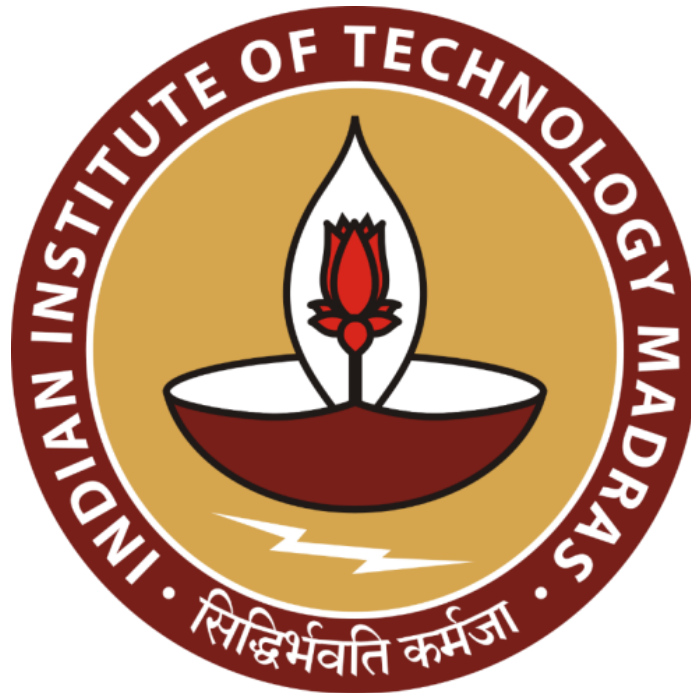


Data-Driven Inventory Optimization and Profit Maximization of a Kirana Store
A Proposal report for the BDM Capstone Project

Submitted by-

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Declaration Statement

I am working on a Project titled “**Data-Driven Inventory Optimization and Profit Maximization of a Kirana Store**”. I extend my appreciation to Mr. **Ajit Kumar Dey**, 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 primary sources and carefully analysed 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 fulfilment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Executive Summary

The project is focused on studying and providing recommendations for the challenges faced by the business Ajit Varieties, a kirana store in Purba Bardhaman, West Bengal. The business primarily operates in a B2B and B2C capacity, serving both small retail vendors and individual consumers seeking to buy groceries and household items.

Despite its loyal customer base, the store is consistently grappling with key challenges related to effectively managing inventory. This struggle results from frequent occurrences of stockouts for high-demand products and overstocking of slow-moving items, leading to significant impacts such as lost sales and wasted capital. Furthermore, the absence of a structured pricing strategy has contributed to inconsistent profit margins, further complicating the situation.

To tackle these challenges at 'Ajit Varieties,' This project aims to leverage transactional data (sales, expenses, and inventory) to address these challenges. By analyzing historical sales patterns, inventory turnover rates, and pricing strategies, the project will:

1. Optimize inventory levels to reduce stockouts and minimize excess stock.
2. Identify high-margin products and recommend pricing adjustments to boost profitability.

The analysis will utilize required datasets. Outcomes will include actionable insights for inventory reordering, dynamic pricing, and cost reduction. This project aligns with the store's goal of achieving sustainable growth through data-driven decision-making.

Organisation Background

Business Name: Ajit Varieties

Location: Satabdibag 2nd Lane, Police Line, Purba Bardhaman-713103

Owner: Mr. Ajit Kumar Dey

Founded in 2012, Ajit Varieties is a local kirana shop providing day-to-day household requirements such as groceries, snacks, and personal care items. The shop is based in a semi-urban location with modest competition from local supermarkets. Its major strengths are its strategic location, personal attention to customers, and affordability. The business is, however, based on hand record-keeping, and hence there is room for inefficiency in

managing stocks and expenses.

The shop retails from local wholesalers and has 50–70 customers per day. Some of the current challenges are:

- Regular stockouts of essentials such as rice, flour, cooking oil and many others.
- Perishables (e.g., biscuits, chips) which are close to their expiry dates being overstocked.
- Volatile profit margins due to unplanned pricing.

The owner wishes to embrace data-driven solutions to streamline business and enhance profitability.

Problem Statement

Objective 1: Inventory Management Inefficiency

- When high-demand items are out of stock, customers may seek alternative sources or choose not to purchase, resulting in missed sales opportunities.
- Increasing the stock of low-demand or perishable items leads to higher levels of waste and results in tying up valuable capital that could otherwise be utilized more effectively in the business operations.

Objective 2: Profit Margin Instability

- A lack of a well-defined pricing strategy often results in fluctuating profit margins, making it challenging to maintain consistency in financial performance.
- Undetected low-margin products, often overlooked, can significantly erode profitability over time, posing a challenge to overall financial sustainability.

Background of the Problem

Ajit Varieties operates in a highly competitive environment where effective inventory management and strategic pricing are crucial for customer retention and profitability. However, the store currently relies on manual tracking of stock levels, leading to frequent mismatches between supply and demand. Essential staples like rice and oil are often out of stock within days, frustrating loyal customers and causing potential revenue loss. In contrast, items like snacks and perishables frequently remain unsold for extended periods, resulting in waste and tied-up capital.

