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Strategies to Reduce Waste in Shipping Service Activities to Sustainably Improve Timeliness

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Abstract

The results of a survey at delivery service companies in Indonesia showed that the number of delivery delays on the Jakarta-Bandung route was 5.43%. The purpose of the research is to identify wasteful activities, eliminate non-value-added activities, and implement continuous improvements. The research solution adopts a lean and DMAIC services approach. These strategies should be implemented to achieve results by avoiding or eliminating wasteful activities such as for example the type of waiting for wasteful goods to be delivered to SPP Jakarta, the solution for the proposed improvement phase is for these activities to be minimized by ensuring timely delivery, during delivery, the officer should pay attention to the type of bag and prioritize the express package. Officers also need to focus on their work to avoid mistakes that can delay the delivery process. Officers must also respond to unclear addresses, for example by contacting a direct shipper so that the goods can be processed on the same day Lean service reinforcement and DMAIC integration in this study improved internal efficiency and customer satisfaction as the study placed more emphasis on customer voice (VOC) and service features (such as procedural clarity and lead time) as the basis for improvements. Shipping companies must conduct regular evaluations to determine the standard delivery time of cargo from Jakarta to Bandung. The results obtained from this study show that there are some wasted activities that must be eliminated such as showing the existing delivery time of 47.6 hours, and the results of process improvement using Lean and DMAIC services show a process time of 22.5 hours, this increase has a performance improvement value of 52.73%.

KEYWORDS

delivery activities; DMAIC; lean service; strategy; waste.

Introduction

The results of a survey from delivery service users for the type of favorite service for express delivery on the Bandung Jakarta route or vice versa, complained that there were often delays in terms of delivery (since the goods were handed over to the counter officer, the goods often reached the consumer beyond the specified time (H+1), and often the goods arrived for days in the hands of the recipient of the goods). Searches from several delivery services that offer Jakarta to Bandung express routes obtained the same results. By taking the example of delivery service companies in Indonesia such as Pos Indonesia, start researching the causes and root causes of the problems that occur. In practice, many quality delivery services offer a variety of services in Indonesia, making it easier for customers to choose the service that best suits their needs (Aris & Utama, 2016), (Dewi, 2023) Users can have many choices of delivery services. PT. Pos Indonesia as a delivery service has the function of planning, organizing, implementing, and controlling, and is responsible for the implementation of processing, transportation, and delivery policies to end consumers. Express delivery services on the Jakarta Bandung route or vice versa have a delivery deadline of H+1 so that this route is quite a favorite among delivery service users. This express delivery service product has a clear implementation of a written Standard Operating Procedure (SOP) and must be applied to meet quality.

standards for each company's products.

However, behind all the completeness of the existing SOPs for the processing of goods and all delivery services provided, there are still often problems that become obstacles in this shipping company, one of which is that delivery delays still occur and there have been complaints in recent months.

This delay will certainly have a negative impact on the company, especially when choosing a delivery service, consumers prioritize fast delivery and price becomes a secondary role. This shows that consumers prioritize delivery time over the price offered (Dewi et al., 2026; Siswanto et al., 2023).

Research conducted on shipping companies shows a delay rate of delivery of 5.43% of the Jakarta-Bandung Express Delivery route. Lean Service and DMAIC approaches are used to solve problems. The Lean Service approach within the framework of DMAIC is very suitable to solve the problem in this study, as its implementation will be effective, considering that Lean is defined as a business philosophy that minimizes the resources used in business processes, including time, and identifies wasteful activities (Cahaya, 2023; Kaplan et al., 2023; Wijaya, 2023).

In logistics, the integration of Lean Service and DMAIC is a fairly established method to be applied in the delivery service industry. This method offers methodological novelty through a hybrid approach that combines the elimination of non-physical service waste with data-driven repair cycles. This results in up to 40% increase in process efficiency in the distribution field. With this integration, Lean Service which focuses on waste such as waste and over-processing in logistics services is combined with DMAIC for quantitative analysis. This method allows for systematic identification of the root of the problem by using tools such as Value Stream Mapping (VSM) and fishbone diagrams. The application of the integration method above is carried out by analyzing the process flow that occurs at the place of receipt of goods until the goods are ready to be shipped. Process improvement in terms of administration in the delivery service environment can increase the efficiency of the cycle process in service activities (Dewi et al., 2025; Li et al., 2024; Samekto & Soejanto, 2014; Sobaih & Alsaif, 2023).

