

Chapter 1

Introduction

1.1 Background

The retail industry plays a significant role in the economy by facilitating consumers' access to a growing variety of products and services. One of the most common forms of retail is brick-and-mortar retail (BMR), where transactions occur in physical stores and consumers interact directly with products and sales personnel (Saccomanno et al., 2025). Even with the rapid expansion of e-commerce, physical retail stores continue to play an important role. This is especially true in the fashion industry, where consumers often prefer to examine products in person before making purchasing decisions (Zhang et al., 2021).

PT Mega Perintis, through one of its brands called Salezone, operates as a brick-and-mortar retail store that focuses on offline consumer interaction. Salezone functions as a multi-brand fashion store resembling a mini department store that offers a variety of products including apparel, footwear, and accessories. Effective merchandising practices are essential in this kind of retail environment, as they help ensure that the right products reach customers at the right time and in the right quantity. (Parker-Strak et al., 2022). Merchandisers play an important role in this process, as they are responsible for planning, selecting, and allocating products in order to maximize sales performance and enhance the overall shopping experience (Basu et al., 2022).

During the internship program, the author worked within the merchandising function at Salezone and observed several operational challenges related to sales performance and inventory management. One of the major challenges is the fluctuation and gradual decline in sales over time, as illustrated in **Figure 1**, which presents the sales trend of Salezone during the 2024–2025 period. Fluctuating or declining sales create uncertainty for merchandisers when making inventory planning and allocation decisions, particularly in fashion retail where demand patterns can change rapidly due to trends, seasonality, and consumer preferences (Giri & Chen, 2022).

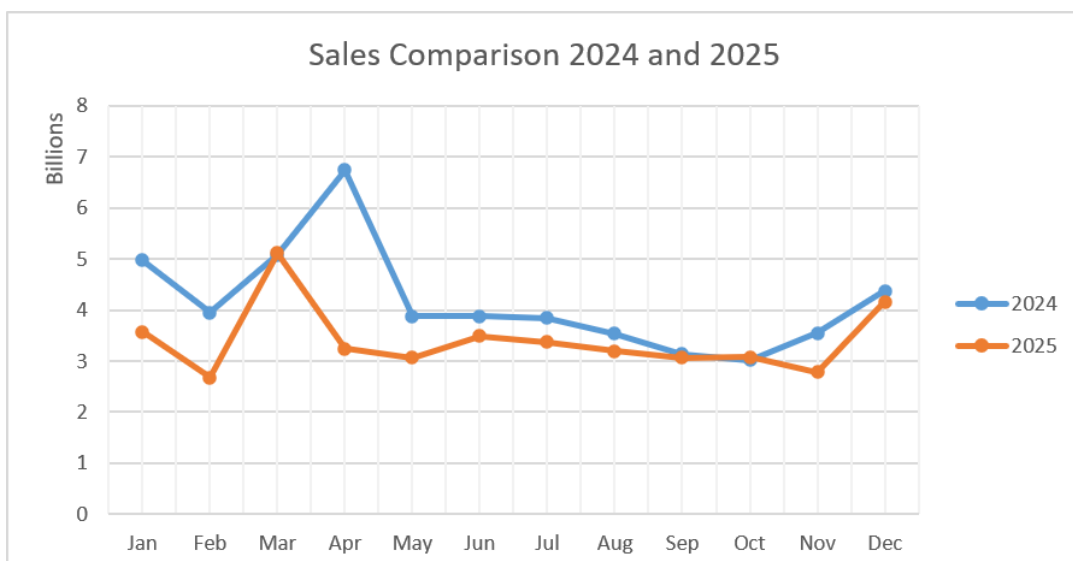


Figure 1. Salezone Sales Period 2024–2025

Through its Salezone brand, it operates across multiple sales channels, including bazaars, online platforms, and key accounts. However, the physical outlet channel remains the primary driver of the business, contributing approximately 70% of total sales revenue as shown in **Figure 2**. Given this significant contribution, maintaining stable sales performance and operational efficiency within these brick-and-mortar locations is critical to the company’s overall financial health

