CHAPTER I
INTRODUCTION

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

1.1 Background

Within organizations, especially in the manufacturing sector, supply chain integrates functions such as new product development, marketing, operations, distribution, finance, and customer service, which work together to ensure that consumer demands are effectively met (Chopra, 2013; Rodríguez-Martín & Yaman, 2022). Among these aspects, distribution is one of the most crucial because it directly affects the overall performance of the supply chain (Kazmi & Ahmed, 2022). Globally, distribution efficiency plays an important role in enhancing a company's competitiveness, reducing logistics costs, and ensuring the availability of timely and high-quality products across various markets (Hamid et al., 2024). In the apparel retail industry, for example, distribution activities can account for around 35% of total revenue (Chopra, 2013). Meanwhile, in Indonesia, distribution challenges remain significant due to geographical factors and uneven infrastructure, resulting in national logistics costs reaching around 24% of the Gross Domestic Product (SastroAtmodjo et al., 2022).

According to Kotler et al. (2013), as cited in (Shaqina, 2023), the distribution process consists of a series of activities and organizations that ensure products are available in the right place, at the right time, and in good condition for purchase or use. Effective distribution occurs when product availability aligns with consumer needs, data and resource utilization during product movement are optimized, distribution channels match the target market, and market share increases through broad and efficient distribution (Wahyudi, 2025). However, many companies face difficulties in achieving this due to challenges such as

delivery scheduling and route planning, which arise from variations such as customer locations and fleet limitations (Chen et al., 2023).

Companies implement various field marketing strategies to reach customers directly and expand market coverage in competitive markets (Kotler & Keller, 2016). One of the common forms of personal selling involves direct visits by sales personnel to customers often referred to in practice as canvassing (Royan, 2013). As a field marketing activity, canvassing aims to generate demand, increase sales opportunities, and strengthen long-term relationships through direct interaction with customers (Kotler & Armstrong, 2018). In some canvassing practices, sales personnel conduct direct selling by carrying product inventory in their vehicles, allowing transactions to be completed at the customer's location. In distribution practice, this approach is known as the van sales or mobile selling system (Rushton et al., 2022).

CV Anugrah Semata Wayang 67 operates as a distribution company in the food and beverage sector using a canvassing system. The company's head office is located in Padang City, and its warehouse operates at Jalan By Pass KM 20, Batipuah Panjang, Koto Tangah District, with working hours for the delivery process from 09:00 to 16:30 WIB. The company deploys three sales teams to carry out its operational activities. Each sales team consists of one driver and one salesperson, and the composition of the driver and salesperson remains fixed within the same team to ensure coordination and operational efficiency.

The company's distribution area covers 11 cities/regencies in West Sumatra Province. To manage this wide service area, each sales team is assigned responsibility for two main working regions, where one working region may include more than one city or regency. The operational system follows a biweekly pattern, in which field activities are conducted alternately between designated working regions each week. The company organizes daily distribution from Monday to Saturday, with each day designated to serve a specific set of customers.

The allocation of sales teams and their respective working areas is presented in **Table 1.1**.

Table 1.1 Sales Territory Allocation

Team	Working Areas
Team 1	Padang, Solok Regency, South Solok Regency
Team 2	West Pasaman, Pasaman, Agam, Bukittinggi
Team 3	Dharmasraya, Sijunjung, Sawahlunto, Lima Puluh Kota

According to Supervisor of CV Anugrah Semata Wayang 67, Padang City serves as the company's main operational hub, while the Solok Regency and South Solok Regency generate the highest sales volume. These areas are handled by Team 1. The average weekly sales volume for the Padang area is 1,542 packs, representing a sales value of Rp16,769,561.54. Meanwhile, the average weekly sales volume for the Solok–South Solok area is 3,448 packs, amounting to a sales value of Rp34,789,138.46. Detailed information regarding the specific stores and their distributions across these clusters can be found in **Appendix B**. The spatial distribution of customer locations of team 1 is illustrated in **Figure 1.1**.