Foundation of Theory

The lean service approach and DMAIC (Define, Measure, Analyze, Improve, Control) have seen significant progress in addressing waste in delivery activities. The integration of modern analytical tools and specific adaptations to the current context of logistics transportation, along with its innovative analysis, demonstrates the synergy between Lean Service and DMAIC in delivery services, combining Value Stream Mapping with statistical analysis. This combination enables holistic waste reduction, from visual identification to data-driven solutions.

Lean Service is a management approach that emphasizes increasing value for customers and reducing waste. The concept of Lean Manufacturing pioneered by Taiichi Ohno was then adopted to the service and logistics industry.

According to (Rajagukguk et al., 2024), (Muntasir & Sofyan, 2022) the principle of lean service is to identify value from the customer's point of view, draw value streams (value streams), create process flows (process flows), pull systems, and kaizen (continuous development).

Waste in Logistics (7+1 Waste) in the context of logistics includes: Overproduction, Waiting, Transportation, Overprocessing, Inventory, Motion, Defects and Unused talent. Implementation in logistics for distribution route optimization, reduction of delivery lead time, warehouse lean and just in time (JIT) efficiency.

DMAIC is a method of improving quality with five stages. They include defining, measuring, analyzing, improving, and

controlling. To define, it will determine who the customer is, what they need from the product or service, and what they expect from them. Determine the boundaries of the problem. A process flowmap is used to determine the process to be improved. After the definition stage, the measurement stage measures the performance of core business processes. Develop strategies for collecting data for processes. collect data from existing sources to determine the type of defect. After the measurement stage, the next stage is the analysis stage. This stage analyzes the data collected and creates a process map to find the root cause of the problem and potential improvements. After the analysis stage, the next is the improvement stage, where innovative solutions to address and prevent problems are created to improve the process objectives. The last repair stage is the control stage, which controls the repair process to make the process run smoothly. Preventing a return to past habits

Value Stream Mapping is a method used to identify value-added and non-value-added activities, making it easier to find the root cause of a process. The advantage of Value Stream Mapping is that it visualizes the process flow to facilitate the discovery of waste, facilitates the process of analysis of improvements, thereby increasing the flow of information and materials in the production process. There are two types of Value Stream Mapping, namely Current Value Stream Mapping, which includes the initial state of material and information flows, and Future Value Stream Mapping for future planning. VSM is useful for the improvement of production lines. Therefore, Value Stream Mapping is the right method to identify waste, analyze waste and then find solutions to recommend real improvements to reduce the resulting waste (Komariah, 2022). The several stages of Value Stream Mapping are as follows:

1. Identify the product/service group.
2. Create a VSM of the current state to define the issue
3. Determining the ideal mapping for the future.
4. Identify the corrective actions needed to close the gap between the current and future ideal states.
5. Take corrective action.
6. Create a new mapping to verify that the issue in step 2 has disappeared. (Ummah, 2019), (Daulay et al., 2021), (Chen et al., 2025).

By implementing the DMAIC framework in the service sector, the innovation of lean service has emerged for the context of its application for service companies such as banks, salons, and restaurants. In delivery service companies, this concept has never been done before, so with the gap in research opportunities and the integration of lean services and DMAIC, the final goal is to reduce waste, increase wait times, improve process cycle (PCE) efficiency, speed up the delivery process, and reduce delays. (Komariah, 2022; Vij et al., 2020).

