CHAPTER I
INTRODUCTION

This chapter contain the research background, problem formulation, objectives, problem scopes, and outline of the research.

1.1 Background

As the population of young Indonesians continues to grow and public awareness regarding the importance of maintaining the appearance and health of the skin, the national beauty industry is also becoming increasingly developed with the establishment of many local cosmetic brands. The trend of using local products is also an indication of the increasing quality of products that are able to compete with various brands from abroad. The phenomenal growth of the cosmetics industry in Indonesia is marked by the growth in the number of cosmetics industries in Indonesia which reached 21.9%, from 913 companies in 2022 to 1,010 companies in mid-2023 based on Badan Pusat Statistik (BPS).

Based on Kementrian Koordinator Bidang Perekonomian Republik Indonesia,the national cosmetics industry is also able to penetrate the export market where cumulatively for the January-November 2023 period the export value for cosmetics, fragrances, and essential oils products was recorded at USD770.8 million. Of the various products produced by cosmetic companies in Indonesia, the largest market segment is dominated by the personal care segment with a market volume of USD3.18 billion in 2022, followed by skincare at USD2.05 billion, cosmetics at USD1.61 billion, and fragrances at USD39 million. The potential market size nationally in 2023 could reach 467,919 products or increase more than 10 times in the last five years.

Indonesia's cosmetics market is experiencing rapid growth, driven by an expanding middle class and a growing demand for halal beauty products. In 2024,

the cosmetics market in Indonesia is valued at USD 1.94 billion. It is expected to grow at an annual rate of 5.35%. **Figure 1.1** illustrates the projected cosmetics revenue in Indonesia through 2029. This chart shows the revenue trends in the cosmetics industry from 2018 to 2029, broken down by product categories eyes, face cosmetics, lips, nails, and natural cosmetics. The total revenue has steadily increased each year, starting from $1.36 billion in 2018 and projected to reach $2.46 billion by 2029 (Statista 2024).

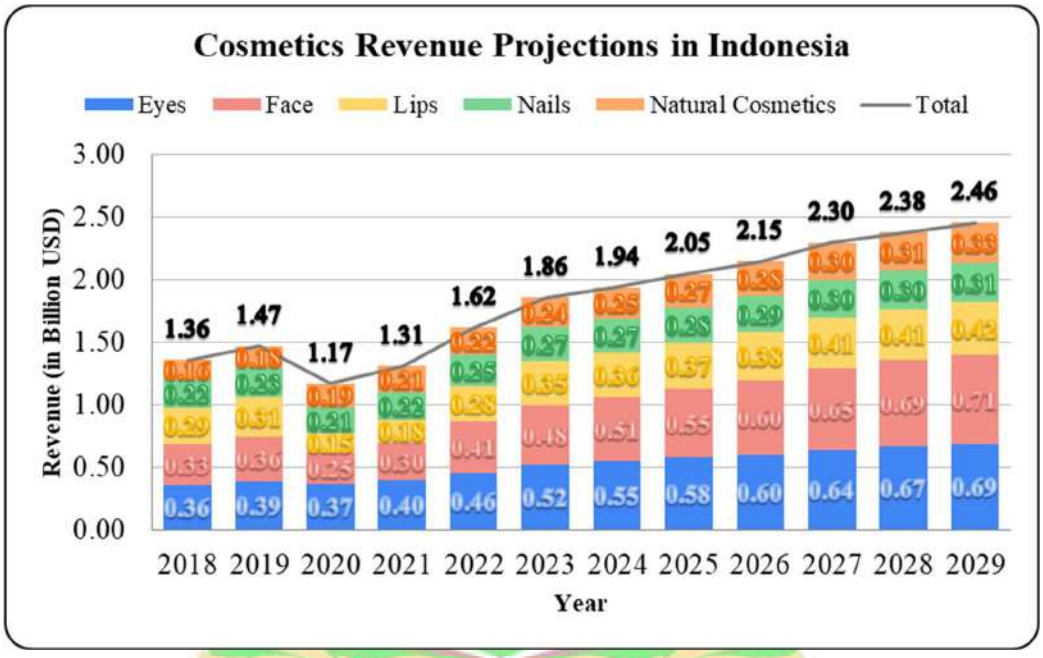

Figure 1.1 Cosmetics Revenue Projection in Indonesia

As the demand for cosmetic products in Indonesia continues to grow, the ability to respond effectively to consumer needs presents both an opportunity and a challenge for companies. This trend drives intense competition among businesses to deliver the best service in meeting consumer demands comprehensively. In this context, inventory and distribution management play a critical role, particularly for manufacturing companies. Therefore, companies must ensure that inventory and distribution processes are optimized by maintaining balanced stock levels to prevent shortages or overstocking while ensuring products reach consumers at the right location, cost, and time (Ridwan & Rizal Gaffar, 2022).

