Implementation of Lean Service Approaches to Improve Customer Satisfaction and Sustainability of Health Equipment Procurement Process at Hospitals

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ABSTRACT

Purpose: This study aims to identify the waste that occurs in the process of procuring medical equipment and provide suggestions for improvements to reduce waste in achieving customer satisfaction.

Methodology/Approach: This study uses a lean service approach with the value stream mapping (VSM) method, which is in the refinement stage combined with the Kaizen method.

Findings: This research found waste that occurs in procuring medical devices called creating a project and admin invoicing. It has increased customer satisfaction with evidence of a decrease in the number of complaints by 44.5%. Meanwhile, the lead time for the procurement of medical devices decreased by 34.2%.

Research Limitation/implication: This research has been beneficial for procuring medical devices, which can reduce the processing time for procuring medical devices and improve health services by hospitals when serving patients.

Originality/Value of paper: This research was conducted on the process of procurement of equipment in the health service industry by shortening the processing time for the procurement of medical devices in the create projects and admin invoicing sections using the application of lean service through the VSM method combined with the Kaizen and Focus Group Discussion (FGD) methods of logistics experts and health experts.

Category: A case study

Keywords: customer satisfaction; health equipment; lean service; sustainability procurement; waste analysis

1 INTRODUCTION

Along with the development of health services in Indonesia, the parameter that must be considered is the medical device equipment in each hospital. (Prajwal, Muddukrishna and Vasantharaju, 2020). These parameters include maintenance, improvement, and procurement of medical devices. Intensive care, in its implementation, requires medical equipment to carry out intensive care (Faddis, 2018). Health care equipment can be divided into two in terms of procurement, namely monitoring equipment and auxiliary equipment including ventilators, hemodialysis, and defibrillators. Hospitals should focus on developing local suppliers, and efforts should be made to build a kanban system with an accurate information system (Gurumurthy, Nair and Vinodh, 2020).

Procurement of medical equipment often does not go well and is not on time due to the long lead times for equipment supply chains to hospitals. The research used a population of government hospitals in Jakarta, totalling 152 hospitals that are regular customers of the company. Hospitals in Jakarta generally have more complete equipment compared to other areas, so they will become a referral for regional hospitals. In the process of procuring medical equipment, customers also provide reports regarding the existence of leads that are too long, which will hinder patient service at the hospital. Therefore, monitoring customer satisfaction is an important part of the measuring processes of the quality management system (Horvath and Michalkova, 2012). Complaints that customers give to the company can be seen in Figure 4. The dominant complaint from customers is that the medical device procurement process is taking too long, reaching 72.6% in 2021.

The process of procuring medical devices takes an average of more than two months, which is a long time, so it is necessary to improve efficiency. The procurement process is carried out as an order package consisting of several tools related to their use, such as operating room packages, child care packages, emergency care packages, and others. The number of packages held from 2018-2022 can be seen in Figure 1.

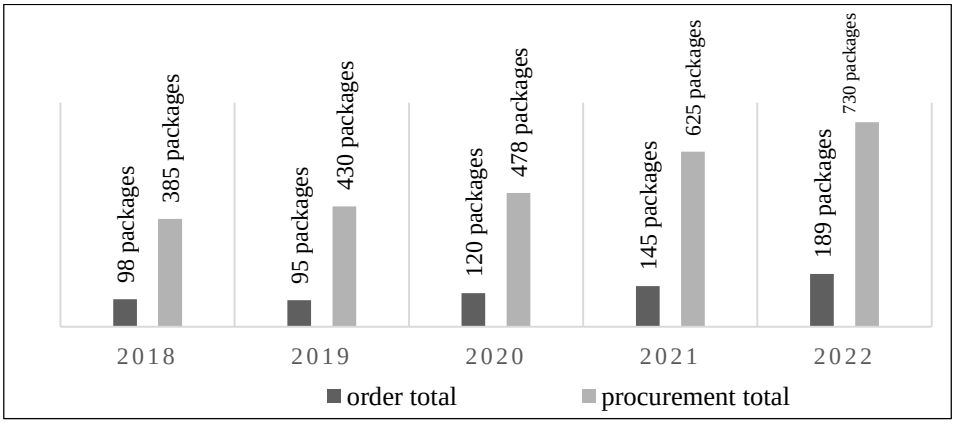

Figure 1 – The Comparison of Procurement and Orders for Critical Care Products (Medical Devices Industry, 2022)

Based on Figure 1, a very large comparison of the number of order packages obtained from all critical care product procurement activities which are carried out every year between 2018-2022. The total procurement was 2,648 packages, while the total orders were only 647 packages, so the percentage of package orders in the procurement of medical devices was only 24.4%. There is still a great opportunity for development and improvement in the coming years.

