Supermarket Sales Trend Analysis

A Proposal report for the BDM capstone Project

Submitted by

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Contents

Declaration Statement

I am working on a Project titled “Supermarket sales trend analysis”. I extend my appreciation to Aung Pyae (Kaggle user) for providing the necessary resources that enabled me to conduct my project.

I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from secondary sources (Kaggle) and carefully analyzed to assure its reliability.

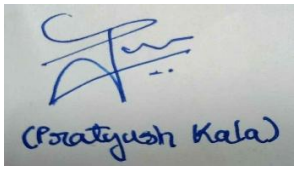
Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the principles of academic honesty and integrity, and I am receptive to any additional examination or validation of the data contained in this project report.

I understand that the execution of this project is intended for individual completion and is not to be undertaken collectively. I thus affirm that I am not engaged in any form of collaboration with other individuals, and that all the work undertaken has been solely conducted by me. In the event that plagiarism is detected in the report at any stage of the project's completion, I am fully aware and prepared to accept disciplinary measures imposed by the relevant authority.

I understand that all recommendations made in this project report are within the context of the academic project taken up towards course fulfillment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Signature of Candidate:



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Date: 03/04/2025

1 Executive Summary and Title

The data I will be analyzing for this project is from secondary sources (kaggle.com). This data revolves around item sales in a supermarket chain in Myanmar. This is a B2C business and it falls under the retail segment which can be highly competitive.

One of the major issues this business is facing revolves around maximizing profits. Despite steady customer traffic and a wide range of products, the desired profit margins are not being achieved. This could be due to a variety of reasons like inventory management, pricing, customer satisfaction etc. These are also the problems the supermarket should and will be focusing on.

The issues will be addressed by analyzing the data via different analytical approaches to obtain a fruitful outcome. We will be focusing on the price of products and their profitability which helps us with planning and managing the inventory and also helps us understand the customer demand which leads to refined pricing and correct product placement.

The expected outcome will help the organization reduce the money blockage in terms of inventory and leads to an increased level of customer satisfaction which helps increase the profitability of the organization.

2 Organization Background

The organization that I am analyzing for this project is a supermarket chain based in Myanmar. The data has been taken from Kaggle.com from a post published by an author called Aung Pyae. The supermarket operates across **three branches** located in different areas of the city.

Following is the link to the dataset that is being analyzed:

https://www.kaggle.com/datasets/aungpyaeap/supermarket-sales

The author gives the following description for the dataset:

"The growth of supermarkets in most populated cities are increasing and market competitions are also high. The dataset is one of the historical sales of supermarket company which has recorded in 3 different branches for 3 months data. Predictive data analytics methods are easy to apply with this dataset."

For this project, I will be analyzing the three branches to gain a comprehensive understanding of sales trends, inventory management, and customer behavior across different locations. This broader analysis will help identify branch-specific patterns and optimize business strategies accordingly.

3 Problem Statements

3.1 Maximization of profits: The company wants to maximize its profits by pricing the products correctly and minimizing any losses due to inefficiency.

3.2 Inventory Management: The stock of products needs to be managed such that the lesser demanded products are not occupying to much space and causing any wastage.

3.3 Customer Satisfaction: The customers should be satisfied after their visit. They value the availability of products at a reasonable price and good service. The increase in customer retention and attraction of new customers is necessary for increase in sales.

4 Background of the Problem

The supermarket industry operates in a highly competitive environment where businesses must optimize multiple factors to sustain profitability. Retail supermarkets face challenges such as fluctuating customer demand, inventory mismanagement, and the need for effective pricing strategies. These challenges, if not addressed efficiently, can lead to increased operational costs, stock wastage, and reduced customer satisfaction, ultimately affecting revenue.

One of the primary concerns for any supermarket is **maximizing profitability** while ensuring that customers find the products they need at competitive prices. Poor pricing strategies can lead to underpricing, which reduces profit margins, or overpricing, which discourages customers from making purchases.

Additionally, **inventory management** plays a crucial role in a supermarket's efficiency. Overstocking slow-moving products can lead to capital being tied up in unsold goods, while understocking high-demand products can lead to missed sales opportunities. Finding the right balance between demand and supply is essential for reducing waste and improving financial performance.

Finally, **customer satisfaction** is a key driver of business success. Supermarkets must ensure that customers not only find the products they need but also receive good service at reasonable prices. Negative customer experiences, such as frequent stockouts, long checkout times, or inconsistent pricing, can lead to a loss of repeat business and a decline in overall sales.

By analyzing supermarket sales data, we aim to uncover insights that can help improve pricing strategies, optimize inventory levels, and enhance customer satisfaction. The findings will provide valuable recommendations to increase profitability and ensure sustainable business growth.

5 Problem Solving Approach

To address the key challenges—profit maximization, inventory management, and customer satisfaction—this project will employ a structured data-driven approach using Excel, with support from Python where necessary. The analysis will focus on identifying sales trends, optimizing pricing, improving stock management, and enhancing customer satisfaction through data insights.

Data Collection and Cleaning:

The first step is to ensure that the dataset is complete, accurate, and free from inconsistencies. This involves:

- Gathering sales data, including transaction records, product details, and customer feedback.
- Identifying and handling missing values, duplicate records, and anomalies to maintain data integrity.
- Using Excel functions and Python libraries (Pandas, NumPy) for data preprocessing, ensuring that the dataset is structured for analysis.

Descriptive Analytics:

Once the data is cleaned, exploratory data analysis (EDA) will be conducted to understand sales performance and customer behaviour. This includes:

- Using pivot tables and summary statistics in Excel to analyse revenue, profit margins, and sales patterns.
- Creating visualizations (bar charts, line graphs, and heatmaps) to identify sales trends, peak purchase periods, and high-performing product categories.
- Detecting seasonal demand variations and customer purchasing habits.

