

CHAPTER 1

INTRODUCTION

1.1. Background

Distribution is crucial in the modern supply chain as it influences many different aspects inside the supply chain. Distribution companies or usually called 3PL (Third-Party Logistics) serve as intermediaries between manufacturers and consumers. 3PL company have to ensure the efficient transportation, storage, and delivery of goods to satisfy specific market demands. According to Jum'a and Basher (2023), 3PL offer value-added services including order processing, inventory management, and customer care. This is essential to satisfy client demand and sustain a high standard of service.

PT XYZ is a local 3PL in Indonesia responsible for overseeing the distribution of diverse items from multiple other companies. The company manages the distribution for a total of 19 companies. It manages the distribution of a range of items. The product encompasses skincare, food, beverages, batteries, and other fast-moving consumer items. It owns multiple branches and offices in Central Java. One of the branches and offices is in Kecamatan Trucuk, Klaten, Central Java. At the Klaten branch, a total of 45 employees work under the supervision of the Depo Head. The branch operates with a single shift, running for seven hours per day from 8 a.m. to 5 p.m.

A 3PL company, such as PT XYZ, engages in a variety of activities. Those activities include promotion planning, managing purchase orders (POs) from various stores, managing sales, inventory control, and warehouse-related activities. Promotion made by distributors is different from promotion made by the collaborating companies (principals). The promotion is usually made by the 3PL to increase the number of orders from the store. The 3PL company also has to manage the PO and prepare the goods until they are received by the store. 3PL are also responsible for managing sales prior to making payments to the principal. Since 3PL operations are closely linked to goods management, it is impossible to separate them from inventory control and warehouse-related activities.

The operation of a 3PL is directly linked to the existence of a warehouse. The existence of warehouses in 3PL companies is essential for fulfilling market demand with sufficient supply. The warehouse in the 3PL performs multiple functions. The

functions encompass receiving, put-away, storage, order picking, accumulation, packing, and shipping (Tompkins et al., 2010). Each function serves a distinct role however aims to reach the same objective. The objective is to deliver best products and services to customers.

As a local 3PL company, PT XYZ have challenge for a number of reasons. The challenge is the result of various pressures from many stakeholders. Besides wanting to increase their sales and manage their operations, the company has to meet high targets from external stakeholders. Furthermore, the unexpected market demand, manual dependent system, and a large number of individual items that have to be maintained in a limited storage capacity increase the complexity of its operations.

1.2. Problem Exploration

The operation of PT XYZ as a 3PL company is closely linked with collaborating company or usually called as principals. Principals itself refer to a manufacturer company who produce certain product or goods. Further, the 3PL such as PT XYZ will be responsible for the distribution of the principal's product in certain range of area. The product manage by PT XYZ are categorized into two types of namely non-food and food which store in different area. The product itself ranges from milk, various drinks, chocolate, snack, candy, skincare, insect repellent, air freshener, and more.



Figure 1.1. Warehouse Condition

The operations of a 3PL company are closely tied to the existence of a warehouse. The PT XYZ's warehouse uses pallet storage, specifically block stacking or floor storage. For order picking activities, it applies piece picking or broken case picking methods. For product identification, it utilizes stock cards that contain various details related to each product. The information recorded on the stock cards includes the product name, expiration date, stock quantity, and product movement history. Figure 1.1 and 1.2 illustrates the current condition of PT XYZ's warehouse.