This research has several problem formulations that occur in the manufacturing industry in the process of procuring medical equipment. This research will identify the types of waste that occur in the process of procuring medical devices and find solutions to reduce waste and achieve customer satisfaction so that there will be continuity in the procurement of medical devices. Customer satisfaction can be affected by the role of the shorter procurement process (Delina et al., 2020).

Based on observations of medical device companies in Indonesia, it was found that there are non-value-added activities that need to be improved in the process of procuring medical devices. Activities that do not add value have an impact on making company reforms ineffective and inefficient (Kurnia and Hardi Purba, 2021). Thus, it is necessary to determine the description related to the problem through a problem-solving approach. One approach to problem-solving is using the lean service approach. The lean service approach can be combined with other methods, such as the Value State Mapping (VSM) method and the Kaizen method at the improvement stage. The VSM method is a method for identifying activities that do not provide added value (non-value added) by mapping the production flow and information flow of a product or product variation (Ikatrinasari, Hasibuan and Kosasih, 2018; Pereira et al., 2019). Kaizen is a method for fixing existing problems in an organisation by analysing, finding the main causes, and carrying out corrective and preventive steps (Kurnia et al., 2021; Aprianto et al., 2022).

Lean service can be used for an internal service approach in which all information can be ensured to be conveyed to consumers directly and quickly so that consumers get effective service to increase customer satisfaction (Jaqin, Rozak and Purba, 2020; Narayanamurthy, Gurumurthy and Lankayil, 2021). Implementing lean thinking has significantly reduced the initial processing time transferred to patient observation, length of stay, and waiting time (Sánchez et al., 2018). Performance improvement is calculated from the percentage of inpatients according to the triage code and waiting time by reducing non-value-added activities (Improta et al., 2018). Consumer satisfaction can be achieved by creating quality, service, and satisfaction value for customers (Dias Irawati Sukma et al., 2022), So the key to gaining customer loyalty is to provide value to these customers (Azarine and Yolanda, 2022).

The new approach to increasing customer satisfaction using a lean service approach to reduce the lead time for procurement of medical equipment using the VSM method combined with the Kaizen method. Then, the root cause analysis, the problem stage using the Fishbone method, Focus Group Discussion (FGD), and Failure Mode Effect Analysis (FMEA). FMEA is a structured procedure to

identify and prevent as many failure modes as possible. The type of FMEA used in this study is the type of FMEA process in the analysis of reducing the lead time for the procurement of medical equipment starting from certain systems, subsystems, or components. Then, at the improvement stage, use the 5W+1H (What, Who, Where, When, Why and How) method and control it using the Standard Operational Procedure (SOP). Other studies also use the lean service approach but in combination with the 5S approach (Nallusamy and Adil Ahamed, 2017). This study aims to identify the waste that occurs in the process of procuring medical equipment and provide suggestions for improvements to reduce waste in achieving customer satisfaction.

2 METHODOLOGY

This type of research includes a mix of quantitative and qualitative methods because there is data in the form of numbers and data in the form of expert opinions. Data collection uses two types of data, namely primary data with observation techniques and secondary data with FGD (Sukma et al., 2022). The limitations of this research are that it only focuses on customers who are in hospitals under government management because, in terms of the number of health equipment agents used by companies as research objects, they sell more at government hospitals, especially in the Jakarta area. Hospitals in Jakarta carry out the process of procuring medical devices, especially critical care products, because hospitals in Jakarta are referral places for regional hospitals.

The output of this research hopes that the company can increase customer satisfaction and obtain continuity in the procurement of medical equipment in the future. The detailed research stages can be seen in Figure 2.