To survive and compete in the market, companies must improve the overall efficiency of their supply chain to produce market-competitive products (Kusumaningsyah 2024). Factors such as globalization, market competition, rapid technological changes, short product life cycles, high productivity, and reduced time to market nowadays have made the impact of logistics on production far broader than before (Dotoli et al., 2015a). Along with the increasing revenue of the cosmetics industry in Indonesia as shown in Figure 1.1, companies are experiencing a significant annual surge in demand. This surge places considerable pressure on operational systems, particularly in warehouses, to process and deliver goods with maximum efficiency. One of the companies that has managed to remain competitive and continues to grow is PT XYZ.

PT XYZ is a Fast Moving Consumer Goods (FMCG) company in the field of cosmetics, perfume, personal care, and skin care in Indonesia which houses a number of brands with a total inventory managed of more than 40 million pcs of finished goods, 4,500 purchase orders every day, and deliver more than 750,000 pcs to stores every day. PT XYZ has 41 Distribution centers (DC) to distribute its products to all stores and retailers throughout Indonesia with more than 75,000 stores served. In order to optimize supply chain costs, an effective and efficient warehousing process is necessary. As part of the supply chain, the warehousing function at PT XYZ plays an important role in managing the flow of materials, goods, and information along the supply chain to ensure customer satisfaction at the lowest possible cost.

Warehouse can be defined as a logistics management system that functions to organize and control the activities of receiving, storing, maintaining, retrieving, and distributing goods or raw materials (Richards & Gwynne, 2014). Warehouses have a very important role in supply chain management with functions as temporary shelters, maintaining stock availability, and distribution efficiency. Therefore, warehouse plays a key role in determining the high and low level of operational costs. Warehouse operations contribute around 30% to 50% of the company's overall operational costs (Nilamsari, 2020). In order to meet consumer demand,

warehousing operations need to be optimized to eliminate inefficiency and make the process more cost reliable (Dotoli et al., 2015). Warehousing is also an important activity in connecting demand and supply that affects the level of success in terms of meeting customer needs and satisfaction (Richards & Gwynne, 2014). If there are product defects caused by storage and shipping activities, customer satisfaction will certainly not be achieved. Customer satisfaction with the quality of goods, the timeliness of delivery and the accuracy of the quantity of goods ordered depends on the quality of the warehousing process itself (Primadi1 et al. 2024).

PT XYZ has seven factory areas with different functions with a total area of 20 hectares. The company has two finished goods warehouses with a total area of approximately 15 m^2 that contain 1,600 product SKUs to be distributed to 41 distribution centers. In general, warehouse activities at PT XYZ consist of incoming, stocking, picking, checking, and packing as illustrated in **Figure 1.2**. In order to understand the warehouse activities carried out by PT XYZ, preliminary observations were made.

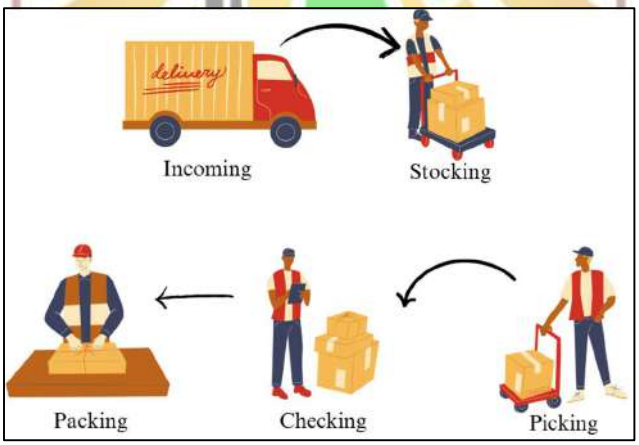

Figure 1.2 Warehouse Activities in Natiional Distribution Center

Figure 1.2 shows NDC warehouse operational flow, starting with incoming, where goods are received and unloaded from milkrun trucks. Moreover, validation process is carried out by matching the received goods with the receiving documents to ensure the accuracy of the quantity, type, and condition of the goods in accordance with the information stated in the documents. The items are then moved