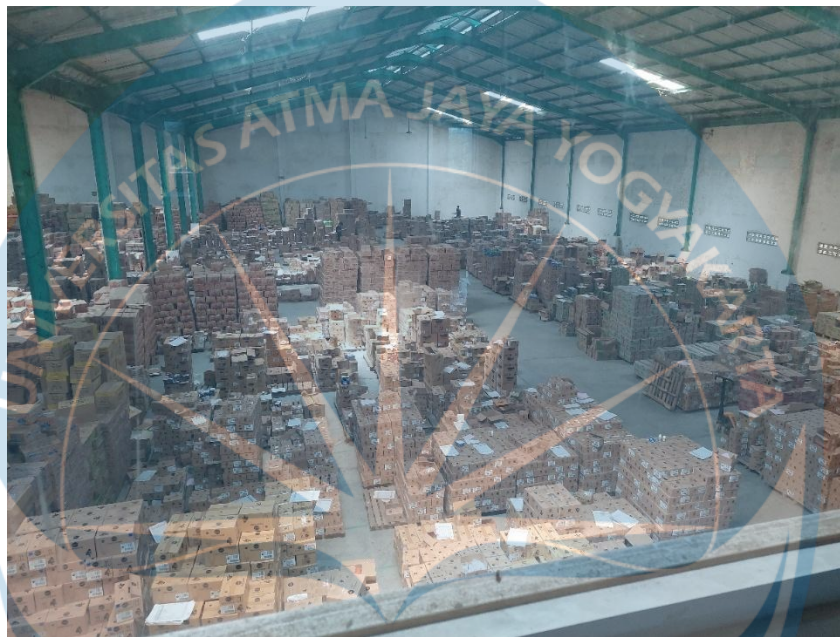


Figure 1.2. Warehouse Condition from Above

The operations of a third-party logistics (3PL) company require close collaboration among multiple roles, which often leads to operational challenges that affect warehouse activities. Figure 1.3 presents the overall process of PT XYZ in a SIPOC diagram. This diagram outlines the key processes, starting from stock planning, inbound and receiving, order management, order processing, transportation and distribution, sales realization and reporting, and ending with payment finalization and order closing. In addition, it highlights the suppliers, inputs, outputs, and customers associated with each process.

SIPOC DIAGRAM				
SUPPLIERS	INPUTS	PROCESS	OUTPUTS	CUSTOMERS
Principal sales team	Past sales and sales forecast	Stock Planning	Stock plan and replenishment request	Principal companies
Principal companies	Inbound stock shipments	Inbound and Receiving	Update stock records	Warehouse administration staff
Principal sales team	Customer purchase orders	Order Management	Validated order in Invoice	Warehouse staff
Warehouse staff	Invoice data	Order Processing	Packed orders	Delivery staff (Dropper and Driver)
Delivery staff (Dropper and Driver)	Packed Order and Delivery Document	Transportation and Distribution	Order delivered to destination	Retailers
Delivery staff (Dropper and Driver)	Delivery confirmation documents	Sales Realization and Reporting	Finished delivery report	Finance
Warehouse administration staff and principal sales	Invoices	Payment Finalization and Order Closing	Closed transaction & payment reconciliation	Principal Companies and Finance

Figure 1.3. SIPOC Diagram

To gain a clearer understanding of the potential issues that may arise in a 3PL warehouse, Figure 1.4 illustrates the business process of PT XYZ, emphasizing the interactions and workflows between different roles within the organization. The illustrated process is limited to warehouse activities, which, based on the SIPOC diagram, only cover order processing as well as sales realization and reporting.

All 3PL operations at PT XYZ begin with an order created by the salesperson. This order is then documented in a *faktur* (Invoice), which is a sales invoice issued by the seller to the buyer. At PT XYZ, invoices are generated based on different *principals* (or product suppliers/brands). As a result, a single store may receive multiple invoices if it places orders with more than one brand. Once generated, these invoices are sent to the warehouse for order preparation. Upon acceptance, the warehouse staff checks each invoice and organizes them according to delivery routes, which are determined based on the store's location. Following this, the warehouse drafter staff prepares a "by nota" draft along with a picking list.

The "by nota" serves as a reference for the warehouse *faktur* checker to compile invoices according to each store. Meanwhile, the picking list guides the warehouse helper staff in retrieving the correct items for each order. At PT XYZ, warehouse helpers are assigned based on specific brands. Once a helper completes the picking process according to the picking list, the selected products are moved to the packing area. In this area, the warehouse checking staff carefully packs the items into boxes, organizing them according to the individual store orders as specified in each invoice.