The strengthening of this study Lean-DMAIC integration improves efficiency and customer satisfaction as the research places more emphasis on voice of customer (VoC) and service features (such as procedural clarity and wait times) as the basis for improvements (Wolter & Hanne, 2024)

Methods

Understanding Lean Service

Lean service, in another definition, is a set of methods and tools designed to reduce costs, improve performance, reduce lead times, and eliminate waste to maximize product quality (Isnan, 2013), (Bučko et al., 2023). Where lean service is used as an internal service approach, it can be ensured that available information can be distributed directly and quickly to consumers and consumers receive effective and maximum service (Arindiaty & Bernik, 2017), (Wijaya, 2023)

The Lean concept follows a systematic approach to identifying and eliminating waste and non-value-added

Table 1. Types of waste

The Seven Waste	
Defect	Error On Documen
Transportation	Transportation of Document
Overprodction	Doing Work not Request
Waiting	Waiting do for the next step
Prosesing	Prosesing step and approvals
Movement	Unnecessary motion
Inventory	Backing of Work

(Source: (Komariah, 2022))

activities. The Lean concept identifies all business processes, starting with creating a big picture map. Once identified, it is hoped that all forms of waste can be minimized. A production system that implements Lean is called lean because it uses fewer human resources, production space, and saves processing time. Lean principles have also been increasingly applied in service companies to improve customer service by eliminating waste.(Harliwantip, 2014). The basic principles of lean are as follows (Daulay et al., 2021).

1. Recognize the value of products (goods and services) from the customer's perspective, where customers expect high-quality products (goods/services) at competitive prices and on-time service,
2. Identify process mapping (value stream process mapping) for each product (goods/services)
3. Eliminate waste (non-value-added activities) from all value stream mapping activities
4. Group information, materials, and products so they flow efficiently through the VSM process using a pull system.
5. Continuously seek improvement tools to achieve excellence and continuous improvement

DMAIC Approach

The DMAIC approach, which focuses on reducing variation and waste, is a systematic Lean Six Sigma framework for process improvement that includes delivery. This method consists of five main stages that can be used sequentially in the shipping logistics process.

The DMAIC methodology, which is often used in Lean Six Sigma, is a systematic framework for process improvement derived from the Six Sigma approach: Define, Measure, Analyze, Improve, and Control.

In this study, determine the purpose of the research and identify the problem of delivery delays such as the delay in goods reaching the hands of the delivery service user. To better understand the flow from the beginning, the user delivers the goods to the nearest Post Office then create a map of the Suppliers, Inputs, Process, Outputs, and Customers (SIPOC) process

Measurement Stage: through observation and reports, data obtained from the initial process of goods handed over by the user to the delivery counter officer can obtain basic data such as which activities have a high level of importance in the process and activities that cause waste to cause high on-time delivery, average delivery time, or error rate. Next, calculate the sigma level of the process to assess current performance.

After the measurement stage, the next stage is the analysis stage, which analyzes the collected data and a process map to determine the root cause of the problem and opportunities for improvement. After the analysis stage, the next stage is the improvement stage, which refines the target process by designing creative solutions to address and prevent problems. After the improvement stage, the last stage is the control stage, which controls the repair process to ensure it runs smoothly and prevents a return to past habits (Huda & Widiyanesti, 2018), (Mulyati & Zahradika, 2022). The details of these phases are as follows:

1. Define

In the define stage, the problem that has occurred and what will be resolved is identified. (Huda & Widiyanesti, 2018; Srivastava et al., 2026), is defined as an identification step performed by defining the types of delays that affect the quality of the process

2. Measure

(Mulyati & Zahradika, 2022), The definition explains that "measure" is a step that follows "define," as an activity to assess the company's condition. At this stage, data collection and processing (calculations) are carried out

3. Analyze

(Purnomo, 2020), explains that analysis is a step to find the root cause of a problem that is the main priority for improvement. The tool for determining root causes is the fishbone diagram (Ishikawa diagram), which outlines the root causes of a problem as consisting of people, materials, machines, methods, and the environment

4. Improve

The Improve phase is a functional analysis of significant improvements to identify and eliminate the root causes of the problem (Rodriguez et al., 2023) Therefore, it can be concluded that improvement is the stage of making recommendations for improvement after conducting a cause-and-effect analysis of the core problem.

5. Control

The control stage aims to ensure that the improvements made can be maintained in the long term. This step involves monitoring process performance and taking corrective action if necessary.