to their designated storage locations in the stocking process. When an order is received, warehouse operators perform picking to retrieve the required items, followed by checking to ensure accuracy and minimize errors. The verified items proceed to packing, where they are securely packed to prevent damage during shipping. Finally, the packed orders are loaded onto delivery trucks in the loading stage for shipment to Distribution Center (DC). However, these interconnected processes within the NDC warehouse, providing a comprehensive overview of how each activity supports the overall operation. **Figure 1.3** shows the productivity of four warehouse activities, namely incoming, picking, checking, and packing, as illustrated in subfigures (a) to (d), respectively.

(a) Productivity of Incoming Activities

(b) Productivity of Picking Activities

(c) Productivity of Checking Activities

(d) Productivity of Packing Activities

Figure 1.3 National Distribution Center Productivity per Function in Ten Weeks

The raw data utilized to obtain the actual productivity, as illustrated in **Figure 1.3**, consist of the total number of items process in each warehouse activity and the number of operators present in a weekly basis. The productivity calculation was carried out by dividing the number of items processed by the available man-hours. The unit for the number of items processed in each warehouse function varies according to the manner in which operators perform the respective operations. Specifically, the processed units are measured in pallets for incoming, boxes for picking, SKUs for checking, and pallets for packing. The available man-hours were determined by multiplying the number of operators present by the working hours and the number of operatos assigned to the respective warehouse functions.

Figure 1.3 presents a comparison between the warehouse capacity and its actual productivity of ten weeks. In this figure, the line chart illustrates the available capacity for each warehouse activity, whereas the bar chart represents the actual productivity achieved within the warehouse during the corresponding week. A condition where the bar chart exceeds the line chart indicates that the current capacity during normal working hours is not sufficient to meet the weekly demand. In several weeks, particularly for incoming, picking, and checking, productivity exceeded the available capacity. This situation suggests the need for overtime, process improvements, or capacity expansion to fulfill operational requirements.

The productivity of warehouse activities is directly influenced by customer demand. When demand increases, the workload on each process, such as incoming, picking, checking, and packing also rises, requiring more resources and time to complete. If the increase in workload is not matched with sufficient capacity, certain activities may operate beyond their normal limits, as reflected in the fluctuations and occasional exceedance of capacity shown in Figure 1.3. This condition can lead to delays, higher operational costs, or reduced service quality if not addressed through process optimization. **Figure 1.4** presents the demand data over 10 weeks.