Once the orders are packed, they are loaded onto the delivery truck with the assistance of the dropping staff. The dropping staff are 3PL employees responsible for accompanying the driver and ensuring that the orders are delivered accurately and safely to each store. After the delivery is completed, the return invoice is returned to the warehouse. The warehouse *faktur* checker staff then reviews the return invoice and checks for any missing or excess items, which may have resulted from packing errors. Following this verification, the warehouse drafter staff prepares a sales realization report, which summarizes the completed deliveries and any adjustments. This report is then forwarded to the accounting department, which uses it to generate an invoice bill. The invoice is then handed over to the sales team, who are responsible for collecting payment from the stores.

Based on observations and interviews with stakeholders, two main issues have been identified within the system described above. The first issue is related to the excessive overtime within the warehouse activities. While the second issue is related to the rejected order by stores. Those two issue is obtained based on interview with the related stakeholders as well as observations. The detailed

condition and data related to the issue is also collected and is describe in the following paragraph.

1.2.1. Warehouse Employee Overtime

The first issue concerns the excessive overtime of the warehouse staff. This problem initially arises through complaints from the staff, who reported having to work overtime nearly every day (6 working day). Later regarding this issue, the depot head also confirmed that the frequency of overtime at PT XYZ, particularly among warehouse staff, is quite high. During the interview, the depot head noted that excessive overtime not only affects employees but also poses a concern for the company. Specifically, it increases labour costs, placing a financial burden on the organization. The interview was conducted with the depot head, rather than representatives from the HR or finance departments. It is because all payroll and compensation calculations are handled centrally by PT XYZ's headquarters in Solo, Central Java with a confirmation by the depot head.

Upon identifying the issue and confirmed by the depot head, then the overtime records were reviewed to support the claims. Overtime data was collected over a one-week period, from 19 May to 24 May 2025, as illustrated in Figure 1.5. The chart below presents the total accumulated overtime hours for all warehouse employees during that week.

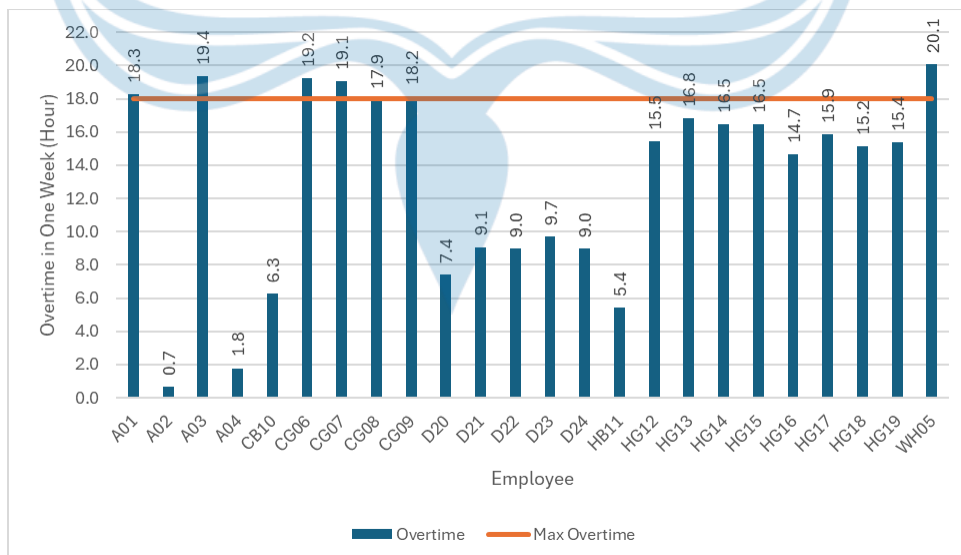


Figure 1.5. Warehouse Employee Overtime Frequency in One Week (Hours)

The identification codes used in Figure 1.5 were used to represent the roles and responsibilities of each warehouse staff member. The letter prefix in each code indicates the job function, where A refers to Administration staff, C represents Checkers, H denotes Helpers, D stands for Droppers, and WH is assigned to the Warehouse Head. For certain roles, an additional letter is included to specify responsibility for item condition, with G indicating Good Items and B indicating Bad Items. The numerical value that follows is simply a unique identifier to differentiate individuals within the same category.