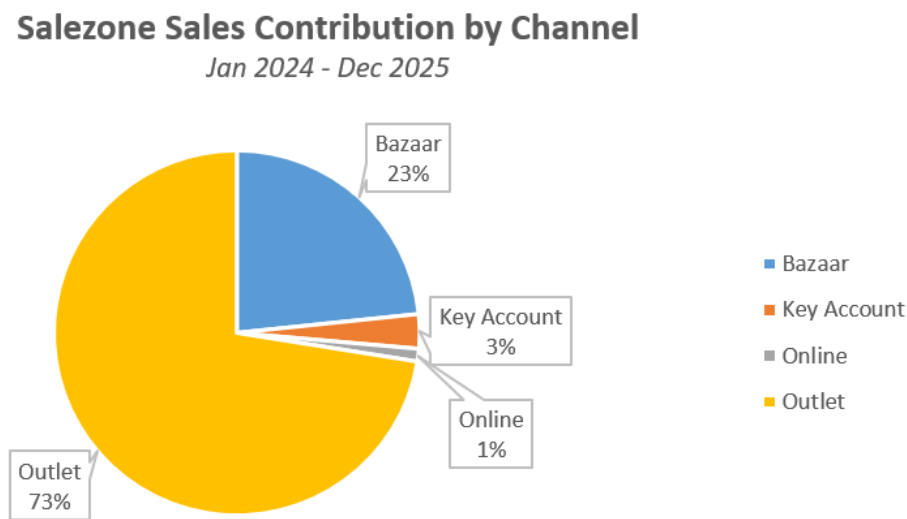


Figure 2. Salezone Sales Contribution by Channel

Despite its importance, the outlet channel has recently faced significant challenges. As illustrated in **Figure 3**, there is a noticeable fluctuation and gradual decline in outlet sales throughout 2025 compared to the 2024 period.

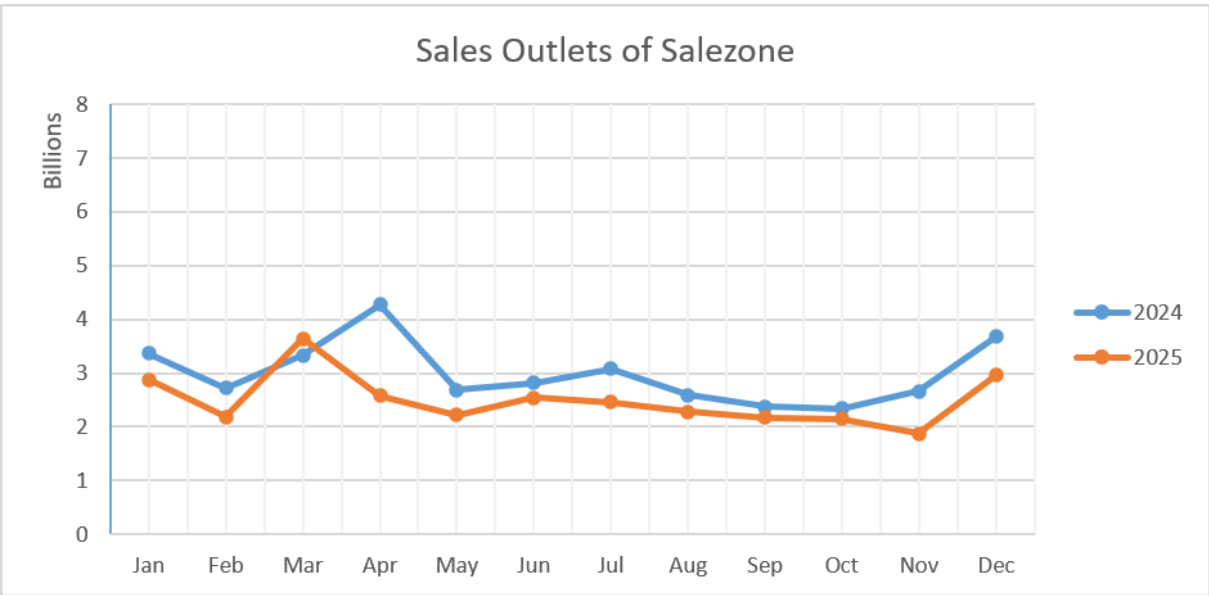


Figure 3. Sales outlets of Salezone

To address these challenges effectively, this study focuses specifically on optimizing the performance of these brick-and-mortar outlets. For the purposes of this research, only outlets with more than two years of operational history are included in the analysis. This criterion ensures that the study utilizes a sufficiently robust dataset, allowing the forecasting models to accurately capture long-term trends and the seasonal patterns necessary for reliable demand estimation

In addition to sales fluctuations, another operational issue observed in Salezone relates to the stock-to-sales ratio (SSR). SSR refers to the relationship between the level of inventory and the volume of sales within a given period, and it is commonly used as an indicator of inventory efficiency (Marzolf et al., 2023). A high SSR indicates that inventory levels are large relative to sales, which may suggest slow inventory turnover and potential overstocking.

As illustrated in **Figure 4**, Salezone experienced relatively high SSR values during the period of June to December 2025. For example, the SSR in June reached 12.7, indicating that the inventory level was significantly higher than the sales volume during that period. In a brick-and-mortar retail environment, this situation can become problematic because physical stores have limited display space. Excessive inventory may lead to higher holding costs, inefficient use of store space, and increased reliance on markdown strategies to clear unsold products (Marzolf et al., 2023).