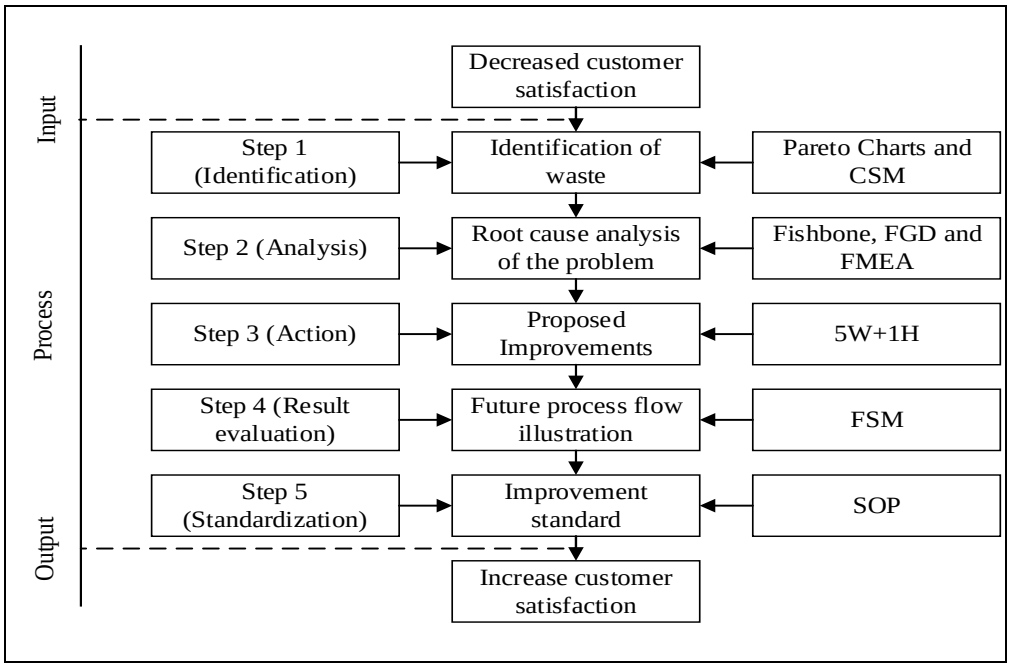

Figure 2 – Research Stages

Figure 2 explains that there are five research stages. Stage 1 identifies the waste that occurs and affects customer satisfaction using the Pareto diagram method and Current Stream Mapping (CSM); the CSM method will calculate Value Added (VA), Non-Value Added (NVA), and Necessary but Non-value Added (NNVA) activities. Stage 2 is to analyse the root causes of the problem using the Fishbone diagram method, conduct FGDs with several stakeholders totalling seven experts, and at the same time, the FGD made an FMEA analysis. FMEA analysis was carried out by the FGD team to determine the Risk Priority Number (RPN), which consists of the arithmetic product of occurrence, severity and detection to produce a risk assessment (Palange and Dhatrak, 2021). Steps to determine FMEA to get the RPN value using a formula:

$$RPN = Severity\ (Sev)\ x\ Occurrence\ (Occ)\ x\ Detection\ (Det) \quad (1)$$

Stage 3 is made suggestions for improvements using the 5W+1H method. Stage 4 evaluated the results of the analysis with illustrations of future processes using the Future Stream Mapping (FSM) method, and stage 5 stands for standardisation of corrective and preventive actions using SOP.

3 RESULTS AND DISCUSSION

This section will discuss the results of the research and its discussion at each stage of the research. This section consists of 5 stages of results, starting from stage 1 to stage five.

3.1 Step 1 (Identification)

The process flow for procuring medical devices for hospitals in Jakarta can be seen in Figure 3.

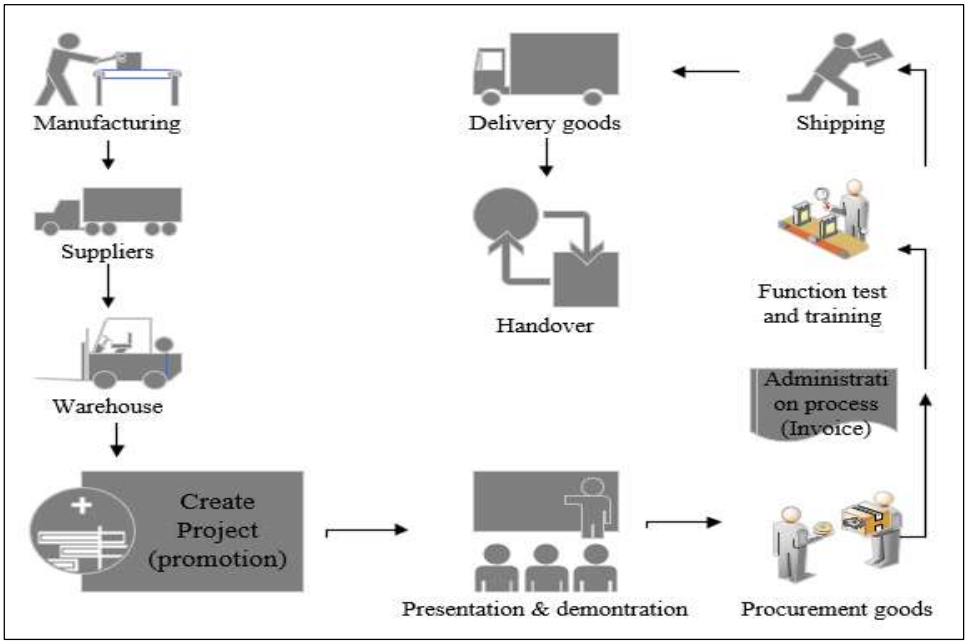

Figure 3 – Flow Process for Procurement of Critical Care Equipment

Based on Figure 3, the initial activity needs to be done to create the need for tools or what is commonly called create a project. Create project activities consisting of promotion, presentation, and demonstration related to medical devices. Currently, the time needed to create a project is 37 days, during which the division visits the hospital (Figure 4). This activity aims to obtain information related to recommendations for quantities, specifications, agreements needed, and after-sales service commitments. The author only focuses on conducting research in the area of the medical device procurement process, especially in the project creation and admin invoicing processes. The results of the Pareto diagram can be seen in Figure 4, which explains the average waste that occurred over the 2021 time frame.

