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Combining Lean Service and DMAIC Stage to Reduce the Lead Time for the Procurement of Critical Care Products

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Abstract.
Currently, the development of the health care industry is very rapid. The rapid development of health services will have an impact on increasing the elements of their supporting activities. One of the supporting activities is the procurement of medical equipment. Procurement cases often do not go well, so procurement is not on time. This is due to the very long lead time. This has an impact on decreasing customer satisfaction. Companies try to overcome this problem to be able to compete in the market. This study aims to help companies eliminate waste that occurs in the procurement process so that customer satisfaction is obtained. The approach used is Lean Service with VSM as a process flow mapping tool. Focus Group Discussion was used in the analysis of problems and solutions for improvement. Based on the FGD, there are three problems, namely, the delivery of goods, project creation, and billing documents. The results showed that the overall lead time of the critical care procurement process decreased from 216 days to 110 days, or by 45%.

Keywords: critical care, lead time, lean service, procurement, value stream mapping

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1. INTRODUCTION

Currently, the development of the health care industry is very rapid in line with the community's need for various types of health services. Therefore, health services will be very important in the future. The rapid development of health services will have an impact on increasing the elements of supporting activities [1]. One of the supporting activities in the procurement of medical equipment. The hospital is one of the health service industries. Hospitals are health service institutions that generally provide inpatient, outpatient and emergency services [2]. Hospitals are usually located in each province called the Rumah Sakit Umum Pusat (RSUP) and continue to grow until hospitals in each district are commonly referred to as Rumah Sakit Umum Daerah. Even starting in 2018, the development of hospitals has reached every sub-district called the Rumah

Sakit Umum Kecamatan (RSUK). Not to mention private hospitals, BUMN hospitals and other hospitals belonging to Indonesian government agencies that continue to grow. The development of this hospital will be followed by the addition of medical equipment. Health equipment is one of the supporting elements of in-hospital services. Along with the increasing number of hospitals that continue to grow, the need for medical devices also continues to increase, one of which is critical care tools. Critical care is a medical device that is used for all patients in an emergency condition.

In the case of procuring critical care equipment, the quality given to hospitals regarding the availability of equipment is reduced. Based on the Ministry of Health [3] of the 492 hospital customers owned by the company, there are still many complaints that are submitted so that they become input to support the improvement of the performance of the procurement of medical devices. Complaints that occur due to the long procurement process. So the company is not able to meet customer expectations on time. It should be noted that the service quality of a company determines the profit earned by the company [4][5]. Not all disappointed consumers easily submit their complaints. If the customer does not submit anything related to his complaint, it can be said that the customer is satisfied [6][7][8][9].

Based on the phenomenon that occurs, customer satisfaction becomes an important focus for companies so that customers remain loyal and make repeat purchases [10]. Customer satisfaction is a consequence of the comparison between the perceived benefits of the benefits expected by the customer. Thus, to achieve improvement, the company must carry out the right strategy to improve quality and processes [11]. Therefore, it is necessary to make improvements with an approach to reduce complaints that have occurred. Based on the problem, the company is expected to increase the order package and reduce customer complaints in the future [12]. One of the activities that do not provide added value can result in the company's formation being ineffective and inefficient [13][14]. Thus, it is necessary to determine the picture related to this problem. One method that can be used is Lean Service with Value Stream Mapping as a tool [15]. VSM is a method to identify activities that do not provide added value by mapping the production flow and information flow of a product or service [16][17].

According to Liker & Meier (2006) waste is any activity that does not have added value [18]. VSM is here to solve this problem. To eliminate waste, companies can use the lean concept [19][20]. Lean is a sustainable strategy to eliminate waste [21][22]. The loss of waste will increase customer satisfaction [23]. A tool that can be used to reduce

waste is Value Stream Mapping (VSM) [24][25]. VSM can help companies identify non-value added activities [26]. At this stage, it is often integrated with the DMAIC method. DMAIC is a popular systematic step used in continuous improvement [27]. Research on Lean Service has also been developed in the healthcare industry. Lean service can eliminate waste and can create customer satisfaction [28][29]. This study aims to help companies to eliminate waste that occurs in the procurement process so that customer satisfaction is obtained. The new thing in this research is to try to use the manufacturing method applied in procurement companies.

