Enhancing Efficiency in Logistics Operations through Waste Minimization at Service Counters: A Case Study of a Private Postal Franchise

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Abstract

This research presents an approach to implementing lean principles in customer service at a parcel service franchise in the Bangkok area. The objectives are: 1) to reduce waste and time during customers' parcel delivery and collection services, and 2) to reduce waste and time in locating packaging materials. The research methodology begins with collecting data on types of work, processes of each task, time, and service usage frequency. The findings reveal that the processes targeted for waste reduction are 1) the parcel-receiving process and 2) the packaging sales/parcel-receiving process. The cycle times for parcel receiving and packaging sales/parcel receiving are 263.4 seconds and 355.2 seconds, respectively. The waste in both processes can be summarized as follows: 1) waste from waiting in queues, 2) waste from excessive motion, and 3) waste from non-value-added activities. Using a fishbone diagram to analyze the causes of waste, it is found that the causes are 1) overwhelming customers using the service, 2) insufficient staff, and 3) complicated work procedures. After that, improvements are sought by reducing service counters and rearranging the store layout. As a result, the cycle times for parcel receiving and packaging sales/parcel receiving are reduced to 244.61 seconds and 260.92 seconds, respectively.

Keywords: Lean, Waste Elimination, Parcel Service

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1. Introduction

1.1 Background and Importance of the Problem

Service is a crucial aspect of logistics, and a key factor influencing customer behavior is service quality. "Service quality" refers to how efficiently a provider delivers their services to create customer satisfaction, promote positive relationships, and encourage consistent service usage, ultimately fostering long-term customer loyalty towards the organization's products and services. Puttaruksa & Taweesuk and Parasuraman emphasize that service quality involves providing services that meet or exceed customer expectations. Buzzell and Gale (1987) underscore the importance of service quality, highlighting its significance in business operations and customer satisfaction. Customer satisfaction plays a fundamental role in shaping long-term customer behavior towards product and service selection (Morgan & Hunt, 1994). Oliver (1981) defines customer satisfaction as the comparison between expectations and the reality of products and services received. Improving processes to enhance efficiency is one effective way to create customer satisfaction, as it reduces customer issues and enhances workflow. The lean concept is a popular and practical approach to process improvement.

At its core, lean principles focus on eliminating non-value-added activities in processes (Shah & Khanzode, 2017). Waste in this context refers to any activity or material that does not contribute directly to fulfilling customer needs or improving the service delivery process. Lean principles have been widely adopted across various industries, including manufacturing, logistics, and supply chain management. Applications such as lean transport (Salhieh, Altarazi, & Abushaikha, 2019) and lean purchasing have demonstrated significant benefits by reducing steps in customer service processes and improving overall efficiency. The post-service franchise operates as part of a logistics holding company, aiming to serve as a convenient community store offering leading express delivery services in Thailand. In addition to supporting basic general services, it facilitates nationwide parcel shipments for customers. The researcher identified several operational issues within the store, including complex customer service processes and extended waiting times during peak customer traffic. Recognizing these challenges, the researcher proposes applying lean concepts to streamline the customer service process, reduce waste, and enhance customer satisfaction.

In logistics and customer service, reducing waste and optimizing time are critical factors directly impacting customer satisfaction and loyalty. Organizations can enhance service quality and improve the overall customer experience by identifying and addressing sources of waste and inefficiencies in service processes. Implementing lean principles, which focus on eliminating non-value-added activities and maximizing value creation, has proven effective in various industries, including logistics and supply chain management. The research questions and objectives of this study specifically target two essential aspects of customer service: improving service delivery and optimizing the retrieval process for packaging materials. By investigating methods to reduce waste and time in these areas, the study aims to uncover practical solutions that can be implemented to streamline operations, enhance service efficiency, and ultimately drive customer satisfaction and loyalty.

Reducing waste and time during customer service interactions is essential for creating a positive customer experience. This may involve streamlining the service process, eliminating unnecessary steps, and minimizing waiting times. By identifying and addressing the root causes of waste and inefficiencies in the service delivery process, organizations can create a more seamless and efficient customer experience, increasing satisfaction and loyalty. Similarly, minimizing waste and time spent locating packaging materials is crucial for optimizing the overall service process.

