Refrigerate the Risk: Optimizing Inventory and Operations for Profit Enhancement in Dairy Retail

A Proposal report for the BDM capstone Project

Submitted by

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Declaration Statement

I am working on a Project titled "**Refrigerate the Risk: Optimizing Inventory and Operations for Profit Enhancement in Dairy Retail**". I extend my appreciation to **Kribhco Karmachari Sahkari Dhiran Purvarsh Society** for providing the necessary resources that enabled me to conduct my project.

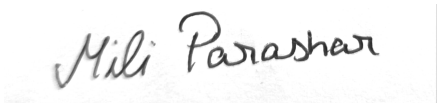
I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from primary sources and carefully analyzed to assure its reliability.

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: (**Digital Signature**)

Name: Mili Parashar

Date: 09-06-2025

1 Executive Summary and Title

The core objective of this project is to enable the business to tackle and minimize the present challenges of ‘Kribhco Karmachari Sahkari Dhiran Purvarsh Society’. It is a small-sized dairy outlet located in Kribhco Township, Surat. Established in 2000, the business primarily serves local households with milk and ice cream, operating in a B2C model.

Key operational hurdles faced by the business include overstocking, stockouts, inventory disruptions during power outages, delivery inefficiencies - all of which negatively impact profiatbility and customer satisfaction.

In order to mitigate these challenges, the project will employ analytical techniques and tools using one year of collected business data to optimize business operations. Techniques such as trend analysis for demand forecasting, regression analysis to understand key loss factors and pareto analysis to identify the major contributors to spoilage and delivery issues. Tools such as Microsoft Excel and Python (Pandas) will be used to perform data analysis and visulaization to derive insights and recommend efficient business practices. The expected outcome is a set of recommendations aiming to reduce losses from spoilage and stock mismanagement, streamline deliveries and enhance overall profitability through smarter data-led decisions.

2 Organization Background

‘Kribhco Karmachari Sahkari Dhiran Purvarsh Society’ is a cooperative dairy shop founded in 2000 within the Kribhco Township, Surat. Initially established to cater to the milk needs of township residents, and overtime, it diversified to include ice cream brands such as Vadilal, followed by Amul and Havmor to meet growing customer demand.In the early stages, the owner, Mr. Ashok, personally procured the stock, incurring high transportation costs. However, with business growth, suppliers now deliver directly to the store. Similarly, the shop evolved from no delivery system to employing 6-7 delivery boys for home deliveries, reflecting an increase in customer expectations and operational scale.

Functioning under a B2C model, the store serves township households with daily dairy supplies. Mr. Ashok single handedly managed stock procurement, inventory handling and

day-to-day sales. Despite this hands on approach, the business continues to struggle. Addressing these will be crucial to ensuring long-term sustainability.

3 Problem Statement

3.1 **Inventory Management Issues**: Frequent overstocking and stockouts due to absence of demand pattern recognition, resulting in either wastage or missed sales.

3.2 **Cold Storage Concerns**: Risk of milk and ice cream spoilage due to inadequate temperature control during extended power outages and lack of cold-chain monitoring.

3.3 **Delivery Disruptions**: Home delivery issues such as packet damage and delays, especially during high-demand or bulk delivery scenarios.

4 Background of the Problem

Through multiple discussions with the business owner, I discovered that his shop heavily relies on manual stock management, and the absence of a data-driven demand estimation often leads to either excess stock or stock unavailability. Perishable items like milk and ice cream, overstocking results in wastage and revenue loss, whereas during stockouts, the store misses sales opportunities and risks losing long-term customer loyalty.

Lack of trained helpers during emergencies forces the owner to leave the shop unattended or hire temporary help, incurring additional costs. Moreover, product discrepancies, such as receiving fewer units than paid for, often go unnoticed and unresolved due to a lack of systematic verification. Additionally, insufficient power backups during electricity outages, though rare, severely affect cold-chain integrity, leading to curdling of milk and melting of ice cream, especially in summer months, escalating financial losses.

