CHAPTER 1
INTRODUCTION

1.1 Background

Inventory management is a crucial aspect of a company's operational system, especially for companies that rely on a continuous supply of raw materials. However, there are two major issues frequently encountered in inventory management: overstock and stockout. Overstock refers to a condition where the quantity of goods stored exceeds the actual capacity needed to meet consumer demand within a specific period. Click or tap here to enter text. Overstock can lead to increased storage costs in the warehouse, the risk of product damage, and a decline in operational efficiency and profitability for the company Asdecker et al. (2). Overstock is a condition where the quantity of goods stored exceeds the actual capacity needed to meet consumer demand within a specific period. Overstock can lead to increased storage costs in warehouses, the risk of product damage, and a decline in operational efficiency and profitability for the company Asdecker et al. (2022). According to the World Bank (2022), inventory inefficiencies can account for 35–40% of losses among small and medium-sized enterprises across various regions in Southeast Asia, underscoring the importance of effective inventory management strategies. On the other hand, a stockout is a situation in which demand for a product increases to the point where it exceeds the available supply in the warehouse, making it impossible to meet consumer demand Kumar et al. (2023). In the context of production, a stockout occurs when the supply of raw materials is insufficient to meet production needs, leading to overall production delays, increased costs due to emergency orders, reduced efficiency, and financial losses resulting from unmet market demand.

CV Andita Swarga Mahakarya is a company engaged in the processing of herbal cigarettes, established in 2016 in Magelang, Central Java. The company offers four types of herbal cigarette products: Assikha Gold, Assikha Habbat, CK, and Tani Madjoe. In its operations, the company not only stores goods but also performs further processing before products are ready for distribution. Based on observations and interviews with stakeholders—including the owner, warehouse staff, and cashiers—it was found that two major issues exist within the company: overstock and stockout. The overstock issue is evident from the accumulation of goods in the warehouse area due to the imbalance between incoming goods and storage capacity and sales demand. This situation results in increasingly limited warehouse space, restricted movement of goods in and out, and

a higher risk of product damage. On the other hand, stockouts still occur for certain products because consumer demand is not always balanced with available inventory.

This issue indicates an imbalance between supply, warehouse capacity, and demand. If this situation persists, the company risks facing increased storage costs, inventory buildup that disrupts operational activities, and difficulties in meeting demand for certain product types. Therefore, improvements are needed in inventory management and warehouse layout to better control stored goods. This study was conducted to help the company gradually reduce overstock levels without neglecting the inventory levels still needed to prevent stockouts.

1.2 Problem Exploration

To gain a comprehensive understanding of the challenges currently facing the company, in-depth interviews were conducted with a number of internal and external stakeholders of CV Andita Swarga Mahakarya. The results of these interviews are summarized in Table 1.1.

Table 1.1 Results of Stakeholder Interviews

Stakeholder	Category	Statement	Implications
Owner	Internal	The fermentation capacity can only process approximately 3 cartons per batch within 3 hours, with a 24-hour operating cycle (168 cartons per week). Meanwhile, the supply from the factory can reach 25–75 cartons per week.	There is a buildup of inventory and a production backlog of 72–192 cartons per week.
Inventory Staff	Internal	The warehouse has a capacity of only 200 cartons. With a Monday shipment of 110 cartons of TM products, 5 cartons of Habbat products, and 10 cartons of Gold products, and a Thursday shipment of 100–150 cartons (twice a week), the warehouse will fill up very quickly. However, at the beginning of the year, the warehouse is nearly empty.	The risk of overstocking when supplies are flowing smoothly, and the risk of stockouts when supplies run out
Cashier	Internal	Demand increases by 1.5 to 2 times during Ramadan and Eid al-Fitr, but it often goes unmet due to delays in the production process and instability in the available supply.	Customers are not being served optimally; this increases the risk of lost sales opportunities.
Supplier (Malang Factory)	Eksternal	Distribution at the beginning of the year is often hampered by excise stamp regulations, causing a temporary halt in supply. However, suppliers still expect large and steady orders.	There is supply uncertainty due to a mismatch between the capacity of the warehouse in Magelang and the suppliers' expectations.
Consumers	Eksternal	Products can be hard to find during certain periods (stockouts), while during other periods there is an oversupply of products.	Consumers are disappointed and are considering switching to a competitor's product.

