
ANALYSIS OF WASTE OF CUSTOMER SERVICE TIME FOR NEW INSTALLATIONS WITH A LEAN SERVICE APPROACH AT PT XYZ

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Abstract

Efficient water distribution is essential for public service, and PT XYZ faces significant challenges in its new customer installation process. The process, which involves several steps, experiences delays and inefficiencies that affect service quality. The research focuses on time waste during the customer installation process. Various forms of waste, such as delays, unnecessary movements, and redundant actions, lead to suboptimal service delivery. The aim is to identify sources of time waste and apply Lean Service principles to eliminate inefficiencies, thereby improving the customer installation process and enhancing overall service delivery. The study utilizes Lean Service tools, particularly Value Stream Mapping (VSM) and Process Cycle Efficiency (PCE) analysis, to assess the time spent on various activities within the installation process. Root cause analysis was conducted using Fishbone diagrams and the 5Whys method. The results from the current value stream mapping revealed that the total lead time for the process was 17.708 minutes, with value-added time of only 253 minutes, resulting in a Process Cycle Efficiency (PCE) of 1,4%. After improvements were implemented, the future value stream mapping showed a reduction in lead time to 14.828 minutes and an increase in value-added time to 253 minutes, improving the PCE to 1,7%. These improvements indicate better operational efficiency and resource optimization.

Keywords: Customer Service, Installation, Lean Service, Value Stream Mapping

INTRODUCTION

Water use is an indispensable need in life, water also plays a vital role in maintaining the sustainability of the ecosystem. Thus, maintaining the stability of the water cycle also maintains the balance of the ecosystem. Therefore, every effort in water management and utilization must pay attention to the principle of sustainability to avoid wider environmental damage. The involvement of various parties in maintaining the quality and quantity of water is a shared responsibility, where every decision made in managing this resource will have a direct impact on the balance of the ecosystem as a whole, especially on people's lives. Therefore, clean water is needed as the main source of life. Along with the increasing water demand, the service of installing new connections is crucial. Delays or long waiting times can hamper people's access to clean water, cause inconvenience, and reduce customer trust.

PT XYZ is a clean water service facility to improve the quality of life of the surrounding community in order to obtain proper water. Service optimization must be carried out so that customer loyalty is maintained, so that they will continue to subscribe and feel satisfied with the services provided. In the last three years in the western technical service department, data was obtained where in 2021 there were 5,237 surveyed and 4,904 installed, then in 2022 there were 5,903 surveyed and 4,927 installed, and in 2023 there were 6,433 surveyed and 5,206 installed, this data shows a significant difference between the survey results and the implementation of the new installation service. The uncertainty of waiting times and inefficiencies in the process of installing new connections at PT XYZ can have significant negative impacts, such as decreased customer satisfaction and loyalty, financial losses, and waste of resources. Customer dissatisfaction caused by installation delays will damage long-term relationships with customers, reduce the company's operational efficiency, and damage PT.XYZ's reputation in the eyes of the public.

With these problems and the data recorded, an analysis of the waste of waiting time for new install customers with a lean service approach at PT XYZ is carried out in the hope of minimizing the waiting time of new install customers, where customer satisfaction must be prioritized to always provide good service. In accordance with the lean service attributes that focus on reducing waste or waste in each process, in this case study, time waste must be minimized to get a good quality service. With the help of the lean service method, it is hoped that it can solve existing problems where the lean service method is a systematic approach that aims to improve the quality of efficiency in service delivery. In addition, lean service is lean in service, which is continuous improvement and eliminates waste or non-value added activities (Sibuea et al., 2023).

Lean Service is currently often utilized as a service approach as well as a guarantee that information is delivered to consumers directly and maximally while using the services provided (Wijaya, 2023). With the lean service method that has been carried out, it is expected to increase efficiency, quality, and productivity for services, which is a way to eliminate waste. With the basic principle of lean service that identifies value and maps which value streams are important or not, which at the end of its completion, non-value added will be eliminated as a form of waste elimination.

