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Analysis of Service Delivery Improvement of Manufactured Products with Lean Method Management

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ARTICLE INFO	ABSTRACT
	This study aimed to determine the waste that occurs in activities from receiving to delivering of finished products that can result in delays in the delivery of audio to Japan. The waste identified is limited to activities in the finished goods warehouse. The problem that occurs is the delay in product delivery, because the product is not ready to be delivered so that it causes delays. The lean approach is used to reduce waste in the overall work process activities in the finished goods warehouse. Waste identification was performed through the 7 waste approach. Process Activity Mapping is one of the tools of VALSAT, and is looking for critical waste to find the root cause of waste. Delay can be minimized by making improvements to the layout of the warehouse and routine inspection of goods transporters. Companies should use lean to reduce the waste that occurs so there is no delay in the delivery of audio products.

1. Introduction

Distribution is the process of channelling products from producers to consumers. Ease of consumers in getting the desired product is the top priority of every company to satisfy its customers. Distribution problems are often the biggest obstacle, especially for companies that produce mass. Errors in planning distribution strategies can cause products that should be delivered to consumers on time according to the agreement but become late and the company loses money. Distribution is an important factor in marketing. In the distribution process, one thing that must be considered is customer satisfaction because customer satisfaction will affect the success of product sales. One of the factors of customer satisfaction is the product arrives to consumers on time and the prod-

uct is as expected. Philip Kotler defined distribution as a group of companies and individuals who take over rights or help in taking over the rights of the goods or services from producers to consumers [1]. According to Kotler a company that carries out physical distribution, certainly has goals to be achieved. The purpose of physical distribution is to move products in the right amount, at the right time, and at the right place with the use of minimal costs. According to Mikael and Suryanto [2] the definition of delivery is the activity of distributing the products and services of producers to consumers. Delivery is a marketing activity to facilitate the distribution of products from producers to consumers. A warehouse is a building that is used to store goods. Warehousing is an activity to store goods in a warehouse [3]. According to Hadiguna and Setiawan [4], warehouse as a place to store products to meet

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customer demand quickly has several functions between receiving and delivering products. Technical activities in warehousing are carried out according to standard procedures and are made as simple as possible, but do not reduce the meaning of the tested work. This process must be synchronous and optimal, in order to increase efficiency by considering the cost reduction in warehouse operations. Details of work procedures must be made, documented and always available to all employees. These activities are pre-receiving, receiving, putting away, storage, picking, refilling, packaging, value added services, delivering, and claim services [3].

2. Literature Review

2.1 Lean Method

According to Gaspersz [5], Lean is a continuous improvement effort to eliminate waste, increase the added value of products (goods and/services) and provide value to customers so that it is in the right place, at the right time, and in the right amount to achieve a perfect work flow besides minimizing waste and flexible (easily change) process. A distribution strategy that results in lower costs can be performed with the activity distribution approach combined with principles of Lean. Lean is a systematic approach to eliminate waste and changing processes. This is performed by identifying and reducing waste by continuous improvement. Lean strives to create production flows along the value stream by eliminating all forms of waste and increasing product added value to customers. In addition, this approach can reduce unecessary inventory, increase knowledge about the production process, save costs, reduce defects so that quality increases, reduce production lead times and reduce waste.

2.2 Big Picture Mapping

Big Picture Mapping is used to describe the production system (ranging from ordering to a finished product as a whole) along with the value stream in the company, so that later obtained an overview of the information flow and physical flow of the existing system, identify where waste occurs, and describe the lead time which is needed based on each characteristic of the process that occurs. This tool is very helpful in identifying the occurrence of waste.