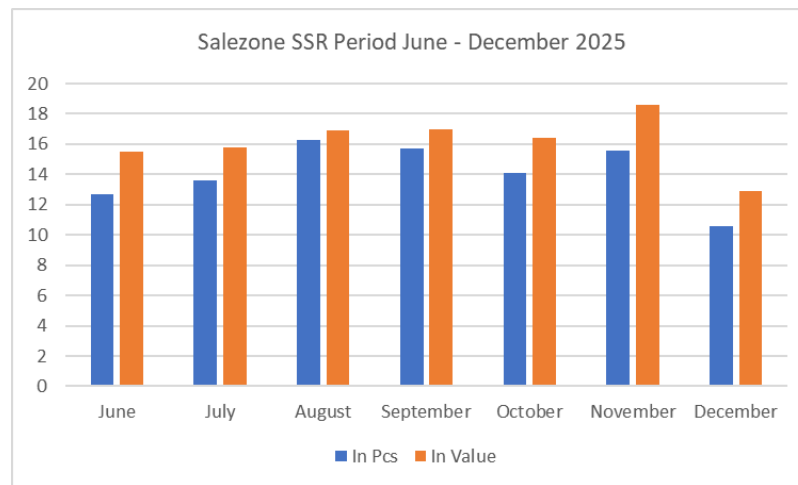


Figure 4. Stock-to-Sales Ratio of Salezone Period June–December 2025

Another challenge identified in the merchandising process is the approach used in product allocation decisions. In practice, the merchandising team tends to rely heavily on recent sales performance and two month moving average forecast when determining the quantity of products to allocate to each store. While this approach may provide quick insights into current demand, it may also lead to biased decisions when short-term fluctuations occur. For example, a temporary increase in sales caused by a specific event such as a holiday or promotional campaign may lead merchandisers to allocate excessive inventory in the following period. If the demand surge was only temporary, this decision may result in excess inventory and overstock conditions.

Researchers commonly link this situation to the bullwhip effect, a phenomenon in which the supply chain increasingly amplifies fluctuations in consumer demand as information moves upstream, often because distorted or incomplete demand signals cause this amplification (Song & Zhang, 2025). In retail operations, relying solely on short-term sales observations without systematic demand estimation may lead to inaccurate inventory decisions and inefficient stock allocation.

To address these challenges, retailers commonly turn to sales or demand forecasting methods. Sales forecasting is the process by which future demand is predicted through the analysis of historical data using various analytical techniques (Chowdhury et al., 2025). Accurate forecasting enables retailers to balance supply and demand more effectively, helping them reduce both stock shortages and excess inventory (Chen et al., 2022). In the fashion retail industry, forecasting plays a particularly important role because demand patterns are often volatile due to changing trends, seasonal variations, and dynamic consumer preferences (Liu et al., 2013).

Various forecasting techniques have been developed for predicting future demand, among which the Autoregressive Integrated Moving Average (ARIMA) model and different forms of Exponential Smoothing are the statistical methods most widely applied (Burinskiene, 2022). Although more advanced approaches such as machine learning and artificial intelligence have emerged, traditional statistical models continue to be widely utilized because they offer a straightforward structure, ease of interpretation, and relatively modest data requirements (Giri & Chen, 2022). Furthermore, Makridakis et al. (2018) emphasize that simpler forecasting models can often achieve predictive performance comparable to more complex techniques while requiring significantly less computational complexity.

Previous studies have also examined how classical forecasting models perform in retail demand prediction. For instance, Kumar et al. (2024) compared how well the Autoregressive Integrated Moving Average (ARIMA) model and the Holt–Winters Exponential Smoothing (HWES) method performed in forecasting. Their findings suggest that Holt–Winters models perform well when sales exhibit consistent seasonal patterns, while ARIMA models are capable of capturing more complex patterns in historical time-series data. In certain contexts, classical statistical models have even been shown to outperform more complex machine learning approaches. Elalem et al. (2022), for instance, found that ARIMAX models achieved mean absolute errors approximately 21–24% lower than deep neural network models in certain forecasting scenarios. As illustrated in Figure 1, Salezone exhibits distinct seasonality, which refers to periodic patterns and regular fluctuations in demand occurring at specific intervals (e.g., annually or monthly) (Chowdhury et al., 2025). In the context of Indonesia, these seasonal peaks are notably driven by the Christmas and Ramadan periods. To account for these fluctuations, we utilized the seasonal ARIMA (SARIMA) model, adapting traditional ARIMA frameworks to effectively capture seasonal time series dynamics.

Given the operational challenges faced by Salezone, particularly related to fluctuating sales patterns and high inventory levels, implementing an appropriate forecasting approach may help support better inventory allocation and merchandising decisions. Therefore, this study aims to develop and evaluate sales forecasting models using SARIMA and Holt–Winters Exponential Smoothing, and to determine which method provides more accurate predictions for Salezone’s sales data. To determine

the forecast accuracy, both models will be based on Mean Absolute Error (MAE), Mean Absolute Percentage Error (MAPE), and Root Mean Square Error (RMSE).

1.2 Objective

Based on the background of the problems to be explored, here are some of the objectives of this research:

1. To develop sales forecasting models using SARIMA and Holt–Winters Exponential Smoothing methods.
2. To compare the forecasting accuracy of SARIMA and Holt–Winters Exponential Smoothing using appropriate error metrics.
3. To identify the most suitable forecasting model to support inventory allocation decisions in Salezone.

1.3 Research Questions

Based on the objectives of this research, three main research questions were formed, such as:

1. How can SARIMA and Holt–Winters Exponential Smoothing models be applied to forecast sales at Salezone?
2. How accurate are the forecasts produced by SARIMA and Holt–Winters Exponential Smoothing?
3. Which model provides the lowest forecasting error for predicting sales at Salezone?