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Inefficiencies in this area can lead to delays, increased costs, and customer frustration. By implementing lean principles and streamlining the packaging material retrieval process, organizations can reduce the time and effort required to locate and access these materials, ultimately improving the speed and efficiency of the service delivery process. The research questions and objectives outlined in this study are essential for understanding and addressing the challenges faced by organizations in the logistics and customer service sectors. By focusing on waste reduction and time optimization in these critical areas, this research aims to provide valuable insights and practical recommendations to help organizations improve their operations, enhance service quality, and ultimately drive customer satisfaction and loyalty.

1.2 Research Question

The research seeks to address two primary questions that focus on enhancing efficiency in logistics and customer service:

1) How can waste and time be reduced during customer service interactions to improve the customer experience?

2) How can waste and time in locating packaging materials be minimized to optimize the service delivery process?

1.3 Research Objective

The objectives of this study are specifically designed to explore and implement strategies that reduce inefficiencies in crucial service delivery areas:

1) To reduce waste and time during customer service interactions, thereby enhancing customer experience and fostering loyalty.

2) To streamline the process of locating and retrieving packaging materials, thereby reducing delays, operational costs, and improving overall service efficiency.

2. Literature Review

2.1 Related Concepts and Theories

The application of lean principles in service industries has been extensively explored in several studies. Lajevardi (2011) and Amin (2021) emphasize the importance of identifying and eliminating waste to improve overall performance in service processes. Their research underscores the necessity of conducting detailed analyses to pinpoint inefficiencies and implement targeted solutions.

Supporting this perspective, Kuaites (2020) focuses on the hotel industry, demonstrating the effectiveness of tools like the Flow Process Chart in visualizing and optimizing processes. Similarly, Murugesan (2021) applies Simulation in the postal service industry to identify bottlenecks and optimize resource allocation, thereby reducing waste in mail delivery.

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2.2 Literature Surveys

These studies collectively highlight the adaptability and potential of lean principles in service industries. By adopting systematic approaches to waste reduction, organizations can streamline processes, enhance efficiency, and elevate customer satisfaction. Implementing lean tools provides structured frameworks for achieving these objectives and fostering continuous improvement in service delivery.

However, applying lean principles to service activities presents unique challenges due to the intangible nature, variability, and simultaneous production-consumption processes inherent in services (Andrés-López et al., 2015). This necessitates redefining value from the customer's perspective and identifying non-value-added activities specific to administrative processes (Wijnhoven et al., 2016).

To effectively apply lean principles in services, organizations must focus on optimizing service delivery by aligning processes with customer needs. This requires adapting lean tools and techniques to suit the distinctive characteristics of service industries, fostering a culture of continuous improvement and operational excellence.

2.3 Conceptual Framework

The conceptual framework for this research integrates lean principles with specific objectives, a structured methodology for data collection and analysis, targeted processes for improvement, causal analysis using a fishbone diagram, strategic improvement interventions, and measurable outcomes. This framework serves as a systematic approach to applying lean management in customer service operations to enhance efficiency and customer satisfaction.

3. Research Methodology

In a study, the research methodology section outlines the structured method used to collect, examine, and interpret data, ensuring that the research goals are effectively achieved and the results are reliable and can be reproduced.

3.1 Research Design

The research design delineates a systematic approach to investigating the effectiveness of lean management practices in logistics operations. This study is structured into four key stages: Data Collection, Data Analysis, Identification of Waste, and Suggestion of Improvements. Each stage plays a crucial role in gathering data, analyzing processes, identifying inefficiencies, and proposing actionable solutions to enhance operational efficiency.

3.2 Population and Sample

The study encompasses all customers who utilize the counter services daily for a month, including individuals and businesses interacting with various aspects of the service. The one-month timeframe offers a comprehensive view of customer behavior and service interaction, covering peak and off-peak periods, weekdays, and weekends, and capturing a wide range of data on service usage patterns.