3. Methodology

Research Design

After the data is obtained by using several data collection

techniques, both primary and secondary data, the data can be identified from the cause of the waste time that occurs and results in late delivery of audio products at PMI. In this stage, the data that has been collected is then processed to map problems and solve problems. At this stage the first thing to do is to map the activities into the big picture mapping, while what is performed in this stage, namely

3.1 Big Picture Mapping

Making BPM that is by mapping the flow of information and material or physical products, the steps that must be taken are as follows:

(1) Describing the flow of information from customers to suppliers, namely: the organization or department that provides information to the company, how long the information appears until it is processed, what information is delivered to the supplier and the required orders.

(2) Linking physical flow and information with arrows that can provide information on the schedule used, work instructions generated, from and for what information and instructions are sent, when and where problems usually occur in the physical flow.

(3) Completing the map with information about the lead time and VA of the whole process to provide information about the time.

3.2 Waste Identification and Weighting

Waste weighting was performed by distributing questionnaires to 4 respondents who were most aware of the conditions that occur. The first respondent was the chief group from PPC, and the second questionnaire was given to the Audio BU PMI goods warehouse supervisor, and the third and fourth were given to the PPC staff. The basis in weighting is the respondent gave a score of 1-5 on each type of waste

3.3 Value Stream Tools

After the value of each waste is obtained by distributing questionnaires, then the selection of the right tool is performed using Value Stream Tools. The value of each tool is obtained by multiplying the waste value in the recapitulation results of the questionnaire with the weight value in the Value Stream Tools (VALSAT) table in Table 1. The following table will be filled in accordance with the weight of each waste at PT PMI, there are high, medium, and low correlations. Furthermore, from this table it can be seen the order of the lowest to the highest score of 7 wastes, for the highest score can choose tools from VALSAT that will be used.

3.4 Process Activity Mapping

After the highest score by processing in the VALSAT table is obtained, it can be determined the tools that will be used further waste analysis. In this tool activities are categorized in several categories such as: operation, transport, inspection, and storage/delay. The process activity mapping consists of several simple steps:

(1) Performing initial analysis for each process of activities that occur from receipt of goods to delivery of finished goods.

(2) Identifying activities that can be a waste of time.

(3) Considering processes that do not have added value to be changed so that the order of the process can be more efficient and also reduce cycle times.

(4) Considering better flow patterns to be more efficient and effective than the previous process.

(5) Classifying activities into Value Added (VA), Non-Value Added (NVA), Non-Necessary Value Added (NNVA) [6].

3.5 Process Cycle Efficiency

After obtaining the time from each activity process and classifying it using Process Activity Mapping, it can calculate the Process Cycle Efficiency (PCE) measurement by comparing VA with Lead Time. If PCE results under 30%, it can be said that there is a waste that occurs in the process of its activities, so it requires to find the most influential waste to the occurrence of problems and minimize it [7].

3.6 Determine Critical Waste

Looking for waste that has great potential in causing prob-lems that occur, the first thing to do was distributing questionnaires to 4 respondents namely the Head of the PPC, supervisor of finished goods and the two PPC staff to determine the waste as the main factor of late product delivery. By distributing questionnaires so that the value of waste weight that has been classified into 7 waste would be obtained. After that, a graph was made to determine the lowest to highest waste weight [8].
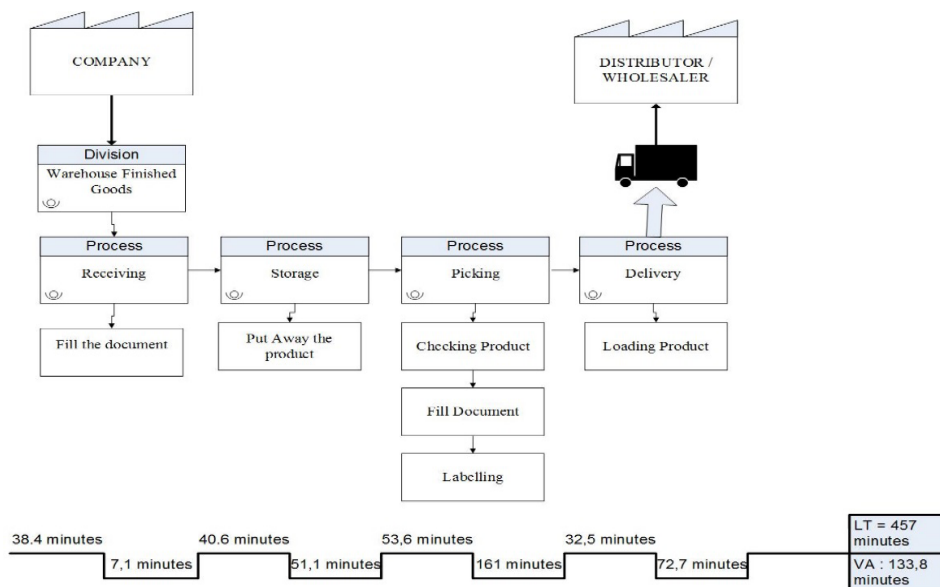
4. Result and Discussion