Predictive Analytics:

To enhance decision-making, statistical models will be used to forecast future sales trends. This involves:

- Applying trend analysis and regression models in Excel to predict demand for different product categories.
- Exploring machine learning models (such as Linear Regression and Random Forest) in Python to refine predictions.
- Identifying external factors (e.g., holidays, promotions) that influence sales fluctuations.

Market Based Analysis:

Market basket analysis identifies the consumer demand like products frequently bought together, providing opportunities for cross-selling and up-selling. This analysis helps in designing store layouts and promotional strategies that encourage customers to purchase complementary items, thereby increasing the average transaction value.

Customer Feedback Analysis:

Systematically analyzing customer feedback helps identify common themes and areas for improvement. Customer reviews provide insights into customer satisfaction and product quality.

Implementation of analysis:

After all the analysis of data is done, we need to come up with solutions for improvement. For example, Inventory management is made possible after we analyze the data (if we see the demand of a certain item decreasing, the company should reduce its stock by purchasing less of that item so that the storage is utilized for the items that are higher in demand). We need to implement solutions like these after we are done analyzing the data.

Continuous Improvement and Monitoring:

Finally, a continuous improvement process is essential for maintaining and enhancing the effectiveness of implemented strategies. Regularly reviewing performance metrics and adjusting strategies based on data-driven insights ensures sustained success.

6 Expected Timeline

6.1 Work Breakdown Structure:

The project will be completed in a structured sequence of tasks to ensure efficient data analysis and reporting using Excel (and python where required)

1. **Collecting Data**
    - Gather the dataset and import it into Excel.
    - Organize the raw data into structured tables for better analysis.
2. **Data Cleaning**
    - Remove duplicate entries and handle missing values.
    - Ensure data accuracy and consistency by standardizing formats.
3. **Finding Insights**

- Conduct exploratory data analysis to identify sales trends and customer purchasing behavior.
- Use charts and summaries to highlight key patterns in the data.

4. **Preparing Proposal**
   - Structure the project proposal, including objectives, problem statements, and methodologies.
   - Document preliminary findings and expected outcomes.
5. **Finding More Insights**
   - Perform deeper analysis, such as revenue distribution, product profitability, and inventory management.
   - Identify areas for improvement and potential business strategies.
6. **Finding Solutions**
   - Develop data-driven strategies for pricing, inventory optimization, and customer satisfaction improvement.
   - Compare different approaches to determine the most effective solutions.
7. **Preparing Final Submission**
   - Compile findings into a well-structured report.
   - Create an interactive Excel dashboard summarizing key insights.
8. **Preparing Presentation**
   - Develop a visually appealing presentation to communicate findings effectively.
   - Use charts, graphs, and key metrics to support conclusions.

6.2 Gantt chart

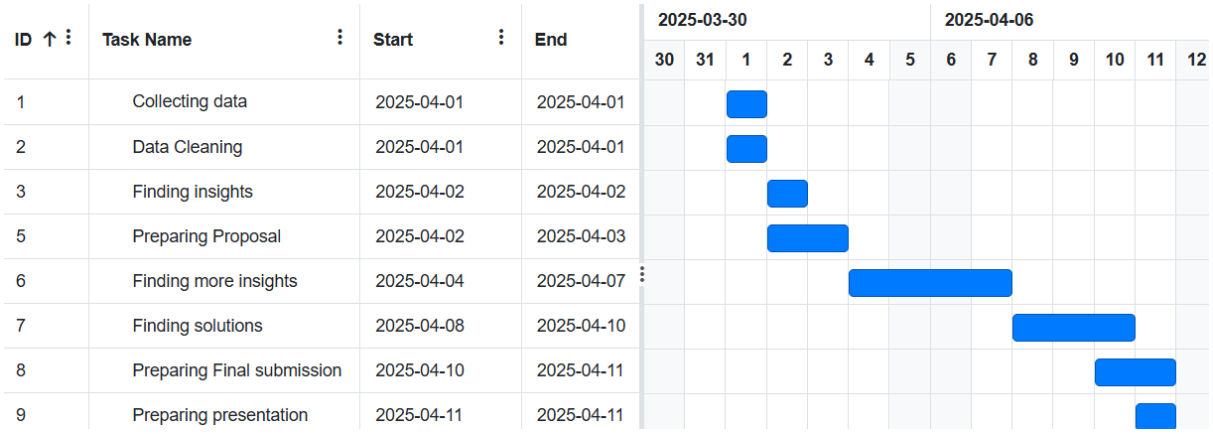

Figure 1 Expected timeline for completion of project.

7 Expected Outcome

Better inventory planning and better understanding of which products are more sold.
The expected outcome of this project is to derive actionable insights that will help the supermarket improve profitability, inventory management, and customer satisfaction. By analyzing sales trends and customer purchasing behavior using Excel, the project aims to achieve the following key results:

1. Optimized Profit Margins
    - Identification of high-performing and low-performing products.
    - Recommendations for price adjustments to maximize revenue.
    - Insights into discount strategies and their impact on sales.
2. Improved Inventory Management
    - Classification of products based on demand to reduce overstocking and stockouts.
    - Efficient stock management to ensure better shelf utilization.
    - Identification of slow-moving inventory to minimize financial losses.
3. Enhanced Customer Satisfaction
    - Insights into customer buying patterns and preferences.
    - Recommendations for product placement and promotions to increase customer engagement.
    - Strategies to improve customer retention and loyalty.
4. Data-Driven Decision Making
    - A structured approach for sales trend analysis to support better business planning.
    - A user-friendly Excel dashboard displaying key performance indicators (KPIs).
    - A final report summarizing findings and recommendations for future strategies.