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By considering the entire population of daily users, the research avoids potential biases associated with sample selection, resulting in findings that are more generalizable and reflective of real-world conditions. This data collection approach allows for a more accurate analysis of service efficiency, customer satisfaction, and potential areas for improvement in operational processes. Additionally, the absence of a sampling frame eliminates the need for inferential statistics, as the data encompasses every customer interaction within the set period, providing a complete overview of the operational dynamics.

3.3 Research Instruments

Based on the description provided, the research instruments used in this study can be summarized as follows:

1) Observation: The primary method employed was systematic observation of customer interactions and service operations at the counter. Researchers observed and documented the sequence of operations, including the steps involved in customer service interactions.

2) Time Measurement: Researchers measured the duration of each customer interaction systematically. This involved recording the time taken for each step in the service process, such as queue waiting times, service provision times, and any other activities involved in customer service.

3) Frequency Counting: The study included counting the frequency of customer service instances. Researchers recorded how often customers interacted with various service processes throughout the observation period.

4) Flow Process Chart: A Flow Process Chart was created based on the observed sequence of operations and the measured durations. This chart visually represents the steps involved in customer service operations, helping to analyze the workflow and identify potential areas for improvement.

These research instruments collectively facilitated a detailed analysis of service efficiency and the identification of inefficiencies or bottlenecks within the service processes. The systematic approach allowed for data-driven insights into how lean principles could be applied to reduce waste and improve process times in the studied environment.

3.4 Data Collection

The researcher conducted a comprehensive field study to collect primary data. The study centered on documenting the sequence of customer service operations, measuring the duration of each interaction, and counting the frequency of customer service instances. This data was meticulously recorded to create a Flow Process Chart that delineates the service operations step-by-step. Table 1 consolidates this information, serving as the basis for further analysis. The systematic data collection process aims to enhance the application of lean principles, specifically targeting the reduction of waste and process time.

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Table 1 Summary of Operation Times for Each Service Component

Parcel Services, Second	
Receipt	263.4
Sorting	19.8
Packaging Sales	415.2
Sabuy (Convenient) Counter Service, Second	
Mobile Top-up	138
Utility Bill Payment (Water, Electricity)	192
Internet Bill	144

3.5 Statistics Used for Data Analysis

The study employs a research method that rigorously analyzes measurements of customer interaction time and frequency data to identify inefficiencies and bottlenecks within service processes. This approach systematically tracks and records the duration and frequency of each customer's interaction within the logistics service environment. It enables the accurate identification of stages in the service process where delays are most pronounced and provides insight into their impact on overall service delivery and customer experience. By integrating both time and frequency data, this method can pinpoint specific phases in the operational flow that require optimization. This data-driven approach facilitates targeted improvements aimed at enhancing service efficiency and customer satisfaction.

4. Data Analysis and Findings

4.1 Introduction

Following the data collection phase, the next step involved selecting service processes with high frequencies of customer interaction to target and reduces waste. The frequency of customer service interactions is depicted in Figure 1.