Waste

(Taheri et al., 2024)Waste is defined as an activity that does not create added value in the input-to-output cycle, requires a lot of time and resources, and does not contribute to customer satisfaction. There are two types of waste:

- a. Type one waste, which is an activity that does not add value but is still needed.
- b. Type two waste, which is work that does not add value and can be immediately discarded. These activities are usually simply called waste because they produce waste and must be disposed of immediately. In general, we know the types of waste that occur during the input-to-output cycle, both in the service and manufacturing industries. Various types of waste are generated in both industries (Chen et al., 2025) The types of waste found in the service and manufacturing industries are as follows (see Table 1).

Value Stream Mapping

(Daulay et al., 2021) Stream Mapping is a method used to identify value-added and non-value-added activities, making it easier to identify the root cause of a process. The advantage of Value Stream Mapping is that it visualizes the process flow to facilitate waste detection, facilitates process improvement analysis, and thus improves the flow of information and materials during production. There are two types of Value Stream Mapping: Current Value Stream Mapping, which covers the initial state of material and information flow, and Future Value Stream Mapping, which is used for future planning. Value Stream Mapping (VSM) is useful for production line improvement. Therefore, Value Stream Mapping is an appropriate method for identifying waste, analyzing it, and then finding solutions to recommend concrete improvements to reduce the resulting waste (Komariah, 2022). The stages of Value Stream Mapping are as follows:

1. Identify product/service groups.
2. Create a VSM of the current state to define the problem

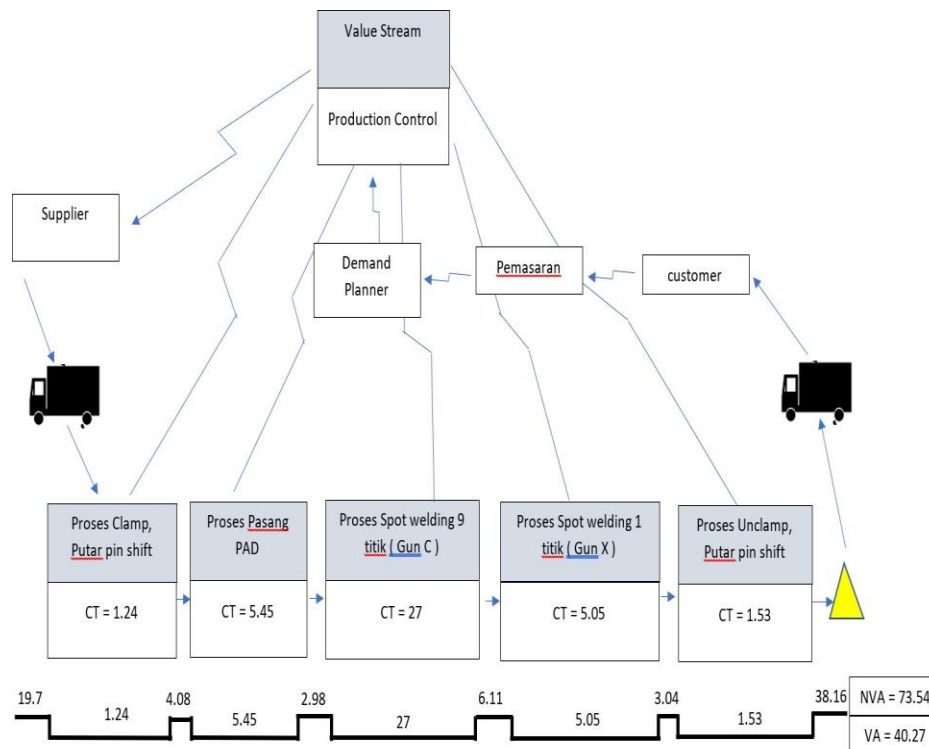


Figure 1. Example of Value Stream Mapping
(Source: (Daulay et al., 2021))

3. Determine the ideal mapping for the future.
4. Identify the corrective actions needed to close the gap between the current and future ideal states.
5. Take corrective actions.
6. Create a new mapping to verify that the problem in step 2 has disappeared

An example of Value Stream Mapping can be seen in the following image (see Figure 1).