This study aims to identify and reduce the waste of new installation service time to make it more effective and efficient. Identify waste by applying lean service using the help of value stream mapping. Waste that has been identified with fishbone will undergo a further

process, namely by proposing improvements using 5Whys. Fishbone Diagram or Ishikawa is a graphical tool used to analyze, explore, and describe a problem, the cause and effect of the problem (Widnyana et al., 2022). 5 Whys Analysis is one of the techniques in RCA used to analyze the causes of errors in business processes. These two methods will complement where it will be done with 5Whys first to find out what causes the problem to find the root of the problem. After 5whys is done, it is analyzed in depth again with a fishbone to find out clearly and describe the real causes of waste that occur. Therefore, these two methods complement each other to find the source of the problems that exist in the research conducted. This research is expected to provide the right solution to reduce waste in new installation services at PT XYZ.

REVIEW OF LITERATURE

Lean Service is a method to solve problems related to waste. Lean Service has a way to identify, calculate, and analyze waste generated in the service process for improvement within the company. Lean itself in general is a business philosophy based on minimizing the use of resources (including time) in various company activities (Gunawan et al., 2020). So that in the application of the Lean Service method, it is currently often used as a service approach as well as a guarantee that information is delivered to consumers directly and optimally while using the services provided (Wijaya, 2023). Meanwhile, the 5 basic principles of lean according to Suherman and Nawangpalupi (2023) are:

1. Specify Value, which determines what can add value to a product or service from the consumer's perspective and not the company's perspective. For example, focus on what customers value, such as speed of response and problem-solving, to improve the customer experience.
2. Identify the Whole Value Stream, which identifies the steps needed to find out the waste that exists along the value stream. These steps start from the process of designing, ordering, and manufacturing products. For example, identify the entire service flow, from complaint to resolution, to find and reduce time wastage.
3. Flow, which is performing activities that can create a product without interruptions such as rework, backflow, or waiting. For example, create a smooth service flow without obstacles or unnecessary waiting time, so that customers get solutions faster.
4. Pulled, which is knowing the important activities needed to create something that consumers want. For example, take action based on real customer needs, avoiding irrelevant or non-urgent processes.
5. Perfection is to eliminate waste gradually and continuously as an effort to achieve perfection. For example, continuously improve the service process by eliminating waste and increasing efficiency on an ongoing basis.

Lean focuses on identifying and eliminating non-value-added activities in design and production (for manufacturing) or operations (for services) and supply chain management that are directly related to customers (Anggraini & Ilhamda, 2020). Conceptually, the implementation of lean service is almost the same as the application of Lean in the manufacturing industry because it is basically the concept of efficiency, waste, which often uses the same techniques and tools. However, some parts differ in output; for example, lean

manufacturing focuses on reducing waste related to downtime, materials, while lean service focuses on lead time, workflow, and customer experience. Then, for the work process, lean manufacturing has a clear flow, while lean service involves humans, which varies depending on customer demand (Ilyas, 2024).

Therefore, in the service business there are also some wastes that have no added value and tend to be detrimental, wastes that occur in the service sector have an impact on fading loyalty, loss of customer trust, reduced profits, and directly affect the company's image in the eyes of the public. The waste in question includes: human activities that use a lot of resources but do not produce value, activities that are always waiting, activities that are carried out repeatedly, making unnecessary movements, communication that is not well established, errors in writing inventory, errors due to errors between customers and officers, and carrying out convoluted procedures (Annisa et al., 2023).

RESEARCH METHOD

The method used in this research is qualitative. At the initial stage carried out in this research is a literature study and a field study were which stage provides a view of obtaining the theoretical basis used and accurately understanding the actual field conditions. After doing this, the next stage is to formulate the problem, which involves identifying the main problems that will be addressed in this research. After knowing the main problems that occur, it sets research boundaries, assumptions, objectives, and benefits to clarify the scope and purpose of the research. This research then identifies relevant variables that affect the process, such as time and resources.