Based on interviews conducted with stakeholders, it was found that the company experiences an overstock of approximately 25–75 cartons per week. This situation arises due to conflicting interests among stakeholders regarding inventory management, which results in an imbalance between supply, capacity, and demand. Given these conditions, this study sets a target to reduce overstock by 15 cartons per week from the total overstock of approximately 25–75 cartons per week. This target is roughly equivalent to 20% of the total weekly overstock. This figure was chosen as a realistic initial improvement target because the study does not aim to eliminate overstock by 100% immediately. Eliminating all overstock is considered impractical because the company still needs inventory to meet demand and avoid stockouts. The setting of this target is also supported by the research by Meilani et al. (2024), which discusses proposed inventory policies to minimize overstock using ABC Analysis and the Newsvendor Model. The results of this study indicate that the proposed inventory policy was able to reduce inventory levels by 20.4% and lower total inventory costs by 10.8%. These findings suggest that a 20% reduction in inventory can serve as a realistic improvement target in efforts to reduce overstock. Therefore, the overstock reduction target of 15 cartons per week or 20% in this study can be considered feasible because it is gradual, does not disrupt stock availability, and still has an impact on reducing the accumulation of goods in the warehouse.

Goods received from the Malang factory and stored in the warehouse before being shipped to customers are available in several sales levels, such as bales, slove, and packages. The differences in units at each level require clear unit conversion standards to maintain the accuracy of warehouse storage capacity calculations. The product unit conversion reference at CV Andita Swarga Mahakarya is as follows.

There is a carton unit, which serves as the primary shipping container and is only received from the Malang factory to the Magelang warehouse. Each carton contains 4 bales; these bales are stored in the warehouse after being removed from the cartons. Each bale contains 20 slabs; these slabs are the intermediate packaging units used as the standard sales unit for customers. Each slove contains 10 packages, and the package is also an intermediate packaging unit commonly used as the standard sales unit for customers.

The interrelationships among stakeholders that have the potential to cause conflict are illustrated more explicitly in Figure 1.1, which shows that the core of the problem faced by CV Andita Swarga Mahakarya centres on the imbalance between the volume of

supplies from the Malang factory and the storage capacity of the warehouse in Magelang.