Based on the chart in Figure 1.5, it is observed that all 24 warehouse employees recorded varying amounts of overtime. In general, a majority of employees show consistently high overtime frequencies, typically ranging from 17 to 20 hours. In contrast, other employees recorded substantially lower overtime, with totals around 5 hours or less. Notably, the data reveals that 6 out of the 24 employees exceeded 18 hours of overtime within the one-week period. The data also reveals that another 4 employees nearly reach 18 hours of overtime within one week period. This finding is concerning, as it does not comply with Indonesian labour regulations, which stipulate a maximum of 18 hours of overtime per week and no more than 3 hours per day.

The data in Figure 1.5 presents the total overtime per week for each warehouse employee, which was obtained from the clock-in and clock-out records. From the same dataset, the average daily working hours of employees can also be calculated, as working hours are directly related to the overtime rate. To keep overtime below 18 hours per week, an employee should not work more than 11 hours per day.

Based on the analysis, the average working hours for all warehouse employees is 10.20 hours per day, which is still safely below the maximum limit. However, the overtime data in Figure 1.5 also reveals that several employees exceed the 18 hour overtime threshold. This indicates that these employees must also be working more than 11 hours per day. Further calculation shows that, for this critical group, the average daily working hours reach 11.17 hours, which clearly surpasses the safe threshold.

In relation to the overtime issue, many warehouse employees reported dissatisfaction with having to complete their tasks late at night and then return early the following morning for the next shift. Although staff members receive overtime

compensation, they still perceive the practice as problematic. Further interview with the warehouse staff revealed that continuous overtime negatively affects employee performance, particularly among helpers and order checkers. Several employees were observed to show reduced physical readiness, such as dozing off during working hours and committing more frequent errors in their tasks.

Interviews with the warehouse staff revealed several insights. For the administrative staff, although their overtime hours are relatively high, the impact is not as significant compared to the checkers and helpers, as their tasks do not require physical labour. The data also show considerable variation among administrative staff overtime hours. This variation occurs because some administrative personnel with lower overtime are not directly involved in the order fulfilment process; instead, they handle other warehouse-related tasks such as managing rejected items. Similarly, the warehouse head, despite having the highest recorded overtime, reported that the extended hours do not significantly affect their physical condition, since their primary responsibility is monitoring rather than performing physically demanding tasks.

During the exploration of this issue, it was found that although warehouse staff are experiencing excessive overtime, several of them also face long waiting times while completing their tasks. In Figure 1.4. that shows PT XYZ business process, the majority of tasks in warehouse operations follow a continuous, sequential process. In order to perform their duties, staff often have to wait for the completion of preceding tasks. The detail situation is described in the following paragraph.

The order preparation process at PT XYZ is divided into two main activities: picking, carried out by the helper staff, and packing, handled by the order checker, as illustrated in Figure 1.4. In this process, the helper receives a picking list document that contains a list of products categorized by their delivery destination, typically grouped by subdistrict (Kecamatan). Once the items are picked, the order checker is responsible for packing the products. This involves consolidating items from various brands into a single package for each store.

In this packing case, order checkers must wait for all picking activities across different brands and destinations to be completed before they can begin their tasks. Since a single store order often includes products from multiple brands, the packing process cannot start until all relevant items have been picked and delivered to the packing area. This dependency creates unavoidable delays in the workflow,

leaving order checkers idle for extended periods. As a result, order checkers are often forced to begin packing late in the day, which extends their working hours well beyond the regular shift.

There is also a waiting time issue involving the dropper and driver during the order loading process. Before loading can begin, both the dropper and driver must wait for two separate requirements to be fulfilled. First, the invoice checking process must be completed for the orders delivered earlier that day. This step ensures that all delivered items are properly recorded, and any returned goods are documented. Separately, the dropper and driver also have to wait for the current day's packing process to be completed or at least partially completed, as only then can the new orders be loaded onto the vehicle for delivery the following day.