Data collection in three categories: service flow, service time, and survey data. When collecting data on service flow, mapping is carried out at each stage in the installation process carried out, then service time is measured by direct observation and time recording, and conducting survey is conducted by collecting feedback from expert employees in the field of new installation services at PT.XYZ. The next step is to create Value Stream Mapping (VSM) and Process Activity Mapping (PAM) to analyze process flow and identify inefficiencies. Where Value stream mapping is a method used to identify activities in a manufacturing industry, including value-added and non-value-added activities (Annisa et al., 2023), while Process Activity Mapping, each stage will be grouped into activities in the form of value-added activity (VA), Non-value-added activity (NVA), or Necessary non-value adding activity (NNVA) (Komariah, 2022).

Areas of waste, such as delays, unnecessary movement, duplication, and unclear communication, were identified through this mapping. A questionnaire was then designed to assess the reliability and validity of these wastes, with a data validation process to ensure the accuracy of the results, where the Cronbach's alpha value of 0.922 exceeded the limit, and the overall attributes were considered valid beyond the R-Table, so that the attributes conducted in this study were considered reliable and valid. This study prioritizes waste by using a weighting system and conducts root cause analysis using tools such as 5Why and Fishbone diagrams. After being analyzed by making VSM, which is then continued with PAM analysis, the attributes of both will be seen, which will be reduced and eliminated to reduce waste. A questionnaire is needed to re-analyze the attributes more deeply to determine what causes them.

After the questionnaire results are declared valid and reliable, a root cause analysis with 5whys and fishbone is carried out, where both complement each other to find out the main source of the existing problems, and then improvements will be proposed. After analyzing and identifying waste, improvements are proposed, and a Future VSM is created to illustrate the potential impact of change. However, for the improvement to be effective, the Future VSM needs to be tested by comparing it with the actual condition after the improvement is implemented. In this way, PT XYZ can ensure the proposed changes are effective in reducing waste and optimizing the installation process.

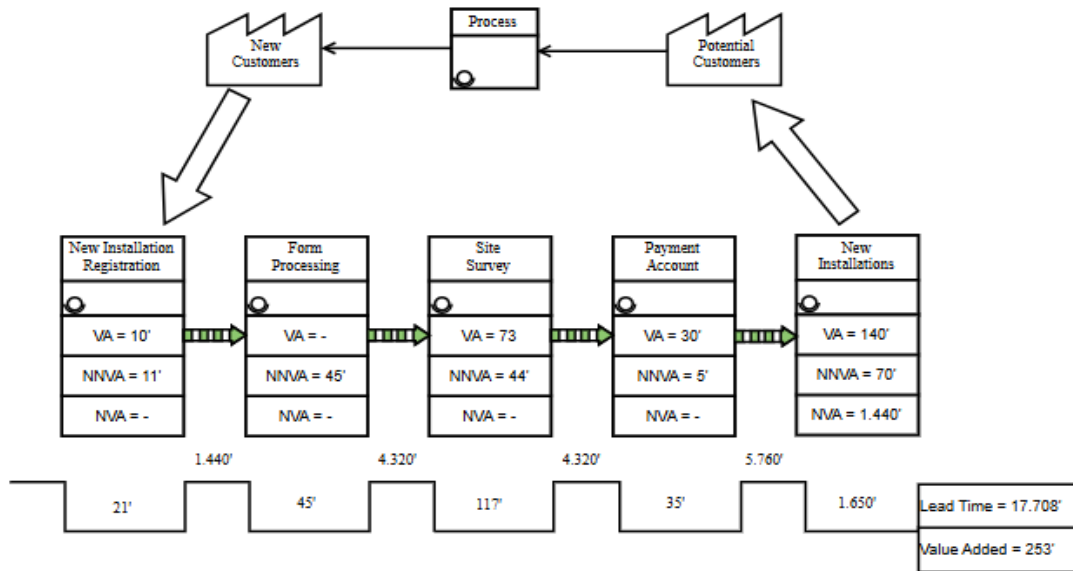
RESULTS AND DISCUSSION

Initially, data collection will be carried out where there is service flow data, service time data, and questionnaire data. The data is collected directly in the field. Then processed according to their respective capacities. After the data is collected, data processing is continued, which begins with the creation of the current value stream mapping.

