Smart FMCG Distribution: Predictive Analytics and Optimization for Enhanced Inventory and Order Management

A Proposal report for the BDM capstone Project

Submitted by

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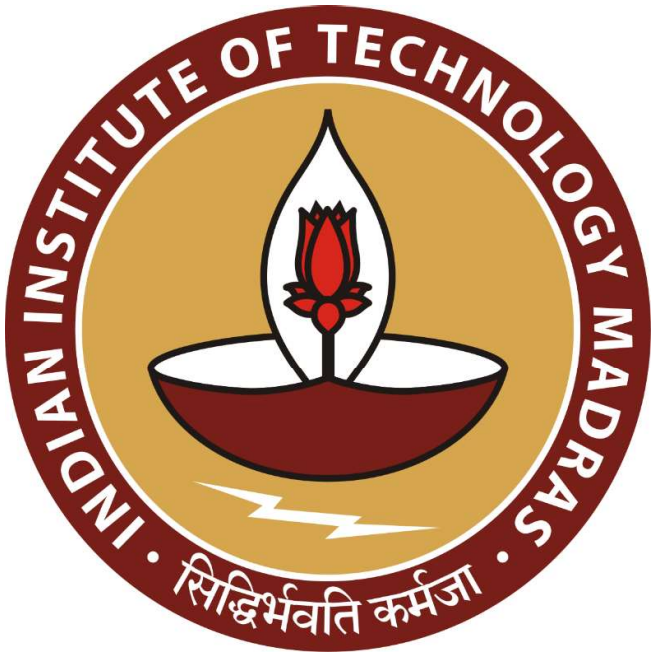

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Declaration Statement

I am working on a Project titled "**Smart FMCG Distribution: Predictive Analytics and Optimization for Enhanced Inventory and Order Management**". I extend my appreciation to **R L ASSOCIATES**, 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: Utkarsh Shukla

Date: 03-11-2024

1 Executive Summary

R L Associates is a super stockist company founded in 2018 (Effective Date of Registration is 13-10-2018), functioning within the FMCG sector. The enterprise predominantly operates as a B2B middleman, linking 4-5 manufacturers with a network of around 200 distributors. Then distributors connect to retail, and then to the end consumer.

The business encounters multiple operational difficulties, such as managing inventory of near-expiry products, the absence of predictive ordering tools, and the necessity for improved distributor segmentation. These difficulties may affect the company's operating efficiency and profitability. The existing workflow of inventory management, order placements only on basis of distributor orders creates opportunity for optimization.

The research seeks to tackle these difficulties with data-driven analytical methods, such as time series analysis for sales forecasting, inventory turnover assessment, and distributor segmentation via clustering algorithms (like k-means). Through the analysis of one year of historical sales and purchase data, in conjunction with distributor billing information, the project aims to generate actionable insights and prediction models to enhance operational efficiency.

Better inventory management and targeted distribution tactics should reduce inventory-related losses, maximize order placement, and boost profitability. These solutions will eliminate inventory money blockage, helping RL Associates maximize profits and streamline operations.

2 Organization Background

R L Associates, a sole proprietorship founded on October 13, 2018, functions as a super stockist in the FMCG sector from its address at 127/1050, W-1 Block, Saket Nagar, Kanpur (208014). The company is registered as a Wholesaler/Distributor and holds an active GSTIN status as a regular taxpayer under the Kanpur II Zone, Kanpur (D) Range, and Kanpur Sector-29 in Uttar Pradesh.

R L Associates serves as an essential intermediate in the FMCG supply chain, partnering directly with 4-5 prominent FMCG manufacturers (Snapin, Insight, Flamingo, etc.) and offering services to a network of over 200 distributors. The company's primary tasks involve bulk buying, basic warehouse management, conduct distribution, and simple inventory control.

R L Associates, with its established presence in Kanpur and operational structure, has emerged as a key participant in the regional FMCG distribution network, facilitating product movement

from manufacturers to retailers by managing the flow of distributors which connects to retail then to the end consumer.

3 Problem Statement (Listed as objectives)

The Company needs improvement in following areas:

3.1 Development of an early warning system for near-expiry products to minimize losses and optimize inventory turnover.

3.2 Creation of a predictive model for order placement based on historical sales data analysis.

3.3 Segmentation of distributors based on product preferences and ordering patterns to enhance distribution strategy.

4 Background of the Problem

Major Cause of Problems in RL Associates:

The core issue is the absence of automated and predictive systems to guide critical operations which results in stockout or overstocking. This reactive approach to managing inventory, ordering, and distribution leads to inefficiencies, stock wastage, and suboptimal distributor engagement.

Internal Problems faced by company:

The company's existing inventory methods neglect to include proactive expiry tracking, hence heightening the risk of product loss from expiration. The manual order placement mechanism depends exclusively on distributor requests without any method for predictive analysis, resulting in either excess inventory or shortages. The absence of data analysis restricts efficient distributor segmentation, impeding the company's ability to address individual distributor requirements or enhance distribution methods.

External Problems faced by company:

R L Associates has to deal with fluctuating demand patterns and diverse ordering practices among distributors, which prevent order forecasting. The competitive FMCG market compels the organization to improve efficiency and accuracy to sustain profitability and service excellence.

These challenges are collectively restricting R L Associates profitability, making it imperative to adopt data-driven solutions for inventory and distribution management along with distributor segmentation. The competitive FMCG environment also pressures the company to enhance precision in order to maintain profitability and service quality.

5 Problem Solving Approach

To address the challenges at R L Associates, a structured and data-driven approach will be implemented across the following three key areas: Inventory Management, Predictive Ordering, and