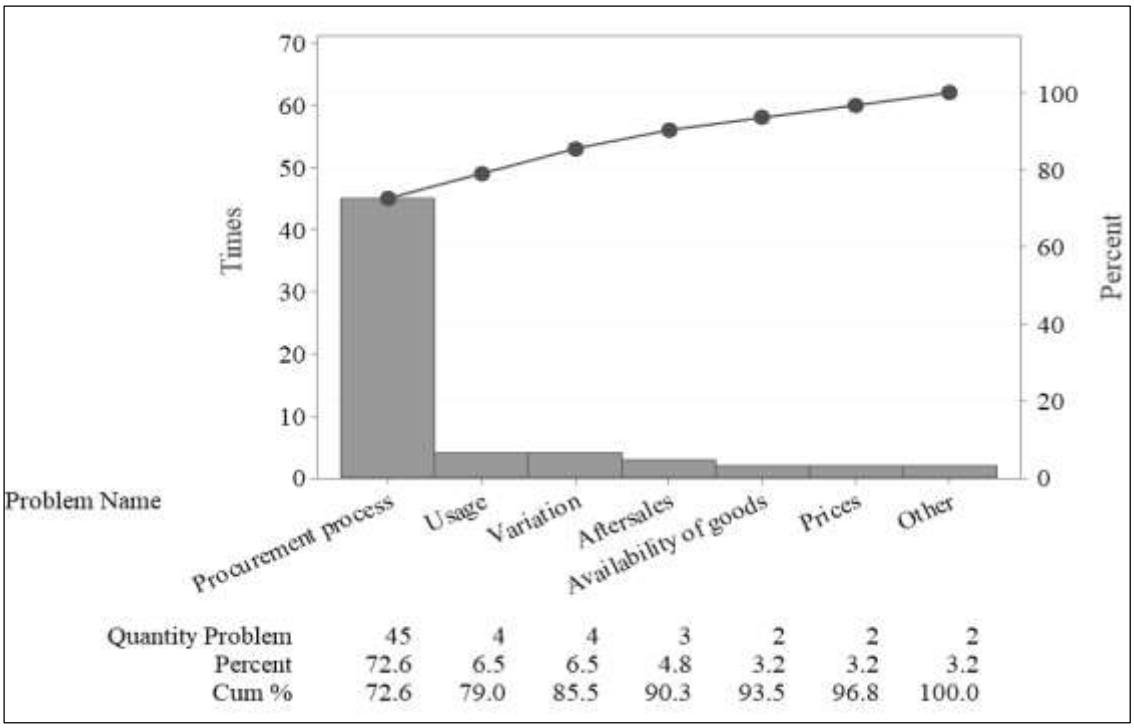

Figure 4 – Customer Complaints Before Improvement

Based on Figure 4, it is explained that the biggest problem is the process of procuring medical devices, which takes too long by 72.6%. The Pareto chart can show the dominant defects that need to be improved immediately (Beatrix and Triana, 2019; I. Setiawan et al., 2022). In terms of CSM, the sequence of the process for procuring medical devices and the processing time for each stage can be seen in Figure 5.

Figure 5 describes the entire process of medical device procurement activities carried out, which requires a Lead Time (L/T) of 197 days. Meanwhile, to fix the problem, the focus is on creating projects and invoicing administration because, in the improvement process, it is considered that they can still be controlled, and improvements are carried out with an L/T of 51 days. VA activities should be improved as much as possible by reducing the waste of time (Kholil et al., 2018; Setiawan et al., 2021; B. Setiawan et al., 2022).