This current value stream mapping is done by observing and analyzing the new installation process from the beginning to the end. In analyzing the current value stream mapping is done in several stages, namely as follows:

Analysis of the new installation process, this stage identifies the entire new installation process from start to finish from the time process to the new installation flow. The following is a picture of the current value stream mapping of the initial new install process at PT XYZ.

Figure 1.
Currents Value Stream Mapping



Based on the initial current value stream mapping in Figure 1. obtained registration of 21 minutes, form processing of 45 minutes, survey process of 117 minutes, payment account of 35 minutes, and installation of 1,650 minutes. The lead time is obtained at 17,708

minutes; value added at 253 minutes. So, the calculation of the Process Cycle Efficiency (PCE) value is as follows:

$$PCE = \frac{VA}{\sum t} \times 100\%$$

$$PCE = \frac{253}{17.708} \times 100\% = 1,4\%$$

Based on the calculation of the Process Cycle Efficiency (PCE) value, the result is 1.4%. After the PCE results are known, proceed with the creation of PAM to find out the activity categories and types of activities that exist in the new installation process at PT XYZ.

Making Process Activity Mapping

This process describes the overall activity of the new tide process with the initial Process Activity Mapping (PAM) in the new tide process of PT XYZ. In this process, each existing activity will be identified by category and type of activity. The following is a description of the initial process activity mapping of the new tide PT XYZ.

Table 1.
Process Activity Mapping

Activity	Type of Activity	Time (Minutes)	Activity Categories		
			VA	NNVA	NVA
New Installation Registration					
Customers Queuing for Forms	D	5 Minutes		V	
Customers Fill Out Forms	O	10 Minutes	V		
Customer Collects Forms and Requirements to Officer	T	1 Minutes		V	
Marketing Officer Submit Form to Planning Subdivision	T	5 Minutes		V	
Form Processing					
Officer Checks Registration Form	I	1.440 Minutes		V	
Officer Checks Completeness of Requirements	I	15 Minutes		V	
Officer Submit Files to Planning Subdivision	T	5 Minutes		V	
Planning Subdivision Distributes Files to Survey Officers	T	25 Minutes		V	
Site Survey					
Planning Officer Waiting for Surveying Process from Survey Officer	D	4.320 Minutes		V	
Survey Officer Conducts Site Survey Process	O	60 Minutes	V		
CAD Design Survey Officer Installation Location	O	10 Minutes	V		
Survey Officer Determines Service Zones	O	1 Minutes		V	

Surveyors Plan the RAB Cost	O	3 Minutes	V		
Survey Officers Re-Plan Surveys If Not Feasible	O	10 Minutes		V	
Survey Officer Submits Survey Files to Planning Officer	T	5 Minutes		V	
Planning Officer Checks and Approves Files	I	28 Minutes		V	
Payment Account					
Officer Provides Cost Information to Prospective Customers	O	20 Minutes	V		
Officer Waiting for Payment from Prospective Customer	D	4.320 Minutes		V	
Officer Processing Files after Receiving Payment Information	O	10 Minutes	V		
Officer Submits Files to Installation	T	5 Minutes		V	
New Installation					
Prospective Customers Waiting for Installation by Officers	D	5.760 Minutes		V	
Installation Subdivision Prepares Implementation Documents	O	20 Minutes	V		
Installation Officer Waiting for Re-Approval (Checking)	D	1.440 Minutes			V
Installation Officer Submit work to the Supervisor (RAB, SPK)	T	10 Minutes		V	
Supervisor Distributes Work to Installers	T	10 Minutes		V	
Installation Officer Submitting BPP to Warehouse	T	10 Minutes		V	
Installation Officer Awaiting BPP Approval	D	18 Minutes		V	
Installation Officer Retrieves Installation Tools	T	22 Minutes		V	
Installation by Installation Officer	O	120 Minutes	V		
Total	-	17.708 Minutes	8	20	1

Source: Primary Data

Information:

O = Operation

T = Transportation

I = Inspection

D = Delay

After Making Process Activity Mapping, the next step is Processing Questionnaire Data to Determine Critical Waste. At this stage, the questionnaire data is analyzed to identify critical wastes in the process, which will help determine what wastes need to be corrected to improve efficiency.