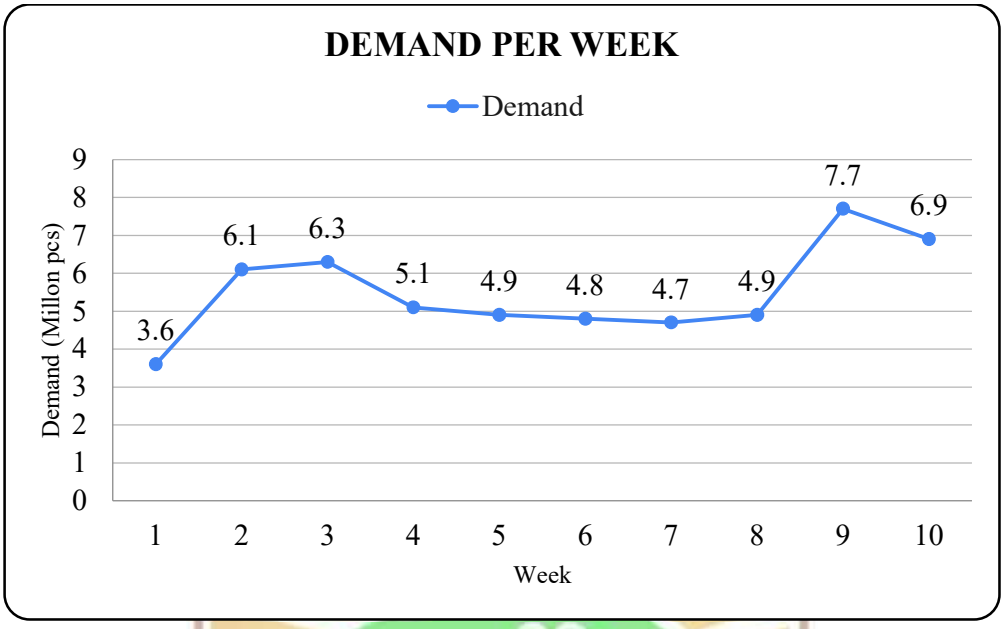

Figure 1. 4 Demand per Week

Figure 1.4 illustrates the weekly demand from January to March 2024. Compared to the first 10 weeks of 2023, which recorded an average demand of 4.1 million pieces, the demand in the first 10 weeks of 2024 experienced a significant increase, reaching an average of 5.5 million pieces. This increase in demand directly impacts warehouse operations, as reflected in the productivity analysis shown in **Figure 1.3**. Higher demand levels place additional pressure on key processes such as incoming, picking, and checking, which in several weeks have already exceeded the available capacity under normal working hours. Consequently, this situation emphasizes the urgency for process optimization or capacity expansion to maintain service levels and prevent operational bottlenecks.

The demand trend over the 10-week period demonstrates notable fluctuations. In the first week, demand was recorded at 3.6 million pieces, representing the lowest value throughout the observed period. This was followed by a sharp increase in weeks two and three, where demand rose to 6.1 million and 6.3 million pieces, respectively. After reaching this peak in week three, demand experienced a consistent decline, dropping to 5.1 million pieces in week four, and further stabilizing around 4.7–4.9 million pieces from weeks five to eight. The following week, week ten, showed a slight decrease to 6.9 million pieces, though

this value remained considerably higher than the average demand of the earlier weeks.

The combination of high demand and productivity levels that frequently approach or exceed capacity can create additional workload for warehouse employees. When operational activities cannot be completed within normal working hours, overtime becomes necessary to ensure that all orders are processed and shipped on time. This overtime serves as a short-term solution to maintain service performance, but if it occurs frequently, it may indicate underlying inefficiencies or insufficient capacity within the warehouse operations.