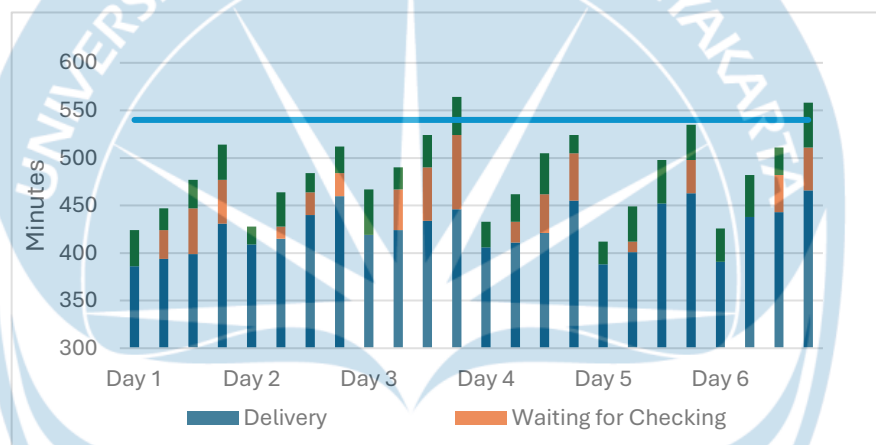


Figure 1.6. Dropper Waiting for Invoice Checking

After identifying the issue and confirming it with the dropper staff, waiting time records were documented to support the findings. The data was collected over a one-week period, from 26 May to 2 June 2025. Figure 1.6 illustrates four different trucks in one day, with each truck represented by one bar. The chart presents the duration of delivery activities carried out by the dropper and driver, the time spent waiting for invoice checking, and the invoice checking process itself. This information highlights how long the dropper must wait before proceeding with the loading activities.

Based on the recorded data, the average waiting time reached approximately 58 minutes, with the longest recorded duration extending to nearly 2 hours. Additionally, it was found that several case where invoice checking processes were completed after normal working hours, specifically past 5 p.m. This finding supports

the data presented in Figure 1.5, further confirming that overtime is a recurring issue under the current operating conditions. However, it is important to note that this waiting data only captures a portion of the overall waiting issue, as the dropper must also wait for the completion of the packing process before loading can begin.

The two cases described above represent only the longest waiting periods within the overall warehouse operations. In addition to these, the order preparation process itself can only begin once the necessary document (picking list and the draft "by nota") are fully generated by the administrative team. Any delays in document preparation further postpone the start of warehouse activities. Moreover, contributing to the issue of excessive overtime, warehouse staff are also responsible for unloading incoming goods. However, due to the priority placed on completing customer orders during regular working hours, unloading activities are typically postponed until after the order loading process is finished. As a result, the unloading or replenishment tasks are often carried out late at night, extending the staff's work hours even further.

Shifting the focus to external stakeholders, the issue creates discomfort for brand representatives, particularly the salespersons. For the salesperson, this issue creates complications in handling direct ordering activities. In a third-party logistics (3PL) company like PT XYZ, aside from the company's standard order delivery to stores, salespersons are given the option to directly deliver orders themselves. This direct ordering method is typically used for special situations such as promotional events or business-to-customer (B2C) transactions. In these cases, the salesperson initiates the process by requesting an invoice directly from the drafter. Once the invoice is prepared, the warehouse team proceeds with the order fulfilment. Here the helper staff prepares the items, and the order checker verifies them for accuracy and completeness.

This direct order process is typically carried out by salespersons in the afternoon, after completing their sales activities. Under ideal conditions, the salesperson can collect the prepared order on the same afternoon and deliver it the following day. Since salespersons are not required to check in at the office each morning, they usually begin their workday in the field. However, they do visit the office in the afternoon to submit payments and coordinate with relevant departments.

When the warehouse staff are already overwhelmed with a high volume of regular orders and delayed operational processes, direct orders are often deprioritized. As

a result, warehouse staff frequently ask salespersons to postpone the process until early the next morning. This creates a disruption in the salespersons' workflow, limiting their ability to respond to urgent or time-sensitive customer needs. Ultimately, these delays can reduce customer satisfaction and hinder the responsiveness of PT XYZ's service for direct-order requests.