Processing Questionnaire Data to Determine Critical Waste

Determination of critical waste is an important step in improving efficiency and reducing waste in a process or system. The determination of critical waste is based on 8 respondents who are directly involved in the new installation process.

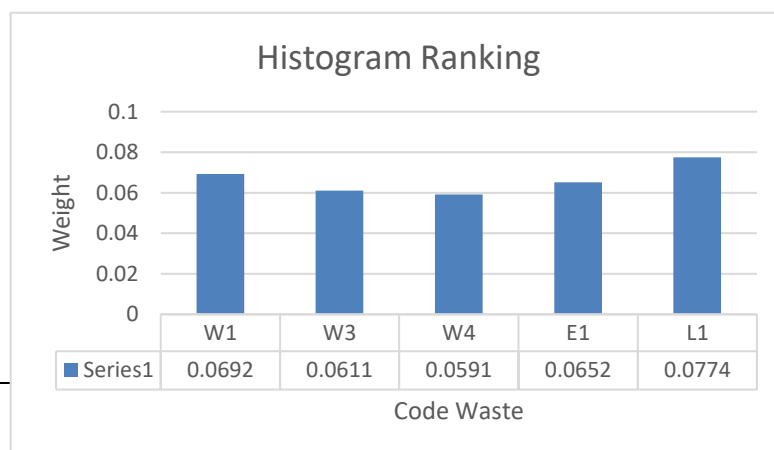
Table 2.
Critical Waste

Waste Code	Respondent								Total	Weight	Rank
	R1	R2	R3	R4	R5	R6	R7	R8			
W1	5	4	5	3	4	5	4	4	34	0,0692	2
W2	3	3	4	3	3	4	3	4	27	0,0550	7
W3	4	4	5	2	3	4	3	5	30	0,0611	4
W4	4	3	5	3	4	3	3	4	29	0,0591	5
D1	2	2	2	2	1	1	1	3	14	0,0285	19
D2	4	4	3	2	3	5	2	4	27	0,0550	8
UM1	2	2	3	2	3	3	1	3	19	0,0387	17
UM2	4	2	3	4	1	4	2	3	23	0,0468	13
UC1	4	2	3	3	2	4	1	4	23	0,0468	14
UC2	5	2	3	2	3	3	2	5	25	0,0509	12
I1	5	2	3	2	3	2	2	4	23	0,0468	15
I2	4	2	3	2	2	4	4	5	26	0,0530	9
E1	5	3	4	3	4	5	3	5	32	0,0652	3
E2	4	2	3	2	4	5	3	3	26	0,0530	10
E3	5	2	3	3	3	3	2	2	23	0,0468	16
UP1	4	4	3	3	4	3	2	5	28	0,0570	6
UP2	3	3	2	1	3	2	1	3	18	0,0367	18
L1	5	5	5	5	4	5	4	5	38	0,0774	1
L2	4	3	4	3	2	3	3	4	26	0,0530	11

Source: Data Processed

After the data is weighted, a histogram is made to make it easier to see the five highest wastes for improvement. The following is a histogram illustration to see the highest ranking