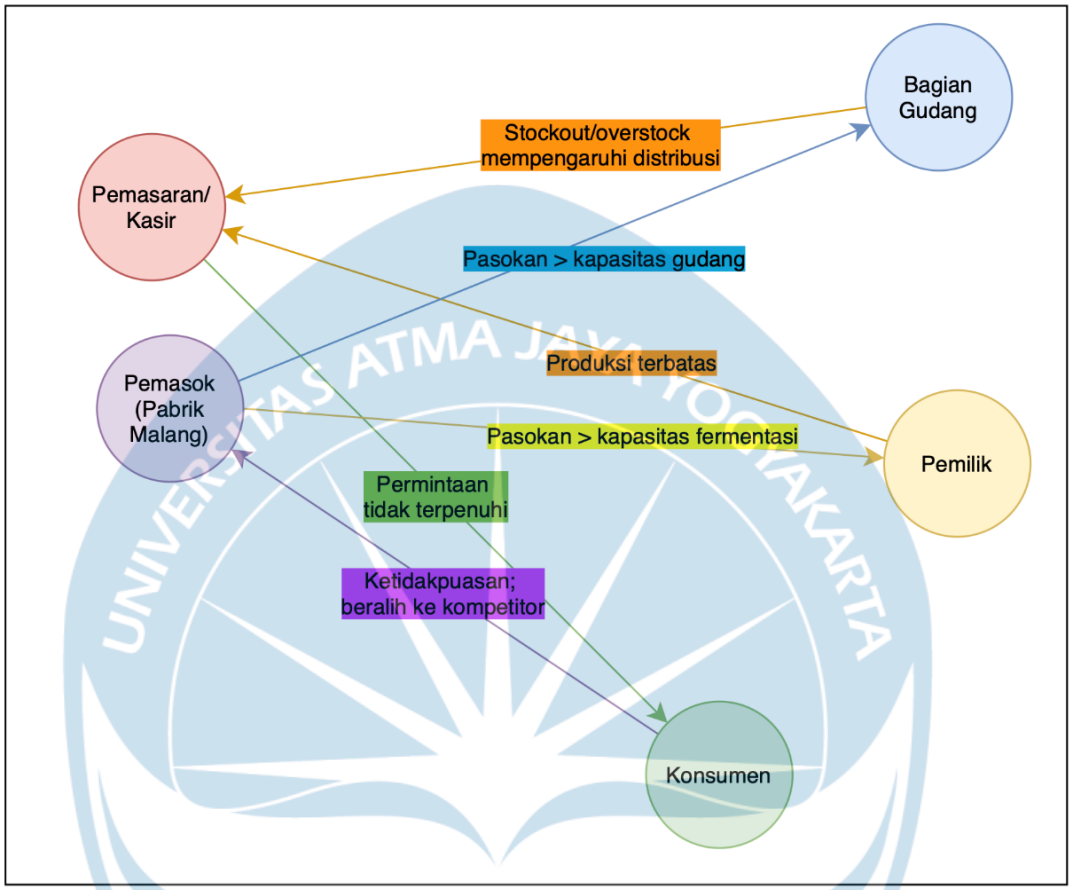


Figure 1. 1 Conflicts of Interest Among Stakeholders

As shown in Figure 1.1 above, the warehouse can only hold approximately 200 cartons, while the supply from the Malang factory can reach 225–275 cartons per week. Consequently, there is a supply gap of 25–75 cartons per week that cannot be adequately accommodated, leading to overstocking. This problem is exacerbated by the fermentation capacity, which can only process 168 cartons per week. This causes a backlog of products that cannot be processed optimally, resulting in products being held up longer in the storage area, which worsens the overstock conditions in the storage area and further exacerbates the overstock situation in the warehouse.

The problem is further compounded by the limited fermentation capacity. Regarding fermentation capacity, the process is conducted at a rate of 3 cartons per batch (3-hour duration). With an effective operating time of 24 hours, only 8 batches can be processed per day (24 cartons per day or 168 cartons per week). Meanwhile, supply reaches 240–

360 cartons per week. This situation creates a backlog of 72–192 cartons per week that cannot be processed immediately, thereby reducing product quality and delaying distribution. Goods enter the warehouse via several routes from various distribution locations. TM and Habbat products shipped from the Malang factory are sent directly to the warehouse in Magelang using box trucks. On Mondays, the shipment volume for TM and Habbat products is approximately 110 cartons, while on Thursdays, the shipment volume ranges from 100 to 150 cartons. Gold and CK products are shipped directly from Yogyakarta to the Magelang warehouse via Grand Max Box vehicles, with a volume of 10 cartons for Gold products and 5 cartons for CK products on Mondays. The high volume of incoming shipments from suppliers within a specific timeframe often results in the warehouse's capacity being insufficient to optimally accommodate all incoming products.

In addition to causing stockpiles in storage areas, delays in the fermentation process also risk a decline in product quality. Tobacco products stored at normal room temperature prior to fermentation do not experience a decline in quality; however, if stored in an area that is too humid, the products will deteriorate—for example, they may develop mold, which can lead to a loss of aroma, colour changes, and altered taste, thereby reducing the product's overall flavour. Additionally, the company has a storage time limit of 5–7 days after fermentation; if this limit is exceeded, the product may fail to meet the quality standards set by the company and risk being unsuitable for distribution, which could result in losses for the company due to unsellable inventory. Early in the year, supplies from the factory were halted due to regulations on the distribution of tax stamps, causing the warehouse to run out of stock.

This situation was exacerbated by significant fluctuations in market demand; under normal conditions, demand is only around 960,000 sticks per month. During Ramadan and Eid al-Fitr, there was a massive surge in demand following the holiday period; however, this surge could not be met in a timely manner due to production constraints, resulting in the warehouse running out of stock and missing out on sales opportunities.

Goods are shipped from the warehouse in several sales units, namely bales, slops, and packages. Finished products that have undergone several storage and fermentation processes are redistributed according to consumer demand.

To map the relationships and interactions between these parties in a more structured manner, the business process of CV Andita Swarga Mahakarya is illustrated in the flowchart in Figure 1.2. The business process begins when consumers place an order. The cashier then receives and records the order, and forwards it to warehouse staff. The

warehouse staff then checks product availability. If the desired product is available in the warehouse, the staff will retrieve the product according to the order. However, if the product is out of stock, the staff will notify the owner to immediately place an order with the supplier. Once the product is ready, the cashier will receive the product in the form of a bundle, print the order information, confirm the order with the customer, and print an invoice as proof of the transaction. The complete business process flow can be seen in Figure 1.2.