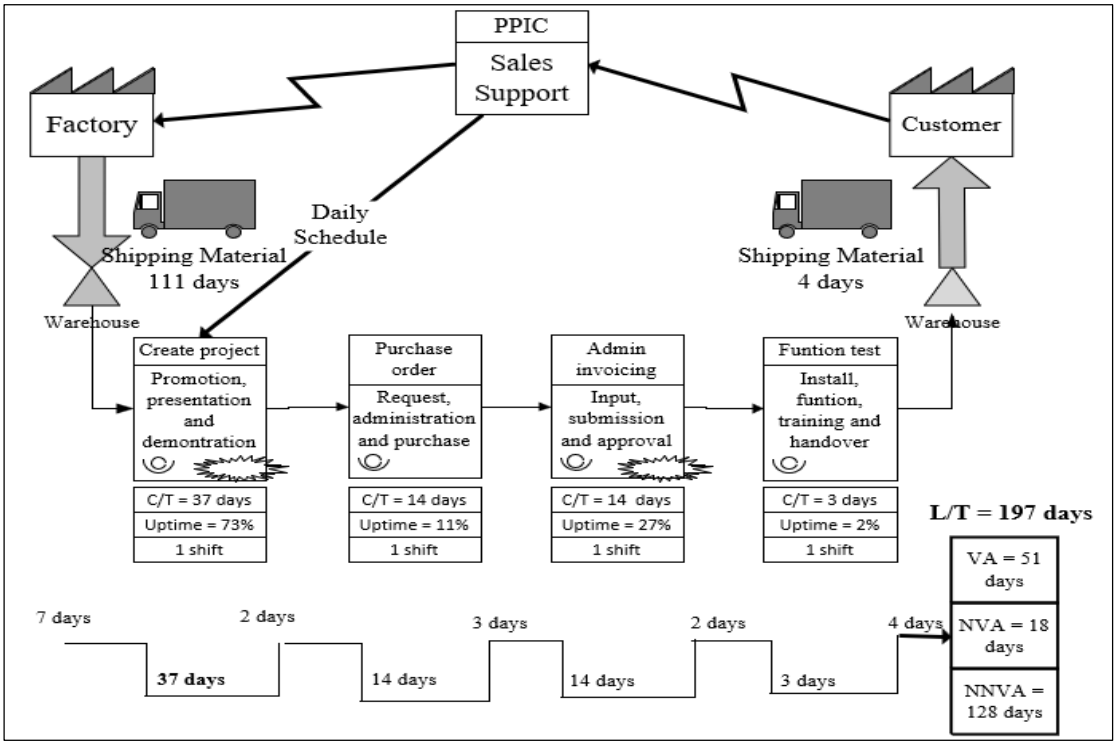

Figure 5 – Current State Mapping (CSM)

3.2 Step 2 (Analysis)

After getting the results of the problem with the procurement of medical devices, the process took too long, so the next step was to analyse the root of the problem. A fishbone diagram is used to analyse cause and effect, so this research focuses on improvement. The results of the Fishbone diagram can be seen in Figure 6.

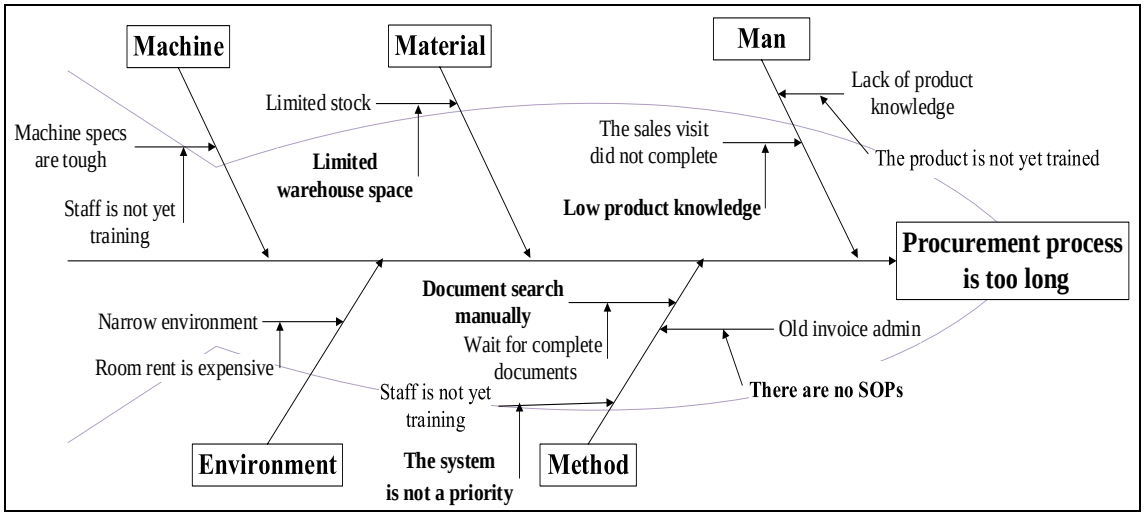

Figure 6 – The Fishbone Diagram of Wasteful Procurement Processes

Based on the Fishbone diagram in Figure 6, the root causes will be explained using a table so that it is easy to identify each factor that influences waste. A fishbone diagram can analyse the dominant root cause so that the cause and effect of the problem will be known (Perdana and Santoso, 2019; Tannady et al., 2019;

Hernadewita, Setiawan and Hendra, 2022). After the fishbone diagram is obtained, the next step is to determine the why-why analysis of the problem. The results of the why-why analysis can be seen in Table 1.