1.2.2. Rejected Item

The second issue is related to the rejected order by store. This problem initially surfaced through complaints from salespersons, who frequently questioned why their orders were not delivered or were rejected by the receiving stores. In response to these concerns, further exploration was conducted through observations and interviews with the dropper staff. The dropper statement revealed that undelivered or rejected orders were often the result of incorrect items being loaded onto the delivery trucks. These errors included wrong products, incorrect quantities, and in some cases, excess items that had not been ordered at all.

Tracing the issue back through the process, the incorrect deliveries is due to packing errors made by the order checker. Mistakes during the packing phase are common and include packing the wrong products, omitting items from the order, or including excess products that were not requested. These errors contribute to confusion during the order dropping process and often result in stores rejecting or refusing to accept the deliveries.

Further exploration reveals that the mistakes frequently begin at the picking stage. Helper staff are often found to make errors when preparing products listed in the picking list. These errors may involve selecting the wrong product, picking incorrect quantities, or including surplus items not specified in the order. These inaccuracies create considerable challenges for the order checkers during the packing and loading phases. When such discrepancies are discovered, checker staff are forced to go back and forth between the storage and packing areas to retrieve or return items and correct the order.

In many cases due to the picking error, order checkers end up performing additional picking tasks themselves, as they are ultimately responsible for verifying the accuracy of each order before it is sent out. In many cases, checker staff also fail to notice that the items prepared by the helper staff are incorrect. As a result,

these errors go undetected, and the wrong items are packed, loaded, and ultimately sent to the stores.

Based on the data from January 2 to January 17, 2025, showed a high number of rejected orders by store or incorrect items delivered to stores. Figure 1.7 illustrates the number of wrong items identified during deliveries over the 13-day period, highlighting the frequency of these errors. The data was obtained from invoice copies saved by the warehouse. It is important to note that this number only represents picking and packing errors that were delivered to stores. Errors made by helpers during the picking process, but corrected before delivery, could not be traced.

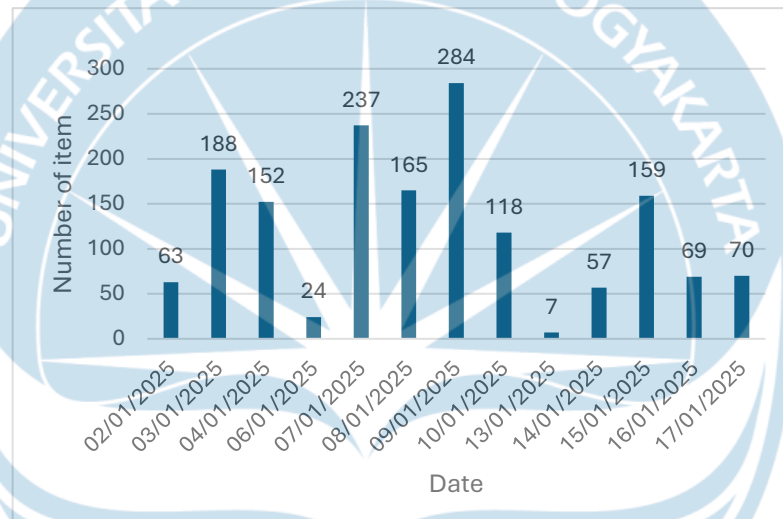


Figure 1.7. Number of Incorrect Item

The number of incorrect has resulted in lost sales, as the stores did not place orders for those specific products. Since these items cannot be sold or accepted by the store, they are returned to the warehouse causing revenue loss. The loss in sales recorded during the observation period is presented in the Table 1.1.

Table 1.1. Sales Impact of Incorrect Item over Two Weeks

Principals	Wrong Item	Loss Sales
B	109	Rp1,751,257
C	77	Rp938,336
G	1126	Rp8,871,993
M	107	Rp643,705
U	174	Rp1,867,450
Grand Total	1593	Rp14,072,741

Table 1.1 presents the loss in sales for each principal or brand over the 2 week observation period, amounting to a total of Rp 14,072,741. These sales were lost because the company was unable to fulfil the orders within the designated delivery timeframe. Additionally, the undelivered orders could not be rescheduled, as PT XYZ follows a fixed and routine shipment schedule, leaving no opportunity for late deliveries.

In addition to impacting warehouse staff, the second problems also have a clear negative effect on the stores. When orders are not fulfilled correctly, the stores do not receive the products they need, resulting in limited or even no stock on their shelves. This stock shortage directly leads to lost sales at the store level, as customers are unable to purchase the unavailable items, ultimately affecting overall customer satisfaction and 3PL service level. PT XYZ not only distributes products to small retail stores but also supplies larger stores and supermarkets. These larger clients often implement service level agreements that set clear expectations for delivery accuracy and timeliness. When the 3PL fails to meet these service levels, as a result, supermarkets and larger stores may choose to reduce their order volumes.

Furthermore, since a 3PL company operates as an outsourced partner for multiple brands, issues such as lost sales and low service levels can lead to client dissatisfaction. In some cases, this may even prompt principals to reconsider or terminate their partnerships with the 3PL provider. From the principal's perspective, these operational problems also create additional challenges for their sales personnel. To meet their sales targets, sales staff are often forced to personally deliver orders that were not fulfilled by the 3PL. Additionally, they must reprocess and reorder items that were undelivered and are now considered expired in the system. However, this reordering can only be done during the next scheduled visit to the store, as the sales team follows a fixed visitation schedule.

1.2.3. Identification of the Problem Focus

Based on the description above it is clear that the two issues identified cause problem for several stakeholders. The stakeholders include PT XYZ as 3PL company, warehouse staff, store owner, as well as the principals or brands. Following a discussion with the Klaten branch head, it was decided that the primary focus would be on the first issue. The branch head selected this issue because it has the most widespread and measurable impact across the facilities. Another

reason to the decision is the because the first issue is still related to the second issue.

The first issue of excessive overtime and the second issue of incorrect items are closely related through the involvement of the same warehouse actors and processes. Overtime mainly occurs during order fulfilment activities such as picking, checking, and packing. These are also the very activities where incorrect item errors most frequently appear. For example, helpers who are responsible for picking rely on checkers to verify the accuracy of items before packing and loading. In other cases, checkers end up performing double work, not only verifying but also correcting errors from helpers. This overlap of responsibilities shows that the two problems are interconnected. Therefore, focusing on reducing overtime through process improvement is considered a strategic choice, as it will also indirectly address the issue of incorrect items.

Then, based on interviews with the depot head, there is a strong emphasis on the need to reduce the amount of overtime experienced by warehouse staff. The depot head emphasizes the need to reduce the overtime to the minimum to follow the current regulations. Based on *Peraturan Pemerintah (PP)* Number 35, 2021, the maximum allowed overtime is 18 hours a week. But also, with a limitation of a maximum of 3 hours per day. The critical success factor for this research is established in alignment with government labour regulations and has been approved by the depot head. The critical success factor is determined to be no employee exceed the 11 hours working hour per day. The threshold of 11 working hours per day is derived directly from labour regulations governing maximum overtime. According to the rule, employees are permitted to work maximum of 3 hours overtime. And with additional 8 normal working hours, then results in a legal limit of 11 hours per day.

1.3. Problem Statement

The core problem identified at PT XYZ is the excessive overtime of warehouse staff, which exceeds legal limits and is driven by prolonged working hours. This situation has resulted in increased labour costs for the company, a decline in employee performance, and delays in fulfilling urgent sales orders requested by the sales team.

1.4. Research Objectives

The objective of this study is to design a warehouse system to reduce excessive overtime. The critical success factor is to ensure that daily working hours do not exceed 11, which corresponds to the legal maximum of 18 hours overtime per week.

1.5. Scope of Limitations

The limitations of the design problem in this research are:

- a. The design solely focuses on the warehouse operation at PT XYZ.
- b. It is not possible for adding resource or facilities such as manpower, shelving or material handling for the proposed solutions or improvements.