The figure above shows that the Lean Service approach uses the DMAIC approach. The advantages of DMAIC (Define, Measure, Analyze, Improve, and Control) lie in its five steps: measuring the problem, focusing on the customer, examining the root cause, breaking old habits, managing risk, measuring results, and supporting change. The DMAIC approach consists of five phases: define (problem definition), measure (problem measurement), analyze (problem analysis), improve (process improvement), and control (performance control). The DMAIC approach is key to problem-solving in this study because it is applied to solve specific problems in the goods delivery process (Zenezini et al., 2024).

Result and Discussion

The control stage of the results of this research at the time of the journal was made, was still in the identification and implementation stage for activity section A (KC Jakarta/Bandung). This research will use the DMAI (Define, Measure, Analyze, and Improve) approach in accordance with the results that have been obtained with the following stages:

Define Stage Analysis

In this stage, a problem was discovered where the delivery time for goods from Jakarta to Bandung exceeded the company's stated delivery time of H+1. The average delivery time shown in the delivery activity description was 171.533 seconds, or 47.6 hours. This clearly exceeds the company's stated delivery time. In other words, the delivery process was delayed.

Measure Stage Analysis

At this stage, it can be seen that in the uniformity test, all the data collected for each element of the activity is already recorded in the Upper Control Limit (BKA) and the Lower Control Limit (BKB). In other words, all data is logged, so no data needs to be discarded. And for the sufficiency test of the data, after calculating the value of N' for each element of the activity, all the value of N' is less than N or in other words, the data required is smaller than the data retrieved so that the data that has been retrieved is declared sufficient and no further data collection is required. Meanwhile, the cycle time for the Express Package (PE) delivery process for Jakarta-Bandung is 171,533.9 seconds or 47.6 hours, the normal time and time are 214,427.4 seconds or 59.36 hours with all adjustment factors for each stage being the same at 1.25. And for the standard time is 253598.2 seconds or 70.42 hours with a leeway factor at the Jakarta Flora Branch Office of 0.175 and for SPP Jakarta, SPP Bandung, and DC Asia-Africa the leeway value is 0.205. During this stage, waste was also identified, with 11 activities identified as waste, with the largest being late shipments from the Jakarta Flora branch to the Jakarta SPPP. Two types of waste were identified in all shipping activities between Jakarta and Bandung: unnecessary motion and waiting for the next step.

Analyze Phase

At this stage, an analysis was carried out to determine the cause of various wastes that occurred in the Jakarta-Bandung round-trip delivery (PP) process. The analysis was carried out using Fishbone diagrams, where the causes of delays and the results of complaints from customers. Of all the wastes, they were identified on a fish bone diagram from the analysis phase. The results of the analysis identified that the cause of waste in the Express Package (PE) delivery process was within the internal operational scope of PT. Pos Indonesia, the results of the analysis are associated with human, machine, and method factors. At this stage, every activity identified starting from activity A of the Jakarta/Bandung Branch Office (KC), Activity B of the DKI Jakarta Postal Processing Center (SPP) and activity C of the Bandung Post Processing Center (SPP) the root cause

Table 2. Comparison of Existing and Recommended Delivery Process Times by Researchers

Shipping Process Section	Existing Process Time (Seconds)	Suggestion Processing Time (Seconds)
KC Jakarta	121734	33769
Transports KC Jakarta - SPP Jakarta	5914	5914
SPP Jakarta	10371	9421
Transports SPP Jakarta - SPP Bandung	17563	17563
SPP Bandung	4171	3937
Transports SPP Bandung - DC Asia Afrika	84,5	84,5
DC Asia Afrika	2370	2370
Transports DC Asia Afrika - Consignee	9323	9323
Amount	171.533,9 = 47,6 hour	82.381 = 22,5 hour

(Source: data processing results, 2025)

of the waste is identified, so that improvements can be made. The root causes of waste that occur in the process of sending Express Packages (PE) from Jakarta to Bandung or vice versa are as follows:

Activity A KC Jakarta/Bandung

1. A.18 Items delivered late to SPP Jakarta
Human: The sender provided an incomplete address, was preoccupied with thoughts and lacked focus
Method: Disorganized work, too many packages, negligent driving