Figure 2.
Histogram Ranking Critical Waste



Cause Analysis of Waste using 5Whys and Fishbone

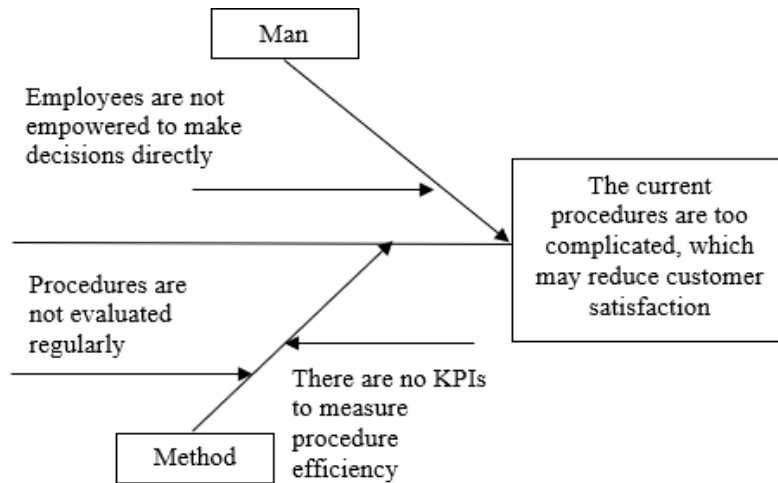
To understand and identify the root causes of waste problems that arise during the new installation process. Then with the help of the 5whys method and fishbone diagram can find the right solution to reduce waste and improve operational efficiency.

Table 3.
Waste Analysis Using 5Whys

Activity	Why 1	Why 2	Why 3	Why 4	Why 5
The current procedure is too convoluted, which can reduce the level of customer satisfaction (L1)	Procedures are inefficient	Too many unnecessary steps	No routine system evaluations	-	-
Planning officer waiting for data verification of survey results (W1)	Verification process is slow	Data is checked manually	-	-	-
The process of requesting a new connection is often late and not in accordance with the predetermined schedule (E1)	Schedule is not met	Job queue backlog	Lack of human resources	-	-
The clerk waits for payment information according to the registration process (W3)	No proactive communication with customers	No clear operational standards	-	-	-
Customers feel that the waiting time for new installations by the staff is quite long (W4)	Installation schedule is too tight	Lack of trained technicians	Insufficient training for new technicians	-	-

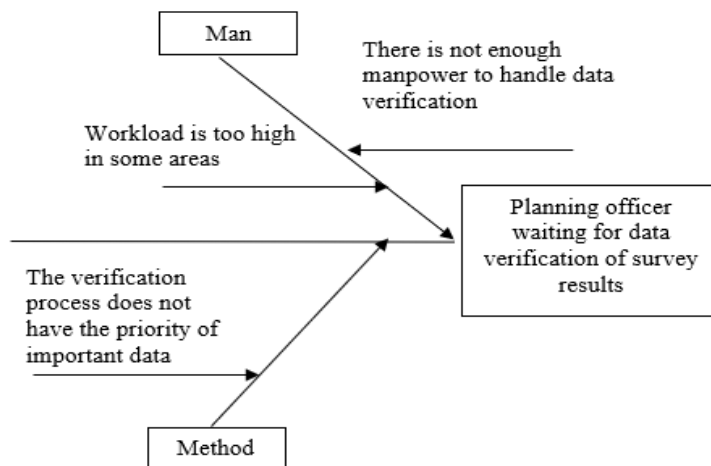
Therefore, from the five waste codes above in sequence in the 5whys table, it can be concluded to implant the process by reducing unnecessary steps and conducting regular evaluations to improve efficiency, automate data checking to speed up the verification process, rearrange schedules and increase human resources to overcome the accumulation of work, improve proactive communication with customers and create clear operational standards, and increase training of new technicians to make them more skilled.

Figure 3.
Fishbone Code L1



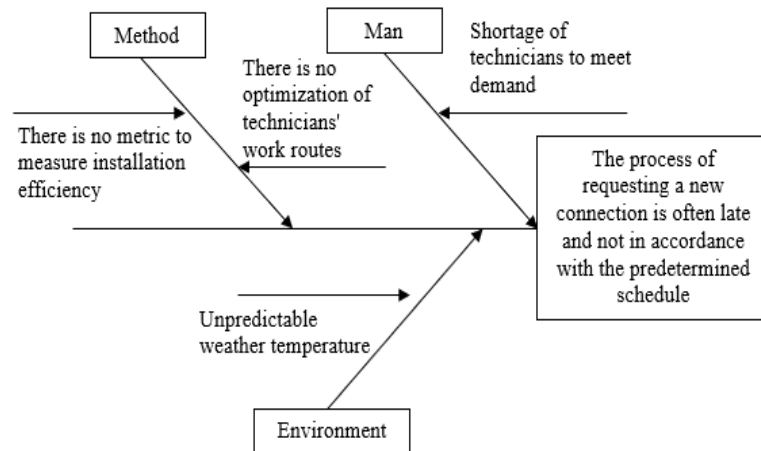
The conclusion from the fishbone analysis showed that the delay problem was caused by the lack of authority for employees to make decisions and the absence of clear KPIs to measure efficiency. In addition, the procedures implemented are not regularly updated, so steps that are not relevant or efficient are maintained.