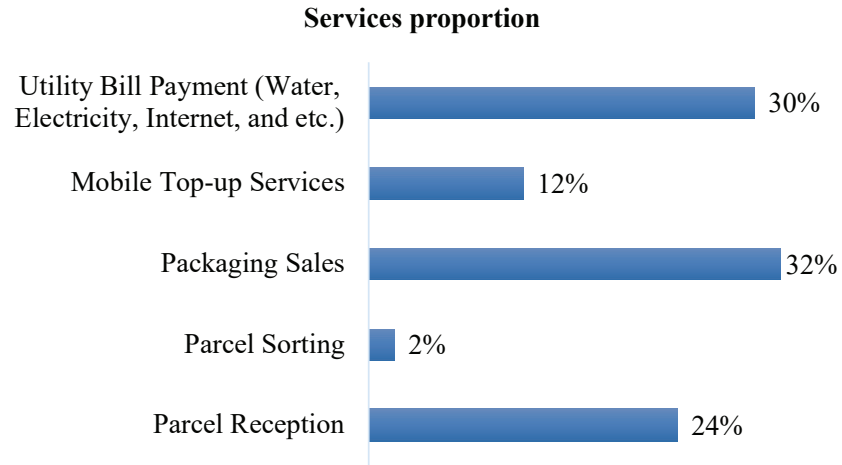

Figure 1 Frequency of Customer Service Proportional

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In Figure 1, the service frequencies for various logistics operations are detailed as follows: packaging sales at 32%, parcel reception at 24%, utility bill payments (water and electricity) and internet bill total 30%, mobile top-ups at 12%, and parcel sorting at 2%. Based on this frequency analysis, the researcher has focused on the two most frequent services to analyze and mitigate inefficiencies, as addressing these could significantly enhance operational efficiency. The two predominant processes identified are parcel reception and packaging sales/parcel reception.

Subsequently, Figure 2 illustrates flow diagrams between the Packaging Sales/Parcel Reception and Parcel Reception processes. Both services involve customers sending products with boxes or purchasing boxes to pack products before shipping. These diagrams facilitate a visual understanding of the operational flow and potential bottlenecks. Reflecting on this, Table 2 compiles data on the time lost during various steps or activities within these two processes. This analysis aims to identify and reduce wastage, thereby improving the efficiency of the most frequently utilized services in the logistics operations under study.

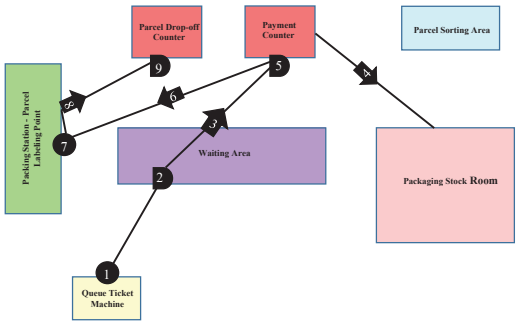
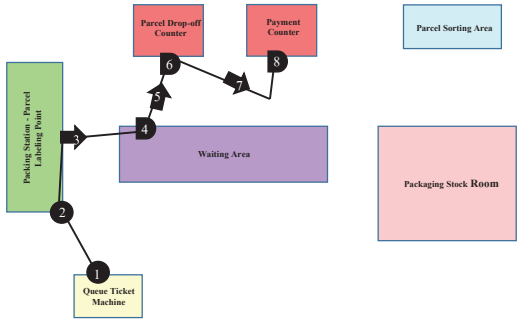
Flow Diagram of Packaging Sales/Parcel Receipt	**Flow Diagram for Parcel Receipt**
	
The process of packaging sales/parcel reception is as follows: 1. Start by pressing the queue ticket button. 2. Wait for the printer to operate. 3. Queue waiting. 4. Inform about the desired packaging. 5. Wait for the staff to bring the packaging requested by the customer. 6. Pack and label the parcel. 7. Proceed to the parcel reception counter. 8. Wait for the staff to enter parcel details. 9. Wait for the staff to print the parcel label. 10. Move to the payment counter.	The flow diagram for the parcel reception process is as follows: 1. Start by pressing the queue ticket button. 2. Wait for the printer to operate. 3. Queue waiting. 4. Pack and label the parcel. 5. Proceed to the parcel reception counter. 6. Wait for the staff to enter parcel details. 7. Wait for the staff to print the parcel label. 8. Move to the payment counter.

Figure 2 As-Is Flow Diagram between Packaging Sale/Parcel Receipt and Parcel Receipt

This flowchart outlines the sequential steps involved in the process mentioned above, identifying critical points where operational delays may occur, which can be targeted for efficiency improvements. In addition to the flow diagrams, data were collected on the time lost during various steps or activities within these two high-frequency processes. This information is summarized in Table 2, which lists specific activities within each process where time is not effectively utilized, enabling targeted interventions to streamline operations and enhance service efficiency.