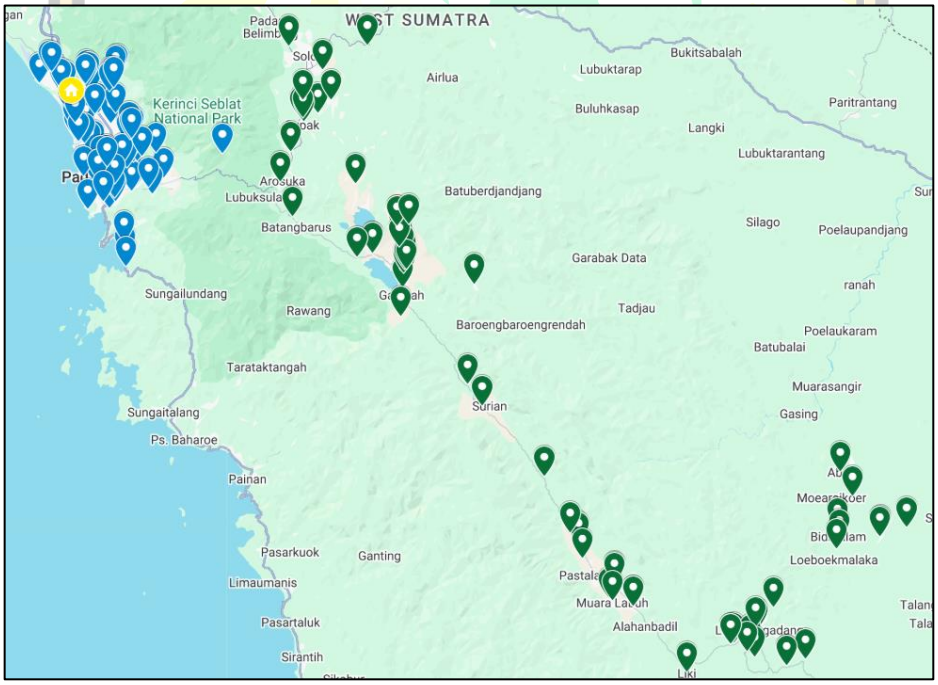

Figure 1.1 The Spatial Distribution of Customer Locations of Team 1

The distribution process begins at the warehouse, where products are loaded onto the vehicle by warehouse staff. The driver and salesperson then depart to visit customers. At each customer location, the salesperson offers the products to the customer. If a purchase occurs, the products are unloaded, payment is collected, and the transaction is recorded by the salesperson. If no purchase is made, the process continues to the next customer. The distribution process flow of CV Anugrah Semata Wayang 67 within Padang City is illustrated in **Figure 1.2**.

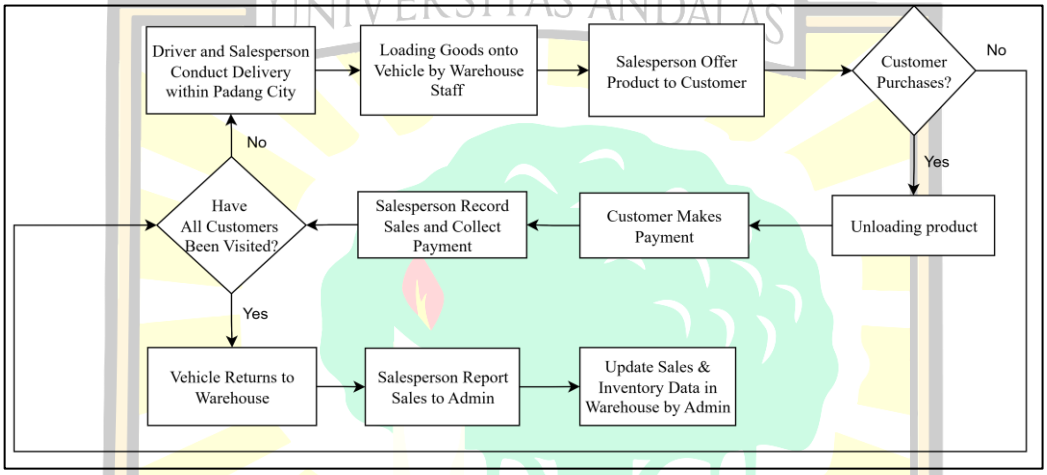

Figure 1.2 The Distribution Process Flow of CV Anugrah Semata Wayang 67 within Padang City

The distribution process in Solok and South Solok Regency follows a similar procedure. However, for the Solok and South Solok Regency route, product loading is conducted only once on Monday and the vehicle returns to the depot on Saturday. During the distribution period, the vehicle stays at an accommodation. Working hours and distribution activities in Solok and South Solok Regency are the same as those in Padang City. The distribution process flow of CV Anugrah Semata Wayang 67 within Solok and South Solok Regency is illustrated in **Figure 1.3**.