Activity B SPP Jakarta

2. B.3 Placing items in a temporary location
Human: Lack of focus and lack of responsiveness to the situation
Method: Incorrect work sequence
3. B.15 Walking to the label printer
Machine: Incorrect layout of the printer
4. B.16 Waiting to print labels
Human: Preoccupied with thoughts
Machine: Insufficient number of printers, paper had to be pulled between each label print
5. B.18 Walking to the bag closure area
Machine: Incorrect layout of the printer
6. B.22 Waiting for the scanning process in the distribution section
Method: Unorganized work

Activity C SPP Bandung

- Human: Waiting for items to pile up, doing unimportant things, being inefficient and lacking focus
7. C.2 Placing items in the correct location Meanwhile
Human: Lack of focus
Method: Incorrect work sequence
 8. C.16 Walking to the label printer
Machine: Incorrect layout of the printing area
 9. C.17 Waiting for labels to be printed
Human: The clerk printed the wrong label
Machine: Not enough printers, paper must be pulled between each label print
 10. C.19 Walking to the work table
Machine: Incorrect work area layout
 11. C.23 Waiting for the scanning process in the distribution

section

Method: Unorganized work

Human: Waiting for items to pile up, doing unimportant things, being inefficient and lacking focus

Improvement Phase Analysis

In this phase, various solutions are provided for every waste problem faced in the Jakarta-Bandung freight delivery process. The table below is the result of measurements made by researchers by taking 30 samples that have the same type of delivery as the time used in seconds, based on the results of observation of the observed parts have a very fast level of completion speed. The table below shows the average results of the measurement of express shipment processing time between existing and proposed conditions after a trial of repeating activity activities after observing the activities carried out

The table 2 above shows the results of measuring delivery times from the Jakarta branch to the Asia-Africa distribution center. Solutions are provided for each waste item, and all root causes analyzed using the fishbone method are provided for improvement. This stage also provides suggestions for actions based on the implementation of Lean Service. This stage revealed that the time required to complete an Express Package (PE) delivery was 82,381 seconds, or 22.5 hours, compared to the existing time. Before the waste elimination, the Jakarta-Bandung delivery process took 171,533.9 seconds, or 47.6 hours, a reduction of 24.76 hours. In the Improve phase, solutions for the waste items analyzed in the analysis phase for Jakarta-Bandung delivery will be presented. The solutions are presented in the table below (see Table 3).

After identifying solutions to the waste that occurred in the delays in the Jakarta-Bandung shipment process, the researcher can provide suggestions for activities or processes for shipping goods from Jakarta to Bandung after eliminating waste. The activities suggested by the researcher are as follows (see Table 4).

Control phase improvement

In this stage, the researcher has provided solutions from the waste that has been analyzed at the analysis stage and continued it for the improvement stage for the delivery of goods from Jakarta to Bandung. At the time of writing this journal, PT. Pos Indonesia has re-identified the process in accordance with the applicable Standard Operational Procedure and started to implement it gradually starting from the activities of part A (KC Jakarta/Bandung), the results of the supervision and control plan show that there is a need for continuous control from the management to maintain the improvement results of the upgrade stage through continuous supervision and corrective action in case of errors. Furthermore, this stage also includes the creation of a control plan to ensure that the process remains stable in the long term. This re-identification stage has been running for 1 month for all KCs in Jakarta and Bandung. Suggested steps for the control process for PT. Pos Indonesia :

1. Develop a Control Plan: Devise procedures to monitor process performance and take action if there are errors.
2. Implement Monitoring System: Record variability in real-time with tools such as control charts.
3. Conduct Periodic Reviews: Find issues quickly and ensure that goals are achieved.
4. Document: Record all changes, results, and lessons learned for future team reference and training.

To demonstrate the stability of the process, control support tools and response plans are often used. In addition, the documentation includes changes to the standard operating procedures (SOPs).