The delivery system becomes a major concern on high demand days or during the unavailability of delivery boys, the owner and his few helpers get overburdened with extra packets. This results in torn packaging and late deliveries. These internal limitations, combined with external uncertainties, make it essential for the business to adopt a structured and data-supported strategy for operational improvement.

5 Problem Solving Approach

5.1 **Methods**: To address the concerns of the dairy retail business, a structured analytical approach will be adopted:

- **Descriptive Analysis** will highlight the current operations, outlining patterns and irregularities in sales, stocking and spoilage.
- **Diagnostic Analysis** will help uncover the root causes of inventory losses, overstocking, and delivery issues.
- **SWOT Analysis** will help understand the strengths, weaknesses, opportunities and threats of the business.
- **Time Series Forecasting** will be employed to identify seasonal demand variations for different SKUs and reduce excess or insufficient stocking.
- **SKU Prioritization** will discover the top-performing milk and ice cream variants contributing to maximum revenue and customer retention.

5.2 **Data Collection**: Data will be gathered using methods like direct interaction with the shop owner, review of handwritten registers and bills, sales and purchase logs. The following data points are essential:

- **Sales Data** includes daily sales volume by product type and brand to identify top-selling SKUs, seasonal/weekly fluctuations, bulk order impact.
- **Stock Movement Data** includes opening and closing inventory, amount of stock returned, spoiled / damaged goods, frequency of overstocking or stockouts to analyze emergency stocking trends.
- **Delivery and Logistics Data** includes frequency and size of home deliveries, manpower availability, delivery failures packaging-related damages, absence of delivery boys to assess workload imbalance and inefficiencies.
- **Cost Variables Data** includes purchase and selling price of items, penalties paid on return, packaging costs, wages to helpers during owner absence to evaluate profitability erosion.
- **External Disruptions** such as frequency of power cuts to link operational losses with prolonged outages or extreme temperature affecting product quality.

5.3 **Analysis Tools**: To clean, visualize, and analyze the collected information, the following tools will be used:

- **Microsoft Excel:** For initial data entry, generating pivot tables, and visual summaries.
- **Python (Pandas, Matplotlib):** For exploratory data analysis (EDA), SKU clustering, and time series demand prediction. Scalable and replicable for future use.
- **Inventory Optimization Models** (like EOQ and reorder point calculation) will track stock movement and guide better restocking decisions.
- **SKU Performance Metrics:** Using ABC analysis to identify the most profitable and fast-moving items.

This multi-layered approach will generate actionable insights tailored to the scale and needs of the store. While it may not be feasible to eliminate all business challenges, this project aims to significantly minimize their impact using data-driven methods, permitting smarter decision making and improved operational efficiency.

6 Expected Timeline

6.1 **Work Breakdown Structure:**

A Work Breakdown Structure (WBS) is a hierarchical decomposition of a project into manageable sections that help organize and define the total scope of work. For our project — *"*Refrigerate the Risk: Optimizing Inventory and Operations for Profit Enhancement in Dairy Retail*"* — the WBS will guide planning, scheduling, resource allocation, and reporting.