Table 1 – The Results of the Why-Why Analysis of the Medical Device Procurement Process

Problem Description	Factor	Potential causes				
		Why 1	**Why 2**	**Why 3**	**Why 4**	**Why 5**
Low product knowledge	Man	The product is not yet trained	Training is not yet scheduled	The schedule has not been made		
Limited warehouse space	Material	The warehouse is not yet capital	Cash flow is not enough	Items have not been sold	Goods haven't been sold yet	Customers are not interested
The system is not a priority	Method	Staff can not be followed up	Sales are lazy to follow up	The product can not understand	The system is not yet trained	The schedule is not yet made
Document search manually	Method	Document requirements must be collected	Requirements for making billing documents			
There are no SOPs	Method	The company has no SOP	The company has not been made	The SOP has no schedule		

The FGD team was formed according to the members involved in the continuous improvement project (Sukma et al., 2022). The parties involved in the FGD meeting totaled seven expert judgments, which can be seen in Table 2.

Table 2 – The Expert of Judgment or Appraiser Profile

Expert	Age (years)	Work Experience (years)	Position	Competency	Remark
1	54	10	Commissioner	Sustainability development	Internal
2	51	12	Director	Lean and green manufacturing	Internal
3	48	11	Head of division	Lean service	Internal
4	46	10	Head of the warehouse	Warehouse management	Internal
5	43	13	Head of administration	Planning control	Internal
6	41	9	Sales Coordinator	Sales and service	Internal
7	45	14	Key accounting	Accounting	Consultant

Based on Table 2, the FGD team produced a resume meeting in the form of FMEA analysis results as corrective actions that determine improvement priorities, and determine 5W+1H for immediate improvement (Wiyatno and Kurnia, 2022). All

forms of improvement management must fully support the improvement team's time leeway until the investment policy for improvement tools. The results of determining FMEA for waste in the process of procuring medical devices in this study can be seen in Table 3. The determination of FMEA in FGD meetings uses standards or guidelines in determining Severity (Sev), Occurrence (Occ), and Detection (Det) values using formula (1), for example, low product knowledge: RPN = 7 x 8 x 9 = 504.

Table 3 – FMEA Results for Wasted Medical Device Procurement Process

No	Potential Failure Mode	Sev	Potential Failures Effects	Occ	Potential Cause of Failure	Det	RPN	Rank
1	Low product knowledge	7	The customer is not interested in the product	8	The sales visit did not complete	9	504	1
2	Limited warehouse space	6	Customers choose other products that are ready stock	6	Stock limitations	7	252	5
3	The system is not a priority	6	Product not sold	7	The new system is not included in the planning	7	294	4
4	Document search manually	7	Billing takes too long	7	Wait for complete documents	8	392	3
5	There are no SOPs	7	Activities will be irregular	8	The company has no SOP	8	448	2

3.3 Step 3 (Action)

The results of the FGD will be discussed in the form of an improvement plan using the 5W+1H method (Somadi, Priambodo and Okarini, 2020). The results of the 5W+1H plan can be seen in Table 4.

Table 4 – The Determination of 5W+1H of the Medical Device Procurement Process

No	What	Why	How	Who	When	Where
	What is the problem?	Why must be handled?	How to deal with it	Who is in charge	When will it be implemented	Where is it implemented?
1	Low product knowledge	The product is not yet trained	Provide training and standardization with pre-test and post-test	Head of division	January 10, 2022	Head office in Jakarta
2	Limited warehouse space	The warehouse is not yet capital	Speed up the flow of goods expenditure	Head of the warehouse	January 20, 2022	Warehouse in Tangerang

No	What	Why	How	Who	When	Where
	What is the problem?	**Why must be handled?**	**How to deal with it**	**Who is in charge**	**When will it be implemented**	**Where is it implemented?**
3	The system is not a priority	Staff can not be followed up	Do funnel reporting	Head of sales	February 1, 2022	Head office in Jakarta
4	Document search manually	Document requirements must be collected	Simplify the requirements for creating billing documents	Admin's head	February 10, 2022	Head office in Jakarta
5	There are no SOPs	The company has no SOP	Make SOPs	Admin's head	February 15, 2022	Head office in Jakarta

3.4 Step 4 (Result Evaluation)

Furthermore, the research team used the FSM method to examine the time of the medical device procurement process. The results of the FSM measurements can be seen in Figure 7.