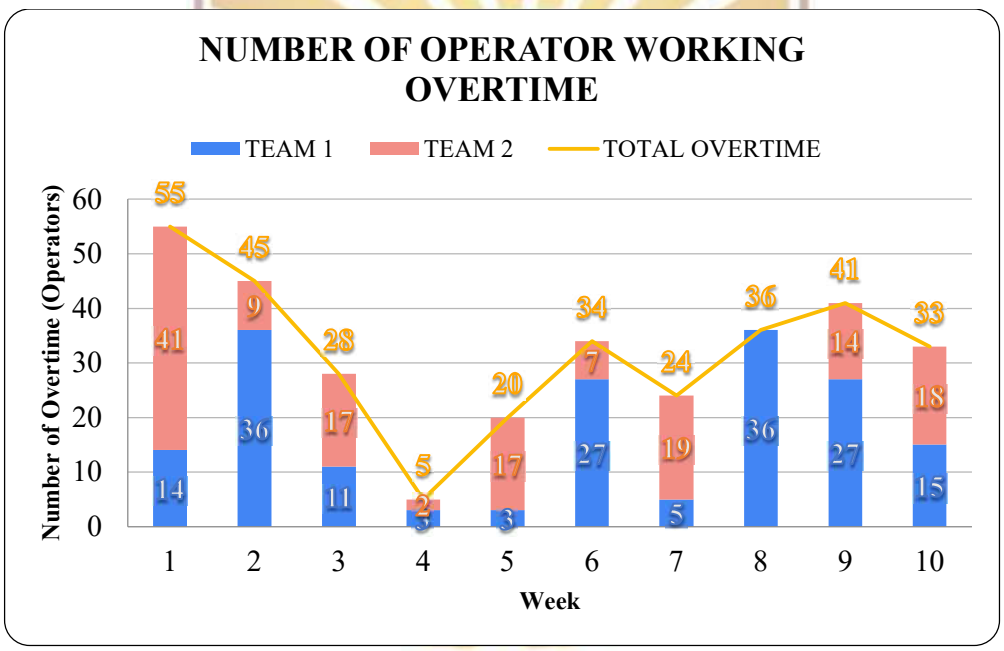

Figure 1.5 Number of NDC Operators Working Overtime in Ten Weeks

High overtime in the long run can affect workers' physical and mental conditions, which in turn can reduce productivity and work quality (Sato et al., 2020). Moreover, this problem not only effect operational efficiency but also financial performance and employee well-being, all of which contribute to the company's overall operational sustainability (Richards & Gwynne, 2014). Based on preliminary observation, one of the key factors contributing to these inefficiencies is the movement of goods within the warehouse that can be seen in **Figure 1.6**.