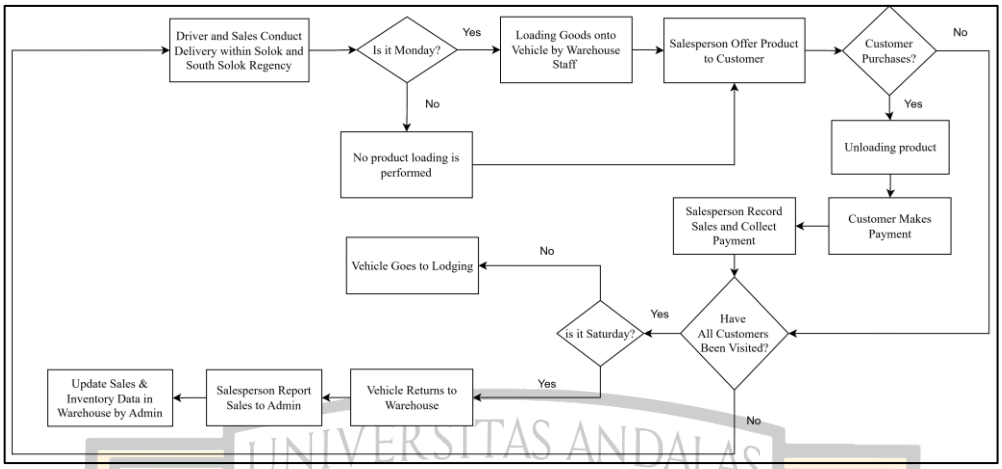

Figure 1.3 The Distribution Process Flow of CV Anugrah Semata Wayang 67 within Solok and South Solok Regency

Under the current operational setup, the salesperson's schedule is organized into daily delivery cycles, where each cluster represents a specific day of service. For instance, Cluster 1 corresponds to the delivery schedule for Day 1, Cluster 2 for Day 2, and so forth. Within this framework, the salesperson serves between 9 and 15 customers per day. These clusters are strategically formed based on geographical proximity to ensure that the daily workload remains manageable within established working hours. In districts with a high density of customers or expansive geographical areas such as Koto Tangah and Sangir the locations are subdivided into multiple clusters. This division allows the team to spread the workload across different days, staying within their daily service capacity. The spatial distribution of stores in each cluster is shown in the **Figure 1.4**.

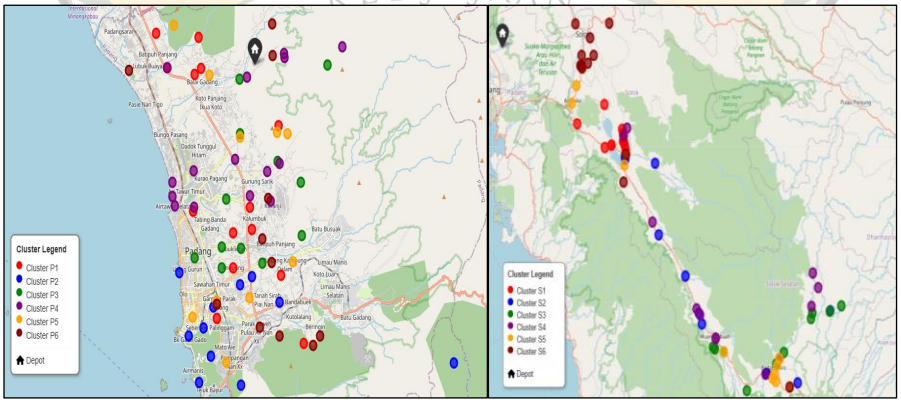

Figure 1.4 The Spatial Distribution of Stores in Each Cluster: Padang (left) and Solok and South Solok (right)

Based on interviews, the driver plans routes using a nearest-store approach, selecting each next stop based on its proximity to the previous one. Although this method appears efficient, in practice it often results in overlapping paths and revisiting previously covered areas. This leads to unnecessary detours, increasing both fuel consumption and travel time. An example of this case can be seen in the route in Padang, where the blue route represents the Cluster 2 route as shown in **Figure 1.5**.