2. METHODOLOGY

This study aims to reduce waiting time in the process of procuring critical care products by eliminating waste. The approach used is Lean Service. The tool used is VSM as a process flow mapping tool. This study uses a mixed-method approach. Data collection is done through observation and Focus Group Discussion (FGD). Observations were made to find out the actual flow of the procurement process, while FGD weas conducted to analyze the causes of waste and find improvement solutions.

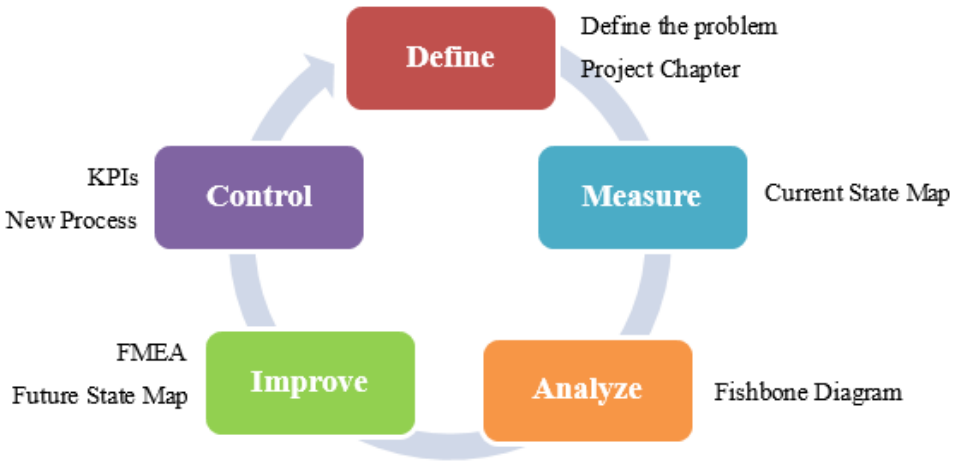

Figure 1: Research Framework.

To eliminate waste, this study uses a systematic step, namely Define, Measure, Analyze, Improve, Control (DMAIC). The following are the research steps that can be seen in Figure 1

3. RESULT AND DISCUSSION

3.1. Define

The define step is to define the problem. The problem that occurs is the process of procuring critical care tools that have been carried out from 2015-2020, the number of projects obtained is still low due to lack of customer satisfaction. One of them in 2015 from a total of 350 procurement packages the company only obtained 90 packages. This condition is generally caused by the lack of active salespeople in carrying out personal approach activities, direct promotions and the ability to respond to customer needs. In addition, there is dissatisfaction related to after-sales service after a purchase was made on the previous project which resulted in customers not making repeat purchases. This dissatisfaction is due to the procurement process that takes a long time so that customers become disappointed and even think the company is inconsistent. Based on these problems the company is trying to shorten the procurement process so that the company increases project acquisitions every year.

This stage also defines the flow of the critical care tool procurement process so that the actual process is obtained. Most of the procurement process starts from the Order of Goods from the Factory - Making Sales to the Hospital - Out of Orders - Payment - Delivery and Handover of Goods.

3.2. Measure

The measuring stage is the second step of the DMAIC stage, where at this stage what must be done is to measure the waste that occurs in the process of procuring critical care tools. After the data is collected, the next step is to map the flow of the procurement process into the Current State Map. CSM is made to find out the actual condition of the process that has occurred so far. VSM also describes which processes are included in Value Added (VA), Non-Value Added (NVA) and Necessary Non-Value Added (NNVA) activities. Based on the value stream mapping map of the current conditions, it can be seen that the NVA activity is 151 days, the VA activity is 37 days and the NNVA activity is 28 days The VSM of the current condition can be seen in Figure 2. Besides the Current State Map, the details of each activity are also grouped into VA, NVA and NNVA activities can be seen in Table 1.