Table 3. Solution for the Improve Phase

Waste	Solution
A.18 Waiting for goods to be sent to SPP Jakarta	This activity can be minimized by delivery that must be on schedule and in the delivery of goods, officers need to pay attention to the type of bag and prioritize the express package pocket. Officers also need to focus on work so that there are no mistakes that can cause delays in the delivery process. Officers also need to be agile in responding to issues of unclear addresses such as directly contacting the shipper so that the goods can be processed that day as well as lastly, in the transportation process, the driver needs to be equipped with many things about driving safety to avoid accidents.
B.3 The officer places the goods in the temporary collection area.	The Activities can be eliminated so that it can reduce the time after the goods are removed from the truck collection area.
B.15 Walk to the label printer	Activities can be reduced by placing the label print tool closer to the pocket-cover officer's desk.
B.16 Waiting for label printing	This activity can be eliminated by adding a label printing unit so that when officers do not need to wait in long queues. Or activities can replace the printing tool that fits better with the label so that the officer does not have to pull the label paper when printing it.
B.18 Walk to the bag cover location	Activities can be reduced by placing the label print tool close to the bag cover area
B.22 Waiting for the scan process in the distribution section	This activity can be eliminated by the way the officer can immediately scan the bag once it reaches the distribution section.
C.2 Place goods in a temporary place	Activities can be eliminated so that items can be removed from the truck directly put on the trolley
C.16 Walk to the label printer	Activities can be minimized by placing label printing tools closer to the officer's desk
C.17 Waiting for label printing	This activity can be eliminated by adding a label printing unit so that when the person prints the label, the officer does not have to wait in long queues.
C.19 Walk to the work desk	Activities can be minimized by placing label printing tools closer to the work desk.
C.23 Waiting for the scan process in the distribution section	This activity can be eliminated with officers who are more dexterous in their work..

Table 4. Elements of the Shipping Process Activities for Jakarta-Bandung Shipments Based on the Researcher's Suggestions

No	Activity Element Description	Average Delivery Time (Second)
KC Jakarta		
1	Officers check goods	20.5
2	The officer asked about the package information.	29.6
3	The officer enters the shipping data	51.8
4	The officer prints the receipt	10.1
5	The officer attaches the receipt to the goods	10.9
6	The officer places the goods in a temporary collection area.	9.7
7	Waiting for the goods to be taken to the collecting place	6868
8	Goods are taken to the collecting place	37.3
9	The officer places the goods in the collecting area	8.4
10	Waiting for the goods to be bagged by officers	20996
11	Items are sorted according to package type	8.5
12	Goods are placed in temporary storage	33.5
13	The items are scanned by the officer and put into the bag.	8.8
14	The bag closure is performed on the computer system.	8.4
15	The bag is sealed and labeled	17.7
16	Waiting for all bags to be processed	3722
17	Loading bags onto trucks for delivery	1920
18	Goods sent to SPP Jakarta	5914
Amount		39683.9
1	Taking the bags from the truck	9
2	Scan in the distribution section	8.4
3	Add items to cart	12.5
4	Pulling the Trolley to the outgoing section	59.67
5	Scan in the outgoing section	9
6	Doing Unbagging	10.1
7	Carrying out the sorting process	8.3
8	Picking up items from the sorting area	12.8
9	Enter the shipping destination on the computer	5.6
10	Scan items	5.4
11	Putting things in the bag	8.4