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Table 2 Time Lost during Various Process Steps or Activities from August to November 2023

Data is Recorded in Seconds

Steps/Activities (seconds)	**Packaging Sales/Parcel Reception**	**Parcel Reception**
Press queue ticket - Wait for printer operation	18.82	18.82
Queue waiting	59.9	56.45
Inform about the desired packaging	12.54	-
Wait for the staff to bring the requested packaging	62.92	-
Pack and label the parcel	12.54	12.54
Walk to the parcel reception counter	6	6
Wait for staff to enter parcel details	99.92	94.35
Wait for the staff to print the parcel label	18.82	18.82
Walk to the payment counter	63.74	56.45
Total	355.2 seconds	263.4 seconds

This Table effectively illustrates the comparative analysis of time consumption between the two processes. Notably, additional steps in the packaging sales/parcel reception process contribute to the higher total time, pinpointing potential areas for efficiency improvement. The duration of activities within the two most frequent processes, parcel reception and packaging sales/parcel reception, shows that the packaging sales/parcel reception process incurs a longer time loss, totaling 355.2 seconds, compared to 263.4 seconds for parcel reception alone.

The queue waiting period significantly contributes to time loss in both processes. As reflected in the data, this step impacts the duration and indicates a potential area where operational efficiency can be improved. Reducing waiting times in queues could significantly enhance overall service speed and customer satisfaction. Strategic solutions such as optimizing staff allocation, employing more advanced queue management systems, or redesigning the service workflow to streamline operations could be considered to address these inefficiencies.

Based on the analysis of operational data, the types of wastage within the processes can be categorized as follows:

1) Wastage due to Customer Queue Wait Times: This wastage occurs when customers spend excessive time waiting to be served. It not only impacts customer satisfaction but also reduces the throughput of the service operation.

2) Wastage due to Excessive Movement: In both the parcel reception and packaging sales/parcel reception processes, unnecessary movement does not add value to the service but increases the completion time. This includes moving between different service counters and unnecessary back-and-forth movements that could be minimized.

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3) Wastage from Non-Value-Adding Activities: These activities do not directly contribute to the end value of the service. Examples include informing about desired packaging and waiting for staff to bring requested packaging. These steps cause delays without enhancing the customer experience or service quality.

Following this categorization, a Cause and Effect Diagram (also known as a Fishbone Diagram) is utilized to further analyze the underlying causes of these inefficiencies. Figure 3 visually organizes potential sources of waste, facilitating the identification of areas for improvement to streamline operations and enhance service delivery efficiency. This methodical approach allows for targeted interventions that can significantly reduce waste and optimize process flows.

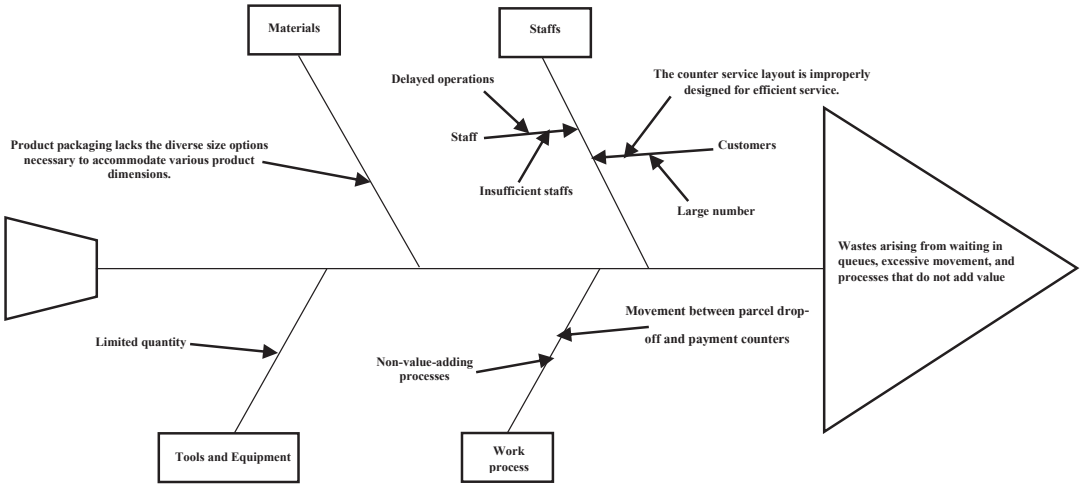

Figure 3 Cause and Effect Diagram

Based on the comprehensive data analysis, several strategies have been developed to reduce wastage and decrease the duration of processes:

1) Wastage Due to Customer Queue Wait Times: The primary cause of customer wait times is high customer traffic and insufficient staffing. This issue can be addressed by increasing the number of staff during peak periods to better accommodate the influx of customers.

2) Wastage Due to Excessive Movement: Complex workflows and excessive movement between parcel and payment counters contribute to waste in the parcel reception and packaging sales/parcel reception processes. This can be mitigated by consolidating operations at a single counter, where one staff member can handle both parcel-related and financial transactions.

3) Wastage from Non-Value-Adding Processes: Specific wastage was identified in activities such as informing about and waiting for desired packaging. This can be eliminated by removing these steps entirely. Instead, packaging can be organized on shelves for customers to select directly. Customers can then proceed to pack, label their parcels, and move directly to dispatch and payment.

These improvements aim to streamline operations, enhance customer satisfaction by reducing wait times, and increase overall efficiency by eliminating unnecessary steps and movements within the workflow.

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4.2 Data Analysis of the Quantitative Data

Following the implementation of the research methodologies, the results post-improvement are as follows:

Table 3 illustrates the revised flow process charts. The service time for the parcel reception process has been reduced to 244.61 seconds. Additionally, the cycle time for the packaging sales/parcel reception process has decreased to 260.92 seconds. These improvements highlight the efficacy of the adjustments made to streamline the processes, effectively reducing the service and cycle times of each operation.

Table 3 Process Flow Chart After Improvement

Task	Symbol					Time (Second)
	Process	Transport	Inspection	Delay	Storage	
	○	⇨	□	D	△	
Packaging Sales/Parcel Receipt						
Press to receive the queue ticket						18.82
Wait in line						59.9
Pack and label the parcel						12.54
Walk to the parcel reception/payment counter						6
Wait for the staff to enter parcel details						99.92
Make payment/receive receipt						63.74
Total	3	1	0	2	0	260.92
Parcel Receipt						
Press to receive the queue ticket						18.82
Wait in line						56.45
Pack and label the parcel						12.54
Walk to the parcel reception/payment counter						6
Wait for the staff to enter parcel details						94.35
Make payment/receive receipt						56.45
Total	3	1	0	2	0	244.61

Table 3 presents the post-improvement flow process charts detailing the steps involved in both the parcel reception and packaging sales/receipt processes:

1) Parcel Reception Process:
- Customer presses to receive a queue ticket: 18.82 seconds
- Queue waiting time: 56.45 seconds
- Parcel packaging and labeling: 12.54 seconds
- Walk to parcel receipt and payment counter: 6 seconds
- Waiting for officer to process the parcel: 94.35 seconds
- Payment and receipt of invoice: 56.45 seconds

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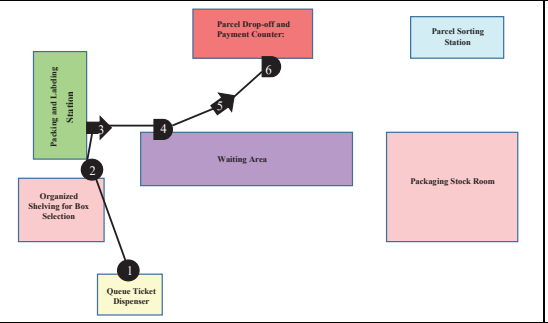
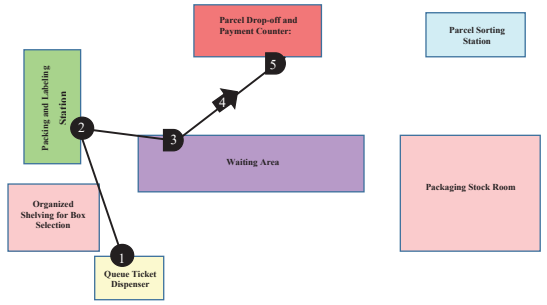
- Total process time: 244.61 seconds
- Packaging Sales/Receipt Process:

2) Customer presses to receive a queue ticket: 18.82 seconds
- Queue waiting time: 59.9 seconds
- Selection and packaging of parcel materials: 12.54 seconds
- Walk to payment counter: 6 seconds
- Waiting for officer to process the parcel: 99.92 seconds
- Payment and invoice collection: 63.74 seconds
- Total process time: 260.92 seconds

These timings highlight specific operational efficiencies and bottlenecks within the parcel reception and packaging sales/receipt processes. They indicate areas where further improvements could enhance throughput and customer satisfaction, focusing on reducing waiting times and optimizing process flows.

Flow Diagram of Packaging Sales/Parcel Receipt	**Flow Diagram for Parcel Receipt**
	
1. Pressing to Receive a Queue Ticket - This is an operational step where customers initiate their service request by obtaining a queue number. 2. Waiting in Queue - This step is classified as a waiting period, reflecting the customer's inactivity while awaiting their turn. 3. Selecting Desired Packaging and Packing the Parcel—This is another operational step in which customers actively select their packaging materials and pack their items. 4. Walking to the Parcel Receipt and Payment Counter—This movement step involves customers physically transitioning to the service counter to complete their transactions. 5. Waiting for the Officer to Process the Parcel—This step occurs while service personnel process the parcel.	1. Pressing to Receive a Queue Ticket - This operational step involves customers initiating their service by obtaining a queue number. 2. Waiting in Queue - Classified as a waiting step, this reflects the time customers spend waiting for their service turn. 3. Parcel Packing and Labeling—This is an operational step in which customers or service personnel pack and label the parcel. 4. Walking to the Parcel Receipt and Payment Counter—This is a movement step that involves customers moving to the counter to complete the transaction. 5. Waiting for the Officer to Process the Parcel—This step involves waiting for the service officer to complete the parcel processing. 6. Payment and Receipt Collection—This is the concluding operational step, during which the transaction is completed, and the receipt

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Flow Diagram of Packaging Sales/Parcel Receipt	Flow Diagram for Parcel Receipt
6. Payment and Receipt Collection is the final operational step, during which transactions are finalized and receipts are issued.	is handed to the customer.

Figure 4 To-Be Flow Diagram between Packaging Sale and Parcel Receipt and Parcel Receipt

Figure 4 depicts a streamlined workflow resulting from the reorganization of customer service processes, showcasing improved service efficiency. The revised processes have significantly reduced customer waiting times and minimized the necessity for customers to traverse between various service stations. These enhancements have successfully optimized service delivery times, as evidenced by Table 4, which contrasts customer service times before and after the improvements.

Table 4 Comparison of Time Before and After

Baseline Measurement in Second	Packaging Sales/Parcel Receipt	Parcel Receipt
Before	355.2	263.4
After	260.92	244.61
Delta change (%)	27%	7.1%

Table 4 shows that the time taken for parcel receipt processes was reduced after improvements. Before the improvements, the process took 263.4 seconds, which was reduced to 244.61 seconds post-improvement, achieving a time reduction of 7.1%. In the packaging sales/receipt process, the time before improvements was 355.2 seconds, which was reduced to 260.92 seconds after the enhancements, resulting in a 27% reduction in time. This indicates that applying Lean principles in the process redesign effectively decreased the operational steps and time required.

4.3 Summary of the Results

The findings reveal that the processes targeted for waste reduction are 1) the parcel-receiving process and 2) the packaging sales/parcel-receiving process. The cycle times for parcel receiving and packaging sales/parcel receiving are 263.4 seconds and 355.2 seconds, respectively. The waste in both processes can be summarized as follows: 1) waste from waiting in queues, 2) waste from excessive motion, and 3) waste from non-value-added activities. Using a fishbone diagram to analyze the causes of waste, it is found that the causes are 1) overwhelming customers using the service, 2) insufficient staff, and 3) complicated work procedures. After that, improvements are sought by reducing service counters and rearranging the store layout. As a result, the cycle times for parcel receiving and packaging sales/parcel receiving are reduced to 244.61 seconds and 260.92 seconds, respectively.

