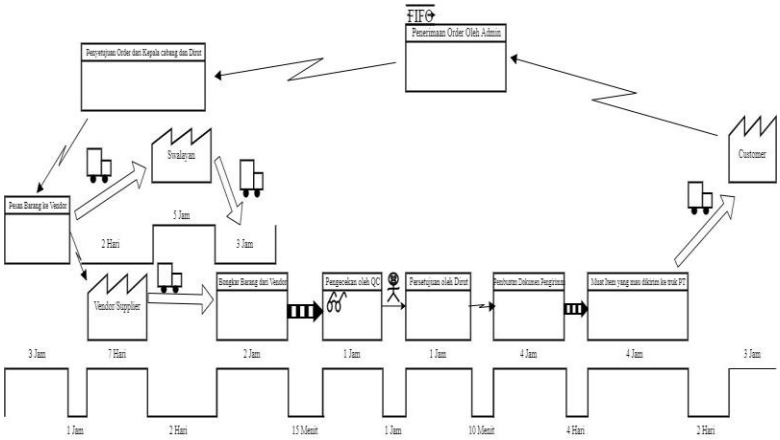


Figure 5. Future Values Stream Mapping Unit Standby

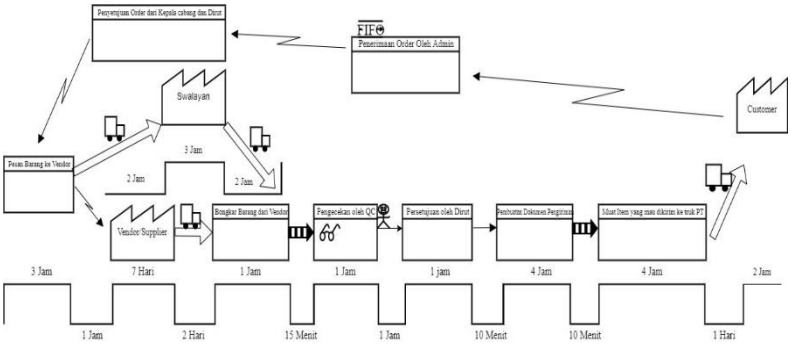


Figure 6. Future Values Stream Mapping Unit Not Standby