Figure 4.
Fishbone Code W1



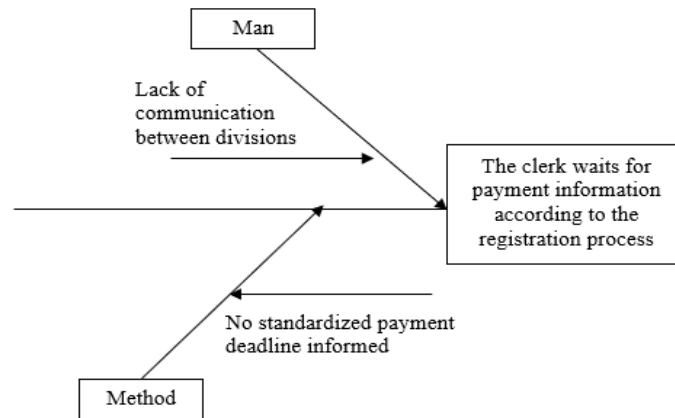
The conclusion of the fishbone analysis showed that the shortage of manpower led to an imbalance in workload, while the absence of prioritization in data verification made the process inefficient and hindered the handling of more important data.

Figure 5.
Fishbone Code E1



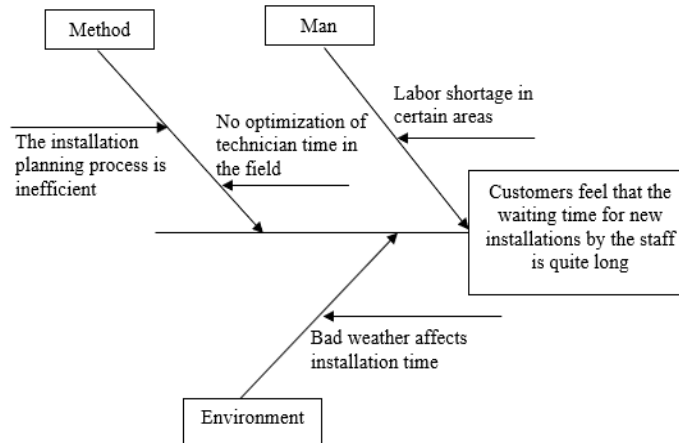
The conclusion from the fishbone analysis showed that the shortage of technicians slowed down the installation process, while the absence of technician work route optimization and external factors such as unpredictable weather also extended the installation time.

Figure 6.
Fishbone Code W3



The conclusion of the fishbone analysis showed that suboptimal communication between divisions hindered the delivery of important information, such as payments, while the absence of a standard payment deadline caused delays in the administrative process.