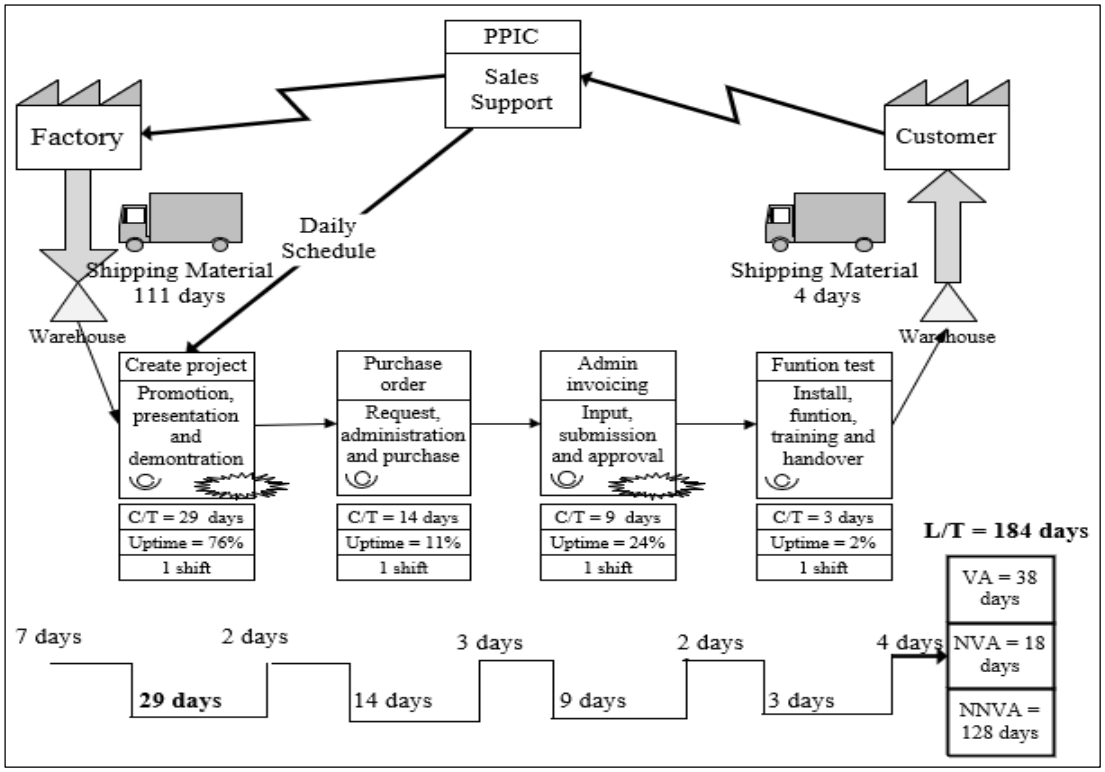

Figure 7 – Future State Mapping (FSM)

Figure 7 illustrates the results of corrective actions which have been able to reduce the process time for procurement of medical equipment with a Lead Time (L/T) of 184 days. The results of the improvement in the processing time for creating projects and invoicing administration decreased L/T by 28 days or by 55%.

Reducing lead time for equipment procurement can reduce manufacturing costs (Hilmola and Tolli, 2018).

3.5 Step 5 (Standardization)

The result of this step is the preparation of SOPs by the research team with all the directors so that these SOPs can be made immediately and disseminated to related parties in the process of procuring medical devices. Improvements by making SOPs are very effective and efficient in applying them to all employees as a work reference (Shkromyda et al., 2021). The SOP that has been made can be seen in Table 5.

3.6 Evaluation of Improvement Results

This section will discuss how the effectiveness of corrective actions results in reducing complaints from customers. There is a very close relationship between the decrease in complaints and the increase in customer satisfaction. The results of the analysis of the number of complaints received by the company during 2022. There was a decrease in the number of complaints related to the case that the time for procuring medical devices was too long, from 45 times to 22 times or 44.5%. At the same time, the comparison of conditions before and after improvement can be seen in Table 6.

Table 5 – Billing Document Administration SOP

<table>
<tr><td colspan="2" rowspan="2">Billing Document Administration SOP</td><td rowspan="2">PT Orid Graha Gemilang (OGG)</td><td>Document no:</td><td>TB.553.SOP.250331</td></tr>
<tr><td>Start from</td><td>January 12, 2022</td></tr>
<tr><td colspan="2">1. Background</td><td colspan="3">Total solution healthcare supplier and provides the best service to customers</td></tr>
<tr><td colspan="2">2. Propose</td><td colspan="3">Organise the process of making billing documents to be more efficient and simple to reduce the waste of time procuring medical devices and increase customer satisfaction</td></tr>
<tr><td colspan="2">3. Scope</td><td colspan="3">Billing administration department</td></tr>
<tr><td colspan="2">4. Responsibility</td><td colspan="3">Finance director and head of the administration department</td></tr>
<tr><td colspan="2">5. Work unit</td><td colspan="3">General administration, billing, and taxes</td></tr>
<tr><td colspan="2" rowspan="3">6. Implementation procedure</td><td colspan="3">1. Sales are required to report and submit requests for billing documents after the work is considered complete in the form of an email to the billing administration</td></tr>
<tr><td colspan="3">2. Direct billing administration creates billing documents based on Sales Orders (SO) and Purchase Orders (PO) that have been filled in the system</td></tr>
<tr><td colspan="3">3. Then the documents are immediately collected to the secretary director to be signed, and the archive process and billing documents are submitted to the collection courier</td></tr>
<tr><td colspan="2">7. Recording</td><td colspan="3">Submission form by e-mail</td></tr>
<tr><td colspan="2" rowspan="3">8. SOP approval</td><td>Made:</td><td>Checked:</td><td>Approved:</td></tr>
<tr><td>Ridwan Kurniawan</td><td>Karina Sukma</td><td>Setiawan Budi</td></tr>
<tr><td>Head of administration</td><td>Operasional director</td><td>President director</td></tr>
</table>