No	Activity Element Description	Average Delivery Time (Second)
12	Performing a bag closure on the computer	8.3
13	Shifting the bag	13
14	Waiting for all bags to be processed	1324
15	Walk to the label printer	5.12
16	Waiting to print labels	15.4
17	Printing labels	14
18	Walk to the bag closure location	5.7
19	Labeling Bags	16.4
20	Put the bag into the trolley	13.1
21	Bring the trolley to the distribution section	48
22	Scan pocket	9.4
23	Waiting for the entire bagging process to complete	5023
24	Adding bags to cart	12.4
25	Carrying the trolley to the truck	37.1
26	Stacking bags into the truck	2733
27	Goods sent to SPP Bandung	17563
Amount		26.984
SPP Bandung		
1	Take the bag and do the scanning process	16.8
2	Add items to cart	8.1
3	Pull the trolley to the incoming section	31.6
4	Scan in the incoming section	8.2
5	Doing Unbagging	10.1
6	Carrying out the sorting process	8.1
7	Taking items from the goods storage area after sorting	12.5
8	Putting items in the cart	5.7
9	Bringing items to the desk	35.8
10	Enter the shipping destination on the computer	5.6
11	Scan items	8.1
12	Putting things in the bag	8.5
13	Performing a bag closure on the computer	8.3
14	Open the bag	13.5
15	Walk to the label printer	4.7
16	Waiting to print labels	15.3
17	Printing labels	14
18	Walk to the desk	4.8
19	Labeling Bags	17
20	Put the bag into the trolley	12.5
21	Waiting for all items to be finished bagging	2708
22	Bring the trolley to the distribution section	35
23	Scan bags	10.1
24	Waiting for the goods to be picked up by the DC officer	935
25	Carrying bags to DC using a trolley	84.5
Amount		4021,8
1	Taking bags from the trolley	17.2
2	Scan bag label	10.3
3	Opening the seal	4.6
4	Unbagging goods	11.1
5	Sorting goods according to delivery area	1.320
6	Taking items from the sorting rack	83
7	Sort items according to delivery flow	673
8	Arrange items into bags	240
9	Walking carrying things to the motorbike	11.3
10	Arranging items on the motorbike	122.4
11	Delivering packages	9323
Amount		11.693,5
Total Number of Processes		82.381 = 22,5 hour

(Source: processing results, 2025)

Conclusion

The conclusions drawn from this study are as follows. The strengthening of Lean and DMAIC service integration in this study improved internal efficiency and customer satisfaction, as the research placed more emphasis on customer voice

(VOC) and service features, such as procedural clarity and wait times, as the basis for improvement. Shipping companies must conduct regular evaluations to determine the standard time of cargo delivery from Jakarta to Bandung. The results obtained from this study showed an existing delivery process time of 47.6 hours, while the results of the repair process using Lean

and DMAIC services obtained a process time of 22.5 hours; this improvement has a performance improvement value of 52.73%.

The results of this research can be used as a solution for improvement while still studying employee behavior, work culture, and change management that contribute to continuous improvement. The waste removal strategy carried out in this study is aimed at preventing delays in the cargo delivery process between the Jakarta and Bandung routes. The following solutions can be considered to eliminate waste in the process of sending express packages between Jakarta and Bandung.

For activity A.18, this activity can be minimized by delivery that must be on schedule, and in the delivery of goods, officers need to pay attention to the type of bag and prioritize the express package pocket. Officers also need to focus on their work so that there are no mistakes that can cause delays in the delivery process. Officers also need to be agile in responding to issues of unclear addresses, such as directly contacting the shipper so that the goods can be processed that same day, and lastly, in the transportation process, the driver needs to be equipped with knowledge about driving safety to avoid accidents.

For activity B.3, this activity can be eliminated so that it can reduce the time after the goods are removed from the truck, as they can be stored directly in the trolley. For activity B.15, this activity can be reduced by placing the label printing tool closer to the pocket-cover officer's desk. For activity B.16, this activity can be eliminated by adding a label printing unit so that officers do not need to wait in long queues, or the activity can be addressed by replacing the printing tool with one that fits the label better so that the officer does not have to pull the label paper when printing it. For activity B.18, this activity can be reduced by placing the label printing tool close

to the bag cover area. For activity B.22, this activity can be eliminated by having the officer immediately scan the bag once it reaches the distribution section.

For activity C.2, this activity can be eliminated so that items can be removed from the truck and put directly onto the trolley. For activity C.16, this activity can be minimized by placing label printing tools closer to the officer's desk. For activity C.17, this activity can be eliminated by adding a label printing unit so that when printing the label, the officer does not have to wait in long queues. For activity C.19, this activity can be minimized by placing label printing tools closer to the work desk. For activity C.23, this activity can be eliminated by having officers who are more dexterous in their work.

Author contributions

Afferdhy Ariffien contributed to developing research ideas, organizing the research team, formulating the research methodology, analyzing the research results, and preparing the report. Nurlaela Kumala Dewi contributed to data processing, report preparation, and journal publication. Anggi Widia Purnama was responsible for conducting measurements at KC Jakarta and KC Bandung, as well as for data inventory. Aisyah Vania Suci was assigned to take measurements at SPP Jakarta-Bandung.

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