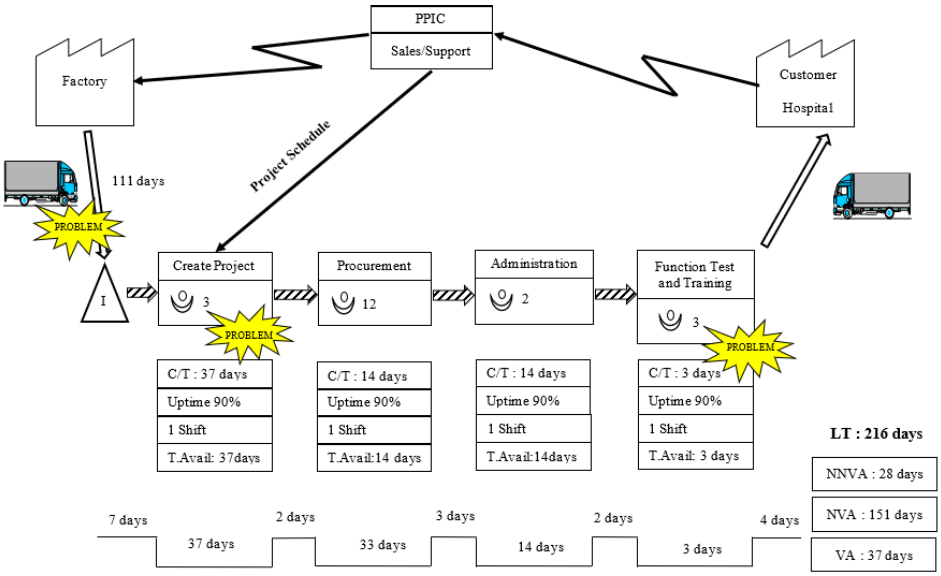

Figure 2: Current State Map.

3.3. Analyze

This phase identifies the main cause of each waste. Based on table 1, it can be seen that activities that are not value added so that improvements will be made. Analysis and identification of the causes of waste problems based on the results of the Focus Group Discussion. After the root cause is identified, the next step is to calculate the RPN value using the FMEA method. This calculation is used to determine the priority ranking for improvement. This RPN assessment is carried out by expert judgment. Table 2 is the calculation of the RPN value of each waste along with the improvements made.

3.4. Improve

Improvements to elements of the procurement process are based on priority ranking by FMEA. Improvements are made using the kaizen implementation method. The following are the improvements made to the elements of the process that are not good.

3.4.1. Create Project

The process of creating a project needs to provide the team with adequate knowledge and skills before prospects come to potential customers. Team members must already understand every process that must be carried out until the order letter is obtained. As a result of this improvement, the salesperson obtained more information related to

Table 1: Details Of Critical Care Procurement Process Activities.

No	Details of Activity	Time (day)	Remark
1	Shipment Factory	111	NVA
2	Transportation (T)	7	VA
3	Promotion	28	NVA
4	Presentation	2	VA
5	Demo	7	VA
6	Transportation (T)	2	VA
7	Submission Request	2	VA
8	Submission Fund	14	NNVA
9	Submission Request	14	NNVA
10	Fund Approved	1	VA
11	Procurement Process	1	VA
No	Details of Activity	Time (day)	Remark
12	Purchase Order	1	VA
13	Transportation (T)	3	VA
14	Input Purchase Order	4	NVA
15	Submission Invoice	4	NVA
16	Submission Approved	4	NVA
17	Payment Confirmed	2	VA
18	Transportation (T)	2	VA
19	Shipment Process	1	VA
20	Installation	0,5	VA
21	Function Test	0,5	VA
22	Training	0,5	VA
23	Handover	0,5	VA
24	Transportation (T)	4	VA

procurement as an opportunity to become a candidate for a letter of order. Good preparation can reduce waiting time for meeting with customers, coordinating presentations, and scheduling tools for demo purposes. At this stage, the salesperson has been able to save about 18 days from what is usually done.

3.4.2. Work on billing documents

Work on the billing document starts from the submission made by the salesperson through the sales administration section. Submission is done by filling out the list of

Table 2: Calculation of RPN Value for Improvement Priority.

Problem	Potential Failure Mode	S	Potential Failure Effects	O	Potential Cause of Failure	D	RPN	R	Current Improve
Factory Shipment	Moda logistics limited	8	Process delivery tool is delayed	8	Lateness delivery from factory	8	512	1	Prepare special transportation to simplify delivery and additional time due to date
Create Project	No submissions	8	No procurement of tools when needed	6	Forget about being too busy and unfocused	7	336	1	Ensure user requests are incorporated into planning
Invoicing Document	Tool not complete	8	The administration process is delayed	6	Inaccurate funnel information	8	384	1	Create accurate data information related to the funnel and future purchase projections

completeness needed to make billing documents. Improvements are made save up to 9 days until the billing document is submitted to the salesperson for the billing process. Documents are provided in full, such as order letters, function test reports, training report and training attendance lists. In addition, the document format model expected by the customer is very helpful in reducing errors in making billing documents.