In the delivery of audio products at PT PMI there are several parts of the process including receiving, storage, picking & delivery. Big picture mapping shows all process activities from receipt of finished audio goods to loading to be sent to their destination. The activities shown in the big picture mapping are only for activities that have only added value. With big picture mapping, it can be obtained a clear picture of the general process of activities from the receipt to delivery of audio.

Looking for waste was carried out from the process of receiving finished goods until the loading of fineshed goods into container trucks. Based on the results of interviews related to parties who understand the problems with the Head of PPC and the supervisor of finished goods data will be presented as follows.

4.1 Defect

Defect is a waste of errors that occur in the work process, problems in product quality or lack of information. This type of waste occured at PT PMI because sometimes the operator did not use gloves that can cause traces of oil in the audio that is being handled in the finished goods ware-

house, it can cause the goods to become reject or "NG". Poor packaging conditions will reduce the quality of the product itself, so it is necessary to repack the item. This problem usually occurs because when handling goods in the finished goods warehouse, there is an error in the equipment that is not operating properly. Hoists that are used to transport goods from the production floor to the finished goods warehouse or vice versa, rarely do routine checks so that when used, the hoist cannot operate properly so that it can potentially cause the goods to fall and cause damaged packaging.

4.2 Unnecessary Inventory

Waste in inventories occured in finished goods warehouses because one audio model experienced an excessive amount so there was not enough space to store the model. If this happens, the audio product which cannot be placed in the place of the model will be placed in the place of other audio models that still have available space. BU AC and BU Refrigerator Printed Circuit Board (PCB) material is made in BU Audio so sometimes before it is delivered, PCB material for Refrigerator and AC is in finished goods warehouse without any special placement for PCB storage in finished goods warehouse

4.3 Excesives transportation

Another waste was found in the finished goods warehouse, namely the allowance that was considered too small because it could only be passed by one hand pallet, so the operator had to find another way or turn around to store goods or receive goods. The location of the hand pallet area is at the end of the room and away from the hoist so that if the operator wants to take a hand pallet to store or receive goods, the operator is required to walk to the end of the room first so as to produce a delay in handling the goods in the finished goods warehouse.

4.4 Waiting

This waste occured because loaders or officers who load goods into container trucks were not available or were loading goods in other BUs. This will cause waiting time and the next process cannot be performed. Waiting for the availability of trucks from the forwarder, because of bad traffic or other so there was delaysto come to PMI.

The waste weight that had been known by distributing questionnaires would be entered into the VALSAT table. VALSAT has seven tools which can later be used to analyze the waste that occurs in the work process. The biggest score would be selected by mapping to identify waste in detail. By entering the weighted scores obtained from the

results of the questionnaire and multiplying by the value of each indicator on VALSAT which can be seen in Table 1. The calculation would be presented in the following table:

Table 1. The calculation value

Waste	PAM	SCRPM	PVF	QFM	DAM	DPA	PS
Overproduction	0	0	0	0	0	0	0
Waiting	1.53	1.53	0.17	0	0.51	0.51	0
Excessive transportation	3.06	0	0	0	0	0	0.34
Inappropriate processing	0	0	0	0	0	0	0
Unnecessary Inventory	0.87	2.61	0.87	0	2.61	0.87	0.29
Unnecessary Motion	0	0	0	0	0	0	0
Defect	0.20	0.20	0.6	0.20	1.8	0.6	1.8
Total	5.66	4.34	1.64	0.20	4.92	1.98	2.43
Ranking	1	3	5	6	2		4
Description : PAM = *Process Activity Mapping* DPA = *Decision Point Analysis* SCRPM = *Supply Chain Response Matrix* PVF = *Product Variety Funnel* QFM = *Quality Filter Mapping* PS = *Physical Structure* DAM = *Demand Amplification Mapping*							

In this process, mapping was performed from receiving finished goods to the delivery of finished goods, time measurement was carried out for goods that were only delivered to Japan which carried out once every 2 weeks a month and with relatively the same number of requests. There were more than 20 types of models delivered to Japan, for example R-45-S, RF-2450-S, RF-P155-S, RF-U15-S, RX-D47-S, RX-FS27-K , RX-M45-H and other models.

From PCE results obtained, it can be known that process had not been efficient due to less than 30%, then critical waste determination was carried out by distributing questionnaires to 4 respondents namely the Head of PPC, supervisor finish goods and two PPC staffs. In determining the critical waste or waste that has the most significant influence on the problem that occurs, it was performed by rating scores 1 to 5 of each waste in order to know the waste with the largest score and have an impact on work productivity and time of work on an activity. The value for weighting waste was obtained from the results of a questionnaire that has been made based on the identification of 7 waste in Table 1. There were 4 respondents to answer the questionnaire which understand the conditions that occur based on work experience. The results of the waste weighting questionnaire will be displayed in the table below. In the table above shows the results of the percentage of waste that occurs, after that it was mapped using a graph to see the waste that has a large value [9].
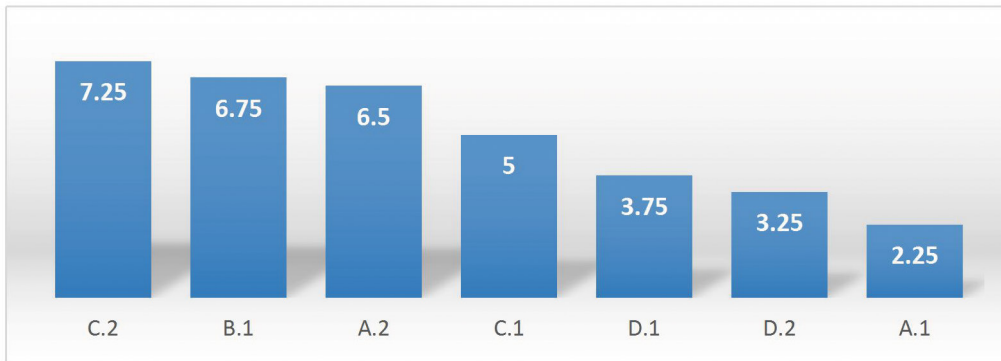
In the graph above shows there were 3 types of waste that have the greatest weight compared to the others, namely C2, B1, and A2.

5. Conclusions

The conclusion that can be drawn from the results of this study, found waste of products with damaged packaging due to tools for transporting goods not functioning properly, such as hoists that cannot operate properly so that when they want to load goods from the hoist the goods have the potential to fall. Another problem is that there was no special storage area for storing PCBs. Hand pallet located at the end of the room and far from the hoist.

Proposed improvement by performing relayout the finished goods warehouse and making a special placement for PCB material storage, and moving the hand pallet storage area adjacent to the hoist. Make a schedule for maintenance on the goods loader. Proposed improvement to the company that it is better to use lean methods to eliminate waste so that it is hoped that there will be no more delays in the delivery of audio products.

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