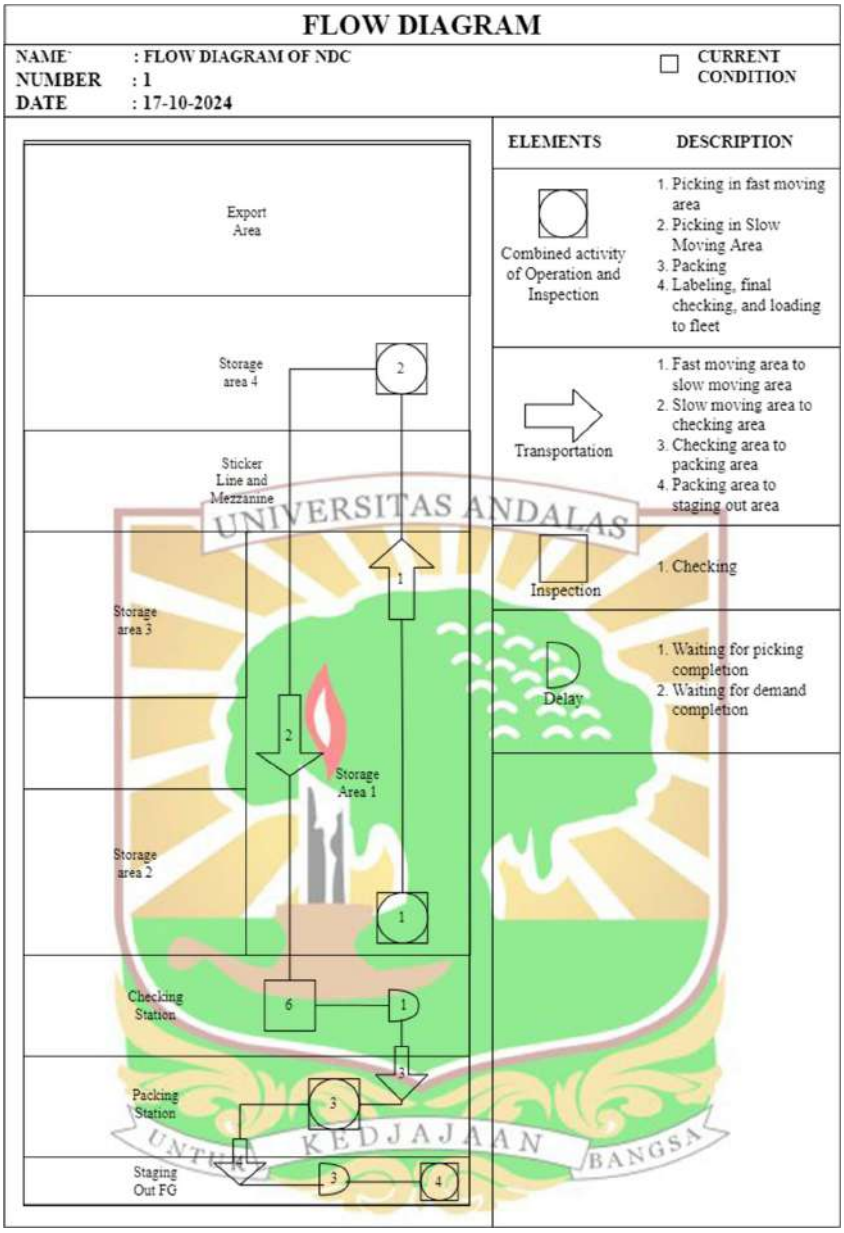

Figure 1.6 Flow Diagram of National Distribution Center

Figure 1.6 illustrates the flow of materials within the warehouse. The warehouse throughput represents the operational capability to process goods within a specific time frame. In the context of the NDC warehouse at PT XYZ, throughput is calculated based on the number of items that can be handled by operators within one manhour. According to the calculations, the current warehouse throughput of the NDC is 8,559 pcs/manhour.

In its current state, the movement of goods involves unnecessary routes that could be simplified which shown in **Figure 1.6**. Picking operators often start from the fast-moving area at the front and must transport items from this location to the slow-moving area in the back, only to return to the fast-moving area for checking, as this checking area is located near the dedicated fast-moving section. This repeated back-and-forth movement takes up a significant portion of the operators' time, reducing the time available for core activities like picking and delaying overall task completion.

Another of the inefficiencies in the warehouse operations arises from the layout, where some high-demand items are placed in a dedicated area located relatively farther from the checking station. **Figure 1.6** shows that storage area 1 and storage area 3 are allocated for fast-moving items, while storage areas 2 and storage area 4 allocated for slow-moving items. The pallet mover operator must cover a distance of 84 meters, taking approximately 47 seconds, to transport items from storage area 3 to the checking station. This arrangement increases the travel distances for operators when retrieving frequently needed items, leading to longer operational times. The extended duration of warehouse activities delays the fulfillment process and creates bottlenecks. Longer picking cycle times reduce throughput, ultimately lowering overall productivity.

Aside from the inefficiencies caused by the movement of goods within the warehouse, another issue affecting productivity is overstock. The occurrence of overstock in the finished goods warehouse can be identified by the gap between the number of incoming items and the number of successfully put away items that is shown in **Figure 1.7**. Overstock items are placed in the mezzanine area. Therefore, the operator have a dependency on Stacker In Order (SIO) operators to put and access items in the mezzanine. This can lead to increased lead time, as other operators must wait for the availability of both the forklift and the SIO operator to assist with the replenishment process. The replenishment activity itself is an additional step that requires the operator to retrieve items from overstock and

restock them into the dedicated storage areas. This activivity can disrupt the flow of operations and add unnecessary delays to the overall workflow.

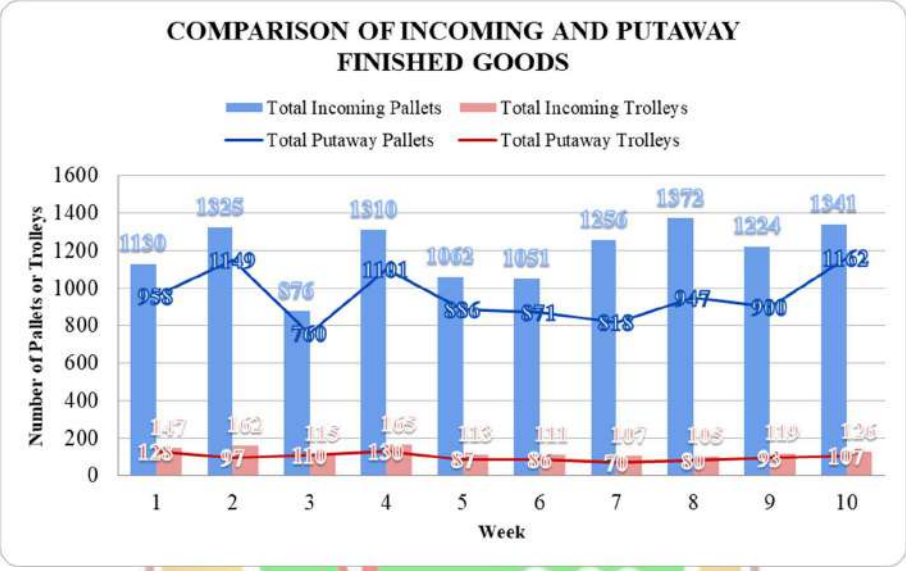

Figure 1.7 Comparison Between Incoming and Stocking Finished Goods

In some high seasons when the mezzanine area is full, finished goods are placed in the aisle. This situation leading to other problems. For instance, the damage of finished goods due to being hit by a pallet mover as the space for maneuvering is filled with overstocked goods. The damaged goods is shown in **Figure 1.8**. This situation not only slows down the workflow but also raises operational costs due to wasted time and labor, thereby harming overall warehouse efficiency.