Pricing decisions at Ajit Varieties are primarily based on intuition rather than informed data analysis. The owner often adjusts prices reactively, lowering margins to match local competitors without fully understanding the underlying cost structures. This reactive pricing strategy has eroded profits, particularly for low-cost, high-volume products that require precise margin control. Additionally, operational expenses such as transportation costs, spoilage, and inventory holding are not systematically tracked, making it difficult to identify cost-saving opportunities.

The absence of structured data analysis further hampers the owner's ability to recognize key trends, such as seasonal demand fluctuations and customer buying patterns. Implementing data-driven inventory management and pricing strategies would enhance operational efficiency and support the store's long-term financial sustainability.

Problem Solving Approach

To address the challenge of optimizing inventory management and profitability, a three-pronged approach combining descriptive analytics, margin analysis, and ABC classification is proposed, supported by targeted data collection and analysis tools. This structured methodology ensures actionable insights while balancing operational efficiency and financial performance.

❖ METHODS

- **Descriptive Analytics:** Historical sales data will be analyzed to identify fast-moving vs. slow-moving products using metrics like sales velocity (units sold per week) and inventory turnover ratios. For example, products with consistently high sales velocity but low stock levels may require revised reorder points to prevent stockouts. Conversely, slow-moving items with excess stock can be flagged for promotions or discontinuation. Justification: This minimizes overstocking costs (e.g., spoilage for perishables) and ensures high-demand items are prioritized, directly improving customer satisfaction and cash flow.
- **Margin Analysis:** Gross profit margins for each product will be calculated as (Selling Price – Cost Price) using data. Products with margins below a threshold (e.g., 20%) will be scrutinized. For instance, low-margin items with high sales volume may still be viable, while low-margin, low-volume products could warrant price adjustments or supplier renegotiations. Justification: This identifies profitability gaps, enabling strategic pricing or cost optimization to enhance overall margins.

- **ABC Analysis:** Products will be classified into A (top 20% by revenue), B (next 30%), and C (remaining 50%) categories using revenue contribution and stock value. Category A items (e.g., premium electronics) will undergo tighter stock control, while Category C (e.g., low-cost accessories) may adopt automated reordering. Justification: Aligns inventory efforts with the Pareto principle, focusing resources on high-impact items.

❖ DATA COLLECTION

- **Transactions.csv:** Captures daily sales dynamics (product ID, quantity sold, price) to assess demand patterns.
- **Products.csv:** Provides stock levels, expiry dates, and cost prices to evaluate holding costs and spoilage risks.
- **Expenses.csv:** Details operational costs (transportation, spoilage) to quantify hidden inefficiencies.

Justification: Together, these datasets enable a holistic view of sales trends, inventory health, and cost drivers. For example, linking spoilage costs (from Expenses.csv) to expiry dates (from Products.csv) can reduce waste for perishable goods.