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5. Conclusion, Discussion, and Recommendation

5.1 Conclusion

The researcher summarized the findings of the study based on the first objective to reduce waste and customer service time in the parcel reception process. Initially, the customer service time was 263.4 seconds. An analysis of the data identified the most significant time losses due to waiting in queues. The identified wastages included:

1) Wastage from customer service queue wait times.
2) Wastage due to excessive movement in both the parcel reception and packaging sales/parcel reception processes.
3) Wastage from non-value-adding processes, such as the time spent informing about desired packaging and waiting for staff to bring requested packaging.

After identifying these wastes, a Cause and Effect Diagram was used to analyze their causes. Subsequently, improvement strategies were developed:

1) Increase the number of staff during periods of high customer traffic to reduce wait times.
2) Reduce the number of service counters to minimize unnecessary movement.
3) Eliminate activities like informing about desired packaging and waiting for staff to bring requested packaging to reduce non-value-adding processes.

As a result of implementing these strategies, the customer service time for the parcel reception process was reduced to 244.61 seconds.

The researcher also summarized the findings according to the second objective, which aimed to reduce waste and time in the process of finding packaging for sale to customers in the store. Initially, the service time for the packaging sales/parcel reception process was 355.2 seconds. After analyzing and identifying wastage, similar types of wastage were identified as in the parcel reception process. Following the application of the Cause and Effect Diagram for analysis and subsequent improvements, the strategies implemented included:

1) Increasing staff to reduce wait times during periods of high customer volume.
2) Decreasing the number of service counters to reduce excessive movement.
3) Removing activities like informing about desired packaging to reduce non-value-adding activities.

Consequently, the service time for the packaging sales/parcel reception process was reduced to 260.92 seconds.

5.2 Discussion

The application of lean principles at the Parcel Service branch located at the Bangchak gas station successfully reduced packaging sales and parcel reception times. Initially, these times were 355.2 seconds and 263.4 seconds, respectively. After identifying key time wastages, particularly waiting in queues, the following types of wastages were identified: 1. Wastage from customer queue wait times, 2. Wastage due to excessive movement in both parcel reception and packaging sales processes, and 3. Wastage from non-value-adding processes.

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Using a Cause and Effect Diagram to analyze the causes of these wastages, improvement strategies were devised. These included: 1. Increasing staff numbers to reduce waiting times during peak customer inflow, 2. Reducing the number of service counters to minimize unnecessary movement, and 3. Eliminating activities such as informing about and waiting for packaging to reduce non-value-adding processes. Consequently, customer service times improved to 260.92 seconds for packaging sales/parcel reception and 244.61 seconds for parcel reception. These reductions illustrate how lean principles effectively streamline processes, a finding consistent with research by Tulaphon Nitidet (2021) on applying lean concepts to enhance efficiency in academic support work at the Faculty of Logistics, Burapha University.

These outcomes also align with the work of Kobkun Suwalak (2017), who utilized Lean enterprise systems to reduce wasteful activities in service provision, leading to decreased operational times and potentially higher customer satisfaction. Furthermore, it correlates with research by Suwat Ngamdee (2017), who applied lean principles to optimize process reporting indicators, using techniques like ECRS to eliminate Non-Value-Adding activities, combine tasks, rearrange work systems, simplify processes, resolve bottlenecks, and enhance work speed through visual control techniques.

5.3 Recommendation

Further exploration of additional methodologies should be undertaken to complement lean principles, thereby enhancing operational efficiency further. Integrating performance improvement philosophies such as Six Sigma, Total Quality Management (TQM), or the Theory of Constraints (TOC), along with technology-driven solutions like automation and data analytics, could offer a more holistic approach to streamlining processes and maximizing productivity.

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