Table 6 – The Comparison of Conditions Before and After Improvement

No	Problem	Condition Before Improvement	Condition After Improvement	Improvement Effect
1	Low product knowledge	The customer is not interested in the product, so it requires more effort resulting in a project creation time of 37 days	Customers are interested in the product, and the information needed has been answered so that the process of creating a project becomes 29 days	Processing time for creating projects is reduced by 8 days
2	Limited warehouse space	The type of item required is not available	The necessary items are available	Products are offered, and opportunities are purchased
3	The system is not a priority	Staff can not be followed up	Staff can follow up, especially with a small chance of winning	Small opportunity funnels can be maximised
4	Document search manually	Document requirements must be collected so that it takes 14 days	Billing terms are only based on SO and PO, so it only takes 9 days	The process of creating billing documents or admin invoicing is reduced by 5 days
5	There are no SOPs	The company has no SOP	The company already has SOPs	Activities will be regular and SOP will be updated

The results of measuring the details of the procurement of medical devices from the beginning of the process to the end of the process (Figure 2) can be seen in Table 7.

Table 7 – The Detail of Improvement Activities

No	Activities	The Detail of Activities	Before Improvement (days)	After Improvement (days)	Remark
1	Shipment factory	Shipment Factory	111	111	NNVA
2	Transportation (T)	Transportation (T)	7	7	NVA
3	Create project	Promotion	25	20	VA
4		Presentation	2	1	VA
5		Demonstration	10	8	VA
6	Transportation (T)	Transportation (T)	2	2	NVA
7	Purchase order (PO)	Submission request	3	3	NNVA
8		Administration	10	10	NNVA
9		Purchase order	1	1	NNVA
10	Transportation (T)	Transportation (T)	3	3	NVA
11	Admin invoicing	Input Purchase Order	4	2	VA
12		Submission invoice	4	2	VA
13		Submission approved	4	3	VA
14		Payment Confirmed	2	2	VA
15	Transportation (T)	Transportation (T)	2	2	NVA
16		Installation	1	1	NNVA

No	Activities	The Detail of Activities	Before Improvement (days)	After Improvement (days)	Remark
17	Function test and training	Function Test	1	1	NNVA
18		Training	0.5	0.5	NNVA
19		Handover	0.5	0.5	NNVA
20	Transportation (T)	Transportation (T)	4	4	NVA
Total			197	184	

3.7 Research Implications

Based on the results of this study, quality improvements were made to reduce NVA activity in the process of creating projects and admin invoicing in the process of procuring medical devices. This affects company sales and good cash flow to increase facility productivity and income from sales, which continues to increase. VA activities should be improved as much as possible by reducing the waste of time (Kholil et al., 2018). This improvement directly makes the process of procuring medical devices more effective and efficient by reducing the waiting time between work completion and payment, providing additional capital to be used for the company's following operations. Reducing lead time for equipment procurement can reduce manufacturing costs (Hilmola and Tolli, 2018). All methods, solutions, and SOPs used make the parties involved in the procurement of medical devices more focused and measurable. Improvements by making SOPs are very effective and efficient in applying them to all employees as a work reference (Shkromyda et al., 2021). The contribution of this research is that it has reduced the processing time for procuring medical devices from medical device suppliers until the hospital receives them. This is following the body of knowledge related to system design engineering.

4 CONCLUSION

The conclusion of this study is the identification of waste in the process of procuring medical devices. This research found waste that occurs in the process of procuring medical devices called to create the project and admin invoicing. So these constraints affect customer satisfaction, which has decreased. Proposed improvements that have been made include: providing training and standardisation with pretest and post-test, accelerating the flow of goods reduction, conducting funnel reporting, simplifying the requirements for making billing documents, and making SOPs. This research resulted in an increase in customer satisfaction with evidence of a decrease in the number of complaints from 45 times to 22 times or by 44.5%. Meanwhile, the lead time for the procurement of medical devices from creative project activities and admin invoicing has decreased from 51 days to 38 days or 34.2%. The theoretical benefit of this research is that it is a reference for further research on the application of lean service using the value stream mapping (VSM) method combined with the Kaizen method in the medical device procurement process. In practice, this research is beneficial for the health service

industry in the process of procuring medical devices needed by hospitals so that they can be fulfilled effectively and efficiently to speed up patient care at hospitals. Then, for the supplier, accelerating the medical device procurement process can increase customer satisfaction and the sustainability of the medical device procurement process. For further research, the researcher recommends that the assessment of the level of customer satisfaction use the development of a customer satisfaction dashboard to facilitate customer access to complaints.

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CONFLICTS OF INTEREST

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