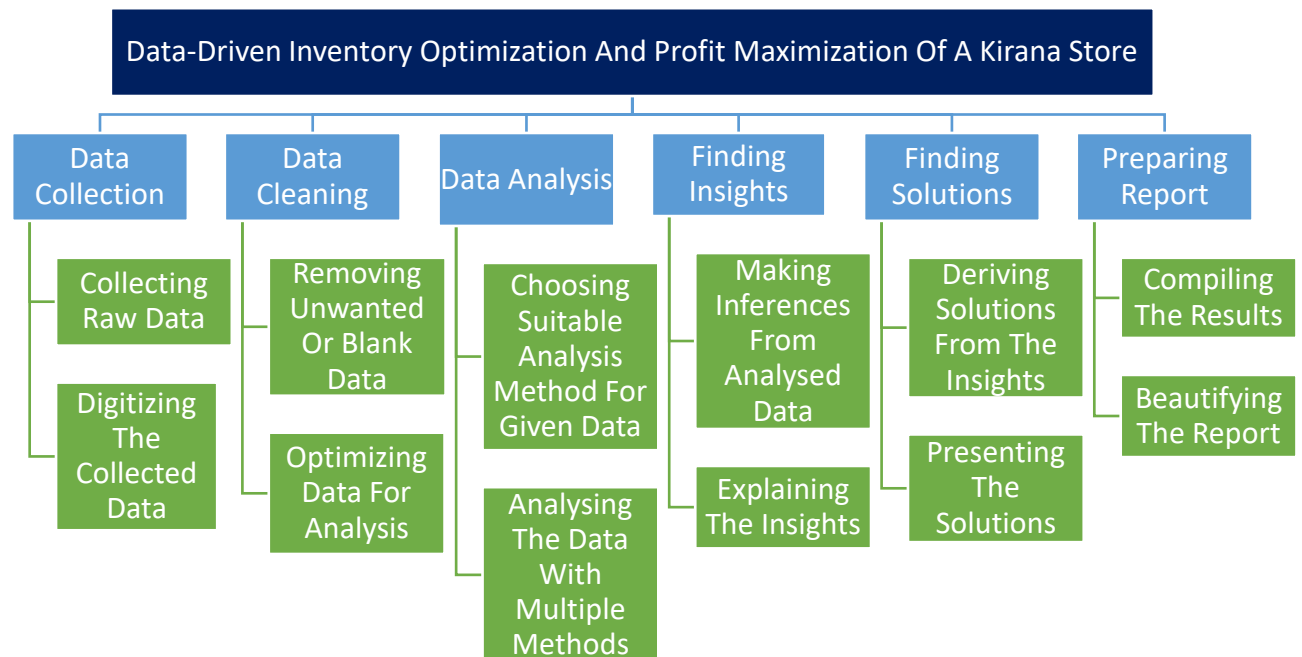
❖ ANALYSIS TOOLS

- **Python (Pandas, Matplotlib):** Ideal for cleaning large datasets, calculating margins, and generating time-series visualizations (e.g., monthly sales trends for ABC categories).
- **Excel:** Enables intuitive pivot tables for ABC classification and stakeholder-ready dashboards (e.g., margin vs. sales volume scatter plots).

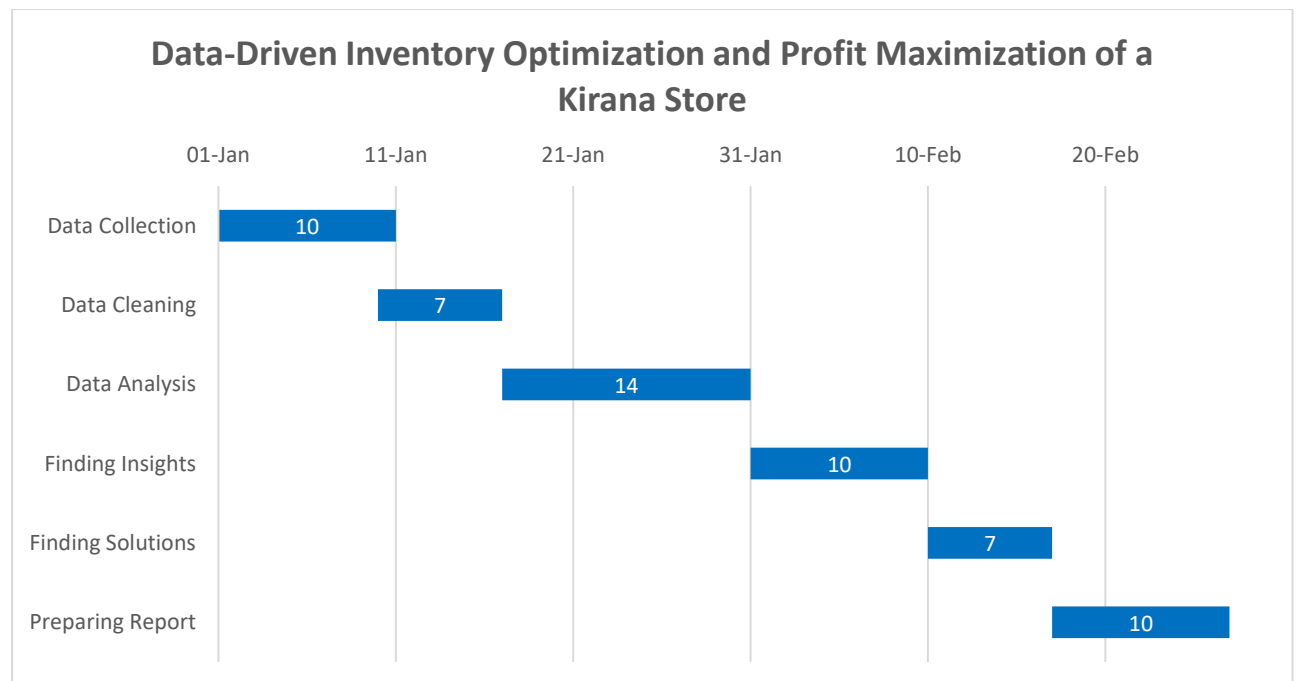
Justification- Python's scalability handles complex calculations (e.g., rolling turnover ratios), while Excel's accessibility ensures non-technical stakeholders can engage with insights.

Expected Timeline

Work Breakdown Structure:



Gantt chart:



Expected Outcome

- To have a clear margin-setting scheme between the cost and selling price of groceries and household items through data exploration of past transactions.

- Formulate strategies to ensure a desirable and sustainable margin, thereby contributing to the business's profitability and financial stability.
- Provide a comprehensive financial overview of the business through data-driven analysis of various aspects, including costs, selling prices, and profits associated with vegetable transactions.
- To assist the business owner in enhancing credit management practices by formulating data-driven credit management strategies and criteria.
- Enable informed decisions regarding extending credit to customers, minimising the risk of losses and promoting a structured and efficient credit system for the business's financial health.