3.4.3. Shipping

The funnel is the basis for stocking goods, this is very helpful in shipping goods. In the previous process, delivery can be made after the issuance of the order letter up to 90 calendar days. After the funnel, the waiting time for delivery is only calculated from delivery from the warehouse to the customer which only takes 3 days for customers in the city and a maximum of 21 days for customers outside the city.

After improvements are made, the waiting time for the process is lost due to cutting activities that are considered unnecessary. Such as the waiting time for delivery of goods from the factory so that the time required only takes 21 days, the create-project process only takes 19 days and the completion of billing documents only takes 5 days. Based on the improvements that have been made to the procurement process flow, the company can find out the future production process. Processes of the future become leaner and faster. The following mapping of the future production flow can be seen in Figure 3.

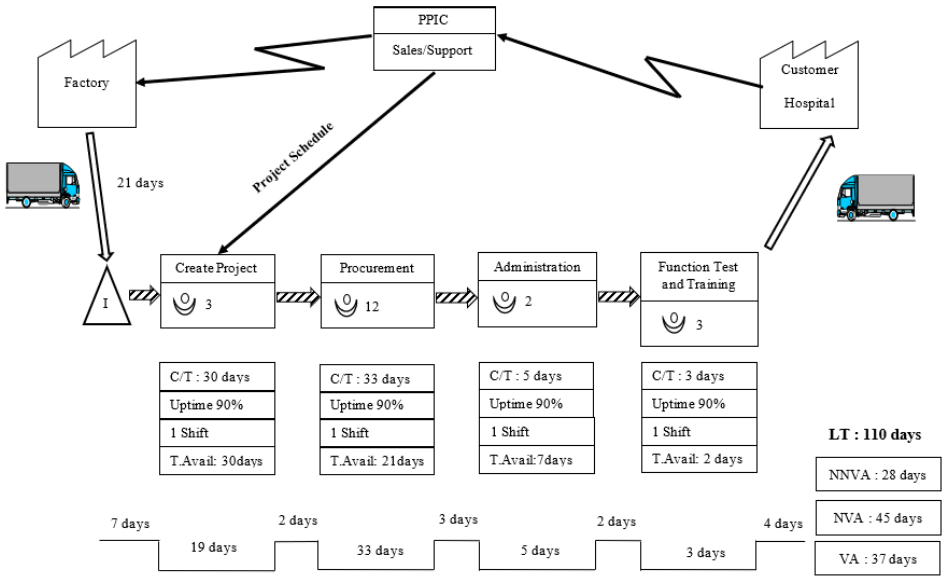

Figure 3: Future State Map.

3.5. Control

Based on the problems that have been repaired, it is necessary to control / control by creating a new work process flow. This control uses a new process standard that is used as a parameter index in carrying out each product procurement. Control is exercised by intervention by top management.

Improvements made in each process have an impact on waiting times. Some processes are considered to be reduced because they do not provide value-added so that they can be maximized on activities that provide value added. The improvement process that was carried out resulted in an efficiency of waiting time from 216 days to 110 days, with changes in activities that did not provide an added-value (NVA) from the initial 69.9% reduced to 40.9%. The comparison of the percentage of value-added and non-value-added activities before and after improvements can be shown in Table 3.

TABLE 3: Comparison Of Percentage Of Activity Before And After Improvements.

Type of Activity	Current State		Future State	
	Time (Days)	Percentage (%)	Time (Days)	Percentage (%)
VA	28	13.0%	28	25.5%
NVA	151	69.9%	45	40.9%
NNVA	37	17.1%	37	33.6%
Total	216	100.00%	110	100.00%

3.6. Research Contribution/ Implication

The implications of this research provide a practical impact for the company in increased sales through increasing customer satisfaction. The process of increasing customer satisfaction is enhanced through improvements in three predetermined segments. Improvements from the project creation segment improve funnel information regarding customer requirements. Information on customer needs is very important so that the salesperson has a clear purpose in working on the project. The salesperson's discipline in monitoring project continuity provides information regarding ongoing processes so that possible project failures can be overcome.

4. CONCLUSION

The conclusion obtained in this study is the reduction in lead time. The total process lead time before improvement of 216 days was reduced to 110 days or decreased by 45%. This result is very influential on the medical equipment procurement industry. Where related to waiting time can be reduced communication and discipline in exploring market needs so that through the data obtained can provide information as a basis for preparing the availability of goods so that waiting times can be reduced. The procurement process can take place on time or even faster than the planned time. Suggestions for future research can combine lean service with Industry 4.0 automation. The system in the procurement process can be controlled easily through the dashboard.

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