Figure 1.8 Goods Damaged by Pallet Mover

These conditions within the company reveal a pattern of inefficiencies. Excessive movement of goods, overstock, unnecessary processes, delays, and defects all result in wasted resources and time, which ultimately impacts the company's efficiency, cost management, and service quality. A systematic approach is needed to pinpoint and reduce these inefficiencies, ensuring more streamlined operations. This research is crucial as it aims to uncover and address these inefficiency-related issues within PT XYZ's operations. By evaluating workflow inefficiencies in the warehouse, there is significant potential to improve processes and identify any additional forms of inefficiencies that may not have been immediately apparent.

1.2 Problem Formulation

Based on the background elaborated above, the problem formulation of this final project is structured as follows:

1. What are the sources of inefficiencies in the National Distribution Center Warehouse of PT XYZ?
2. What are the causes of waste occurring in the National Distribution Center Warehouse of PT XYZ?
3. What waste elimination action can be proposed to address the identified inefficiencies using the lean warehouse approach?

1.3 Research Objective

Based on the problem formulation above, this final project is carried out with the following objectives:

1. Determine the sources of inefficiencies occurring within National Distribution Center Warehouse of PT XYZ.
2. Analyze the causes of waste occurring in the National Distribution Center Warehouse of PT XYZ.

3. Propose waste elimination action to address the identified inefficiencies by implementing Lean Warehouse approach.

1.4 Problem Scopes

The scopes of the problem research that conducted in National Distribution Center Warehouse at PT XYZ is defined as follows:

1. The type of warehouse that will be observed for this research is the finished good warehouse called National Distribution Center (NDC). This study focuses on the activities within the National Distribution Center (NDC) that includes the stages of incoming goods, stocking, picking, checking, and packing. However, the loading process is excluded from the scope of this study, as it is managed by a separate division outside the NDC's operational.
2. The object of this research is NDC warehouse with the highest level of warehousing activity.
3. The implementation of the proposed solution will be conducted through scientific methods or within pilot project, without being directly applied comprehensively across all warehouse activities within the company.

1.5 Assumption of The Research

The assumption of research that conducted in National Distribution Center Warehouse at PT XYZ is defined as follows:

1. There were no changes in warehouse activities during the research period.
2. There were no changes in company policies related to warehouse processes throughout the research period.

1.6 Outline of The Research

This research consists of several chapters with the following systematic structure:

CHAPTER I INTRODUCTION

The introduction presents the research background, outlines the problem formulation, defines the research objectives, specifies the scope of the study, and provides an overview of the research structure.

CHAPTER II LITERATURE REVIEW

The literature review section outlines relevant theories and concepts that form the basis of this study, providing a framework for understanding the operational challenges in warehouse processes. It serves as a foundation for analyzing identified issues and developing solutions, particularly through the application of lean warehouse principles to address waste and inefficiencies.

CHAPTER III RESEARCH METHODOLOGY

This chapter outlines the systematic stages and procedures of the research conducted in this study. These include preliminary analysis, problem identification and formulation, data collection, selection of appropriate methods, data processing, analysis of results, and final recommendations.

CHAPTER IV COLLECTION AND PROCESSING DATA

This section provides a detailed explanation of the data collection process essential for the subsequent data analysis. The data gathered focuses on identifying and quantifying inefficiencies in warehouse operations, serving as a basis for applying the lean warehouse approach to address the identified issues.

CHAPTER V ANALYSIS

This section presents an analysis of the findings obtained from the processed data. The analysis focuses on evaluating the root causes of inefficiencies in warehouse operations and identifying opportunities for improvement.

CHAPTER VI CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions derived from the research findings, summarizing the outcomes of the analysis and providing actionable insights. Additionally, recommendations for future research are outlined to support further exploration and improvement of warehouse operations.