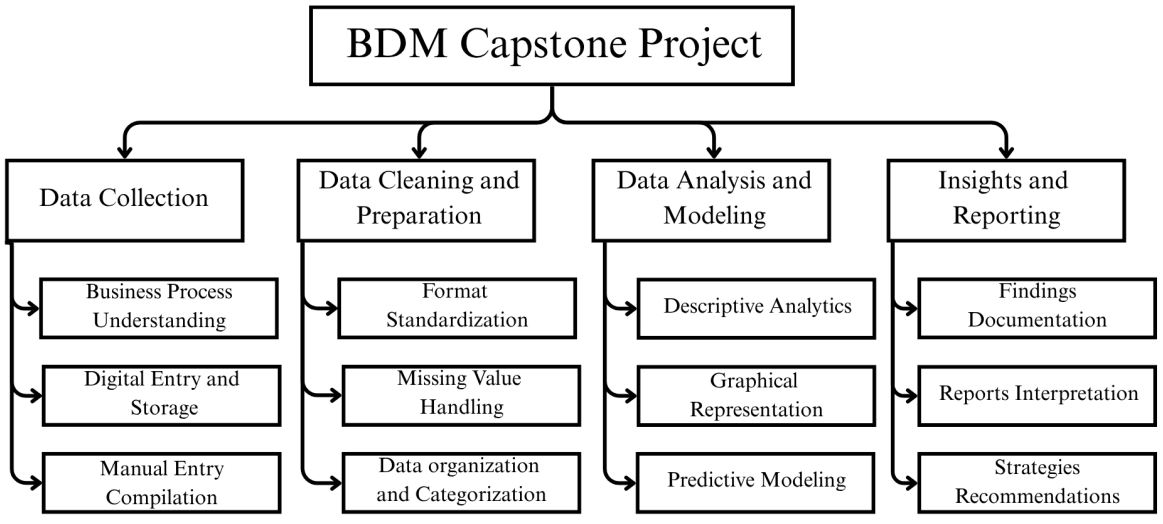


Figure 1: Work Breakdown Structure

6.2 Gantt chart

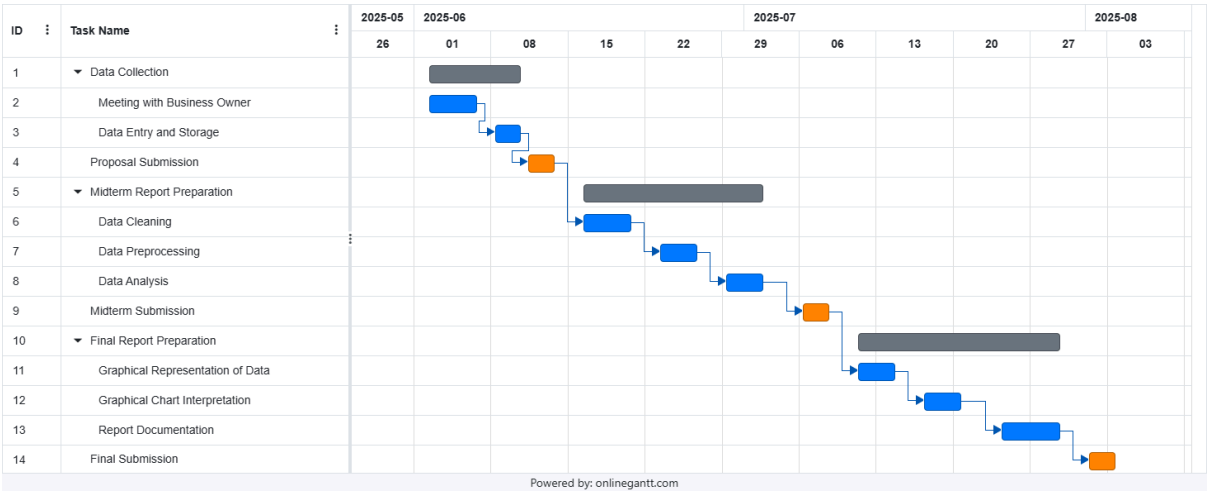


Figure 2: Gantt Chart.

7 Expected Outcome

7.1 **Deliverables:** The project will deliver a report highlighting critical inefficiencies in inventory management, delivery logistics, and SKU performance. Fruitful action plan will be provided for optimal stock levels, demand forecasting, and prioritization of high-performing brands of milk and ice cream.

7.2 **Insights:** The analysis is expected to uncover key patterns such as peak sales periods, frequent stockout triggers, profit-draining SKUs, and delivery-related bottlenecks. Operational impact due to external factors such as power cuts on product perishability and customer satisfaction will likely be revealed too.

7.3 **Data-Driven:** All insights and recommendations will be derived from rigorous data analysis using statistical and forecasting models. The objective is to move away from intuition-based decisions and enable the shop owner to adopt a more evidence-based, efficient, and scalable approach to inventory and business management.