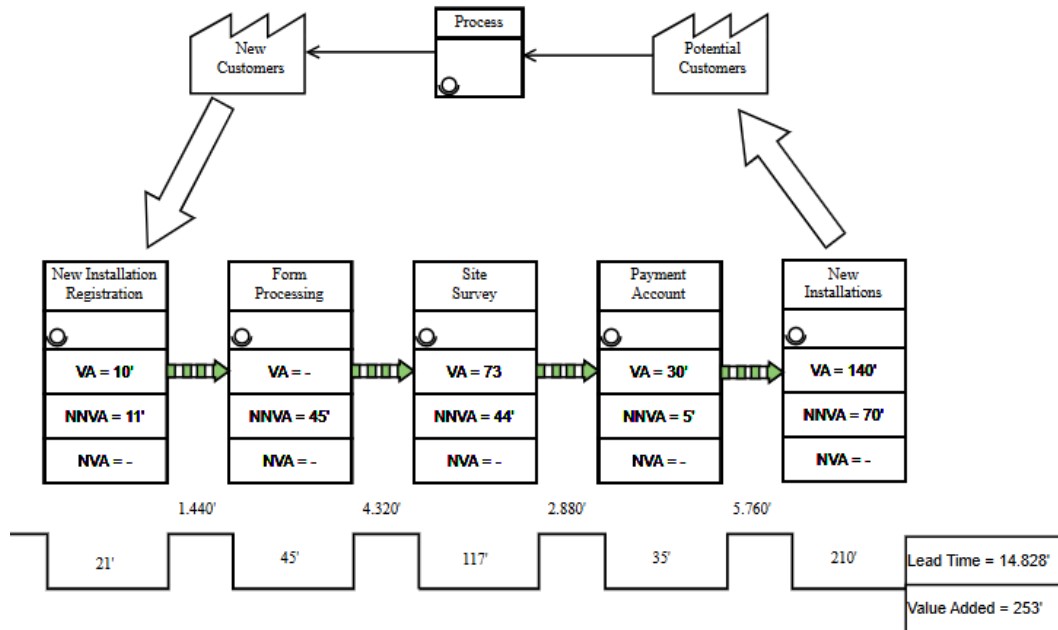
Figure 7.
Fishbone Code W4



The conclusions from the fishbone analysis showed that labor inequality led to unbalanced installation queues, while an inefficient planning process meant that technicians often experienced unproductive waiting times. In addition, bad weather is also an external factor that slows down installation, especially during rain or extreme conditions.

Creation Of Future Stream Mapping

Figure 8.
Future Value Stream Mapping



Based on the initial future value stream mapping in Figure 7, registration is 21 minutes, form processing is 45 minutes, survey process is 117 minutes, payment account is 35 minutes, and installation is 210 minutes.

The lead time is obtained at 14,828 minutes; value added at 253 minutes. So the calculation of the Process Cycle Efficiency (PCE) value is as follows:

$$PCE = \frac{VA}{\sum t} \times 100\%$$
$$PCE = \frac{253}{14.828} \times 100\% = 1,7\%$$

Based on the calculation of the Process Cycle Efficiency (PCE) value, the result is 1.7%.

Therefore, the results of PCE in CVSM and FVSM have increased from 1.4% to 1.7%. The change is the result of eliminating non-value-added activities. 0.3% increase is a significant enough increase to reduce waste and increase the efficiency of new installation services at PT XYZ. This FVSM is expected to be a consideration for the initial basis of a theoretical improvement model for PT XYZ in improving the quality of new installations. So that customers can feel the extraordinary service of PT XYZ.

CONCLUSION

The top five wastes identified at PT XYZ are, Complicated procedures (weight 0.0774), Planning staff waiting for survey data verification (weight 0.0692), Delays in new connection requests (weight 0.0652), Staff waiting for payment information (weight 0.0611), and Customers feeling the installation waiting time is too long (weight 0.0591). To address these issues, it is recommended to simplify procedures, automate verification, increase trained staff, use GIS-based route planning, and improve scheduling. Additionally, setting clear payment timelines, enhancing communication with customers, and adjusting installation schedules will help expedite the process. Regular training for technicians is also suggested to improve work quality. These improvements reduced lead time from 17,708 minutes to 14,828 minutes a reduction of 2,880 minutes and increased Process Cycle Efficiency (PCE) from 1.4% to 1.7%, resulting in higher productivity and efficiency in the new installation process.

Based on the analysis, PT XYZ should seriously consider the findings and recommendations provided. It is crucial for the company to implement a scheduled monitoring system and conduct regular evaluations to assess the overall performance of the new installation process. For future research, it is recommended to develop a more comprehensive analysis method, such as using Valsat, to further enhance the findings.

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