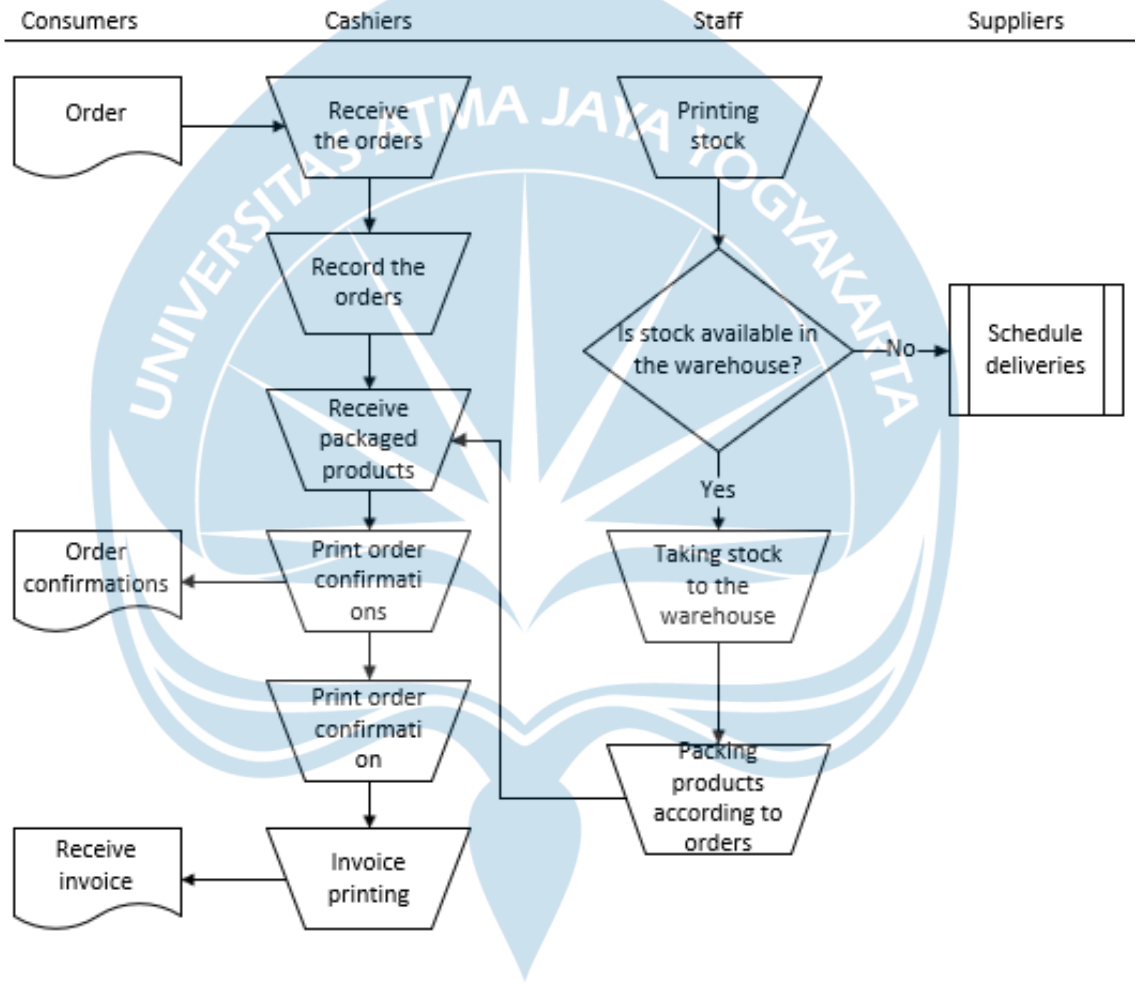


Figure 1. 2 Business Process Mapping

1.3 Research Question

Based on the background and problem exploration outlined above, the research question for this final project is: How can a solution be designed to address the problem of excess Work-in-Process inventory amounting to 75 cartons per week at CV Andita Swarga Mahakarya?

1.4 Research Objective

Based on the research question established, this study aims to design an integrative solution to address the problem of finished goods overstock at CV Andita Swarga Mahakarya in order to reduce the excess stock by 15 cartons per week from the current 75 cartons.

1.5 Scope of Study

The scope of this study is as follows:

a. The study will focus solely on analyzing the causes of excess work-in-process inventory for cigarettes.

b. The data used will consist of actual historical sales data from the past 24 months.