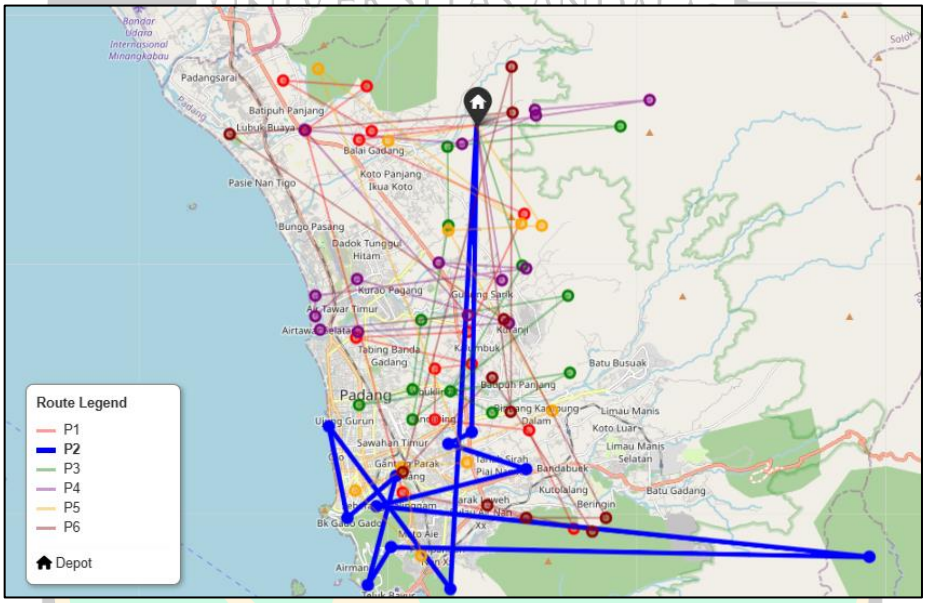

Figure 1.5 The Actual Route of Padang Area

The products distributed in Padang, Solok Regency, and South Solok Regency include Legenda Pia, Legenda Cookies, Legenda Gepeng, Maxis Gepeng, Potato Q, and Tobiko Gepeng. The products are sold in packs. The volume and weight of each product type are presented in **Table 1.2**.

Table 1.2 Volume & Weight per Product Type

No	Product	Volume/Pack (m^3)	Weight/Pack (kg)
1	Legenda Pia	0.002592	0.32
2	Legenda Cookies	0.002592	0.4
3	Legenda Gepeng	0.0023698	0.2
4	Maxis Gepeng	0.0035532	0.25
5	Potato Q	0.0069768	0.22
6	Tobiko Gepeng	0.0023698	0.2

Delivery activities are carried out by a single vehicle operated by the same delivery team for both the Padang and Solok-South Solok regions. However, the specific type of vehicle used differs depending on the distribution area being served. The driver is responsible for transporting the products, while the salesperson manages customer interactions and sales recording. Detailed vehicle specifications, including volume and weight capacities for each type, are presented in **Table 1.3**.

Table 1.3 Vehicle Capacity for CV Anugrah Semata Wayang 67 Distribution

No	Vehicle Type	Capacity		Number of Units
		Volume (m^3)	Weight (kg)	
1	Mitsubishi Colt Diesel FE 111 Ezry, 4 Wheels	10.003	3150	1
2	Mitsubishi Canter Colt Diesel FE 74 125 PS, 6 Wheels	16.745	4695	1
Total				2

(Source: Konsultan Mitsubishi (https://konsultan-mitsubishi.com))

The information presented in **Table 1.4** is important as it serves as the basis for calculating the vehicle carrying capacity. This carrying capacity influences the number of products that can be transported on each distribution route. However, daily sales volumes remain highly variable. This condition is evidenced by the historical sales data from August 2025, as shown in **Figure 1.6**.

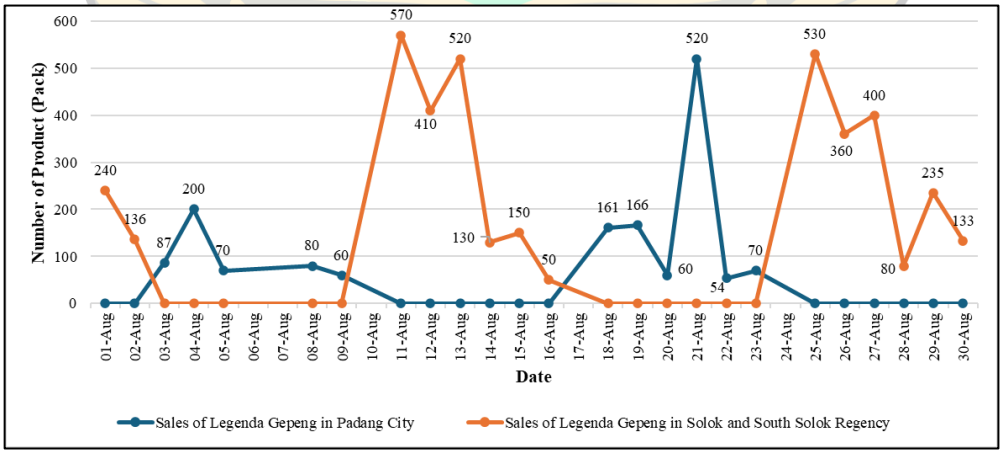

Figure 1.6 Daily Sales of Legenda Gepeng in August 2025
(Source: Historical Data of CV Anugrah Semata Wayang 67, 2025)

Based on **Figure 1.6**, product sales vary significantly from day to day, with noticeable fluctuations across different product types. This high variability indicates the need for a more systematic approach in determining the quantity of each product carried during canvassing activities, as the current loading decisions are largely based on estimation rather than structured planning. Carrying products in excess of actual demand increases the vehicle load and may lead to higher fuel consumption, although the impact is relatively small because the products are lightweight. Conversely, carrying insufficient quantities creates the risk of stock shortages during customer visits, which can result in lost sales opportunities and reduced revenue.

The vehicle operating in Padang was manufactured in 1980, indicating older diesel engine technology, whereas the vehicle for Solok and South Solok is a newer 2015 model. Although the products carried to both regions are the same and relatively light, the vehicle in Padang consumes approximately 6 km per liter, which is lower due to the age of the engine and less efficient technology. In contrast, the newer vehicle for Solok and South Solok achieves 8 km per liter because of improved engine performance and fuel efficiency despite the longer route. This pattern is consistent with research showing that older vehicles generally exhibit lower real-world fuel efficiency under similar load and road conditions (Collier et al., 2019; Mitsubishi, 2024). The Pertamina biodiesel price as of November 2025 was Rp6,800/liter. The detailed fuel consumption of both vehicles is presented in **Table 1.4**.

Table 1.4 Fuel Consumption Information per Week

No	Information	Vehicle	
		Mitsubishi Colt Diesel FE 111 Ezry, 4 Wheels (Padang)	**Mitsubishi Canter Colt Diesel FE 74 125 PS, 6 Wheels (Solok and South Solok)**
1	Biodiesel Price (Rp/Liter)	Rp6,800.00	Rp6,800.00
2	Fuel Consumption Rate (km/L)	6	8

Therefore, the company is advised to adopt a data-driven distribution planning approach to address three main operational needs: accurate demand estimation for canvassing distribution, the optimization of delivery schedules over a six-day planning horizon, and the determination of optimal delivery routes that minimize total travel distance and operational costs while respecting vehicle capacity and operational constraints. The implementation of this data-based routing and scheduling system is expected to improve distribution time efficiency, reduce fuel consumption, and enhance overall delivery effectiveness, without disrupting the company's existing operational schedule.

1.2 Problem Formulation

Based on the background described above, the problem formulation in this study is what are the reconfigured daily store visit schedules and delivery routes for each distribution area that minimize total travel cost under operational constraints?

1.3 Objectives

Based on the problem formulations described above, the objective of this study is to reconfigure the daily store visit schedules and delivery routes for each distribution area to minimize total travel cost under operational constraints.

1.4 Scopes of Problems

The scopes of the problem in this study are as follows:

1. The study is limited to distribution activities in Padang City, Solok Regency, and South Solok Regency, which are treated as an integrated service area due to their shared use of limited operational resources, particularly drivers and sales personnel as Team 1.

2. The number of stores served has been predetermined.
3. Each store is visited only once in one distribution route.

The assumptions of this study are as follows:

1. The fleet operates at a constant average speed of approximately 40 km/h for Padang and 60 km/h for Solok-South Solok.
2. Traffic jams are ignored.
3. Customer demand is known based on the results of forecasting.
4. During delivery, all stores are assumed to be open (none are closed).
5. During delivery, all stores are assumed to place orders for the products.
6. Service time at each customer location is assumed to be constant.
7. The demand is treated as deterministic rather than stochastic, as the quantity of products to be distributed is predefined by forecasting data, ignoring potential real-time fluctuations during the execution of the route.

1.5 Outline of The Report

This final project report is presented using the following chapters.

CHAPTER I INTRODUCTION

This chapter presents the background, problem formulation, research objectives, scope of the study, and the outline of this final report.

CHAPTER II LITERATURE REVIEW

This chapter provides a review of relevant literature, including theses, journals, and books related to the research topic.

CHAPTER III RESEARCH METHODOLOGY

This chapter contains problem formulation, and methodologies of the thesis to solve the problem.

CHAPTER IV MATHEMATICAL MODEL AND RESULT

This chapter contains mathematical model and result obtain in determining the route of distribution product at CV Anugrah Semata Wayang 67.

CHAPTER V ANALYSIS

This chapter contains the analysis of the data processing that has been conducted.

CHAPTER VI CONCLUSION

This chapter presents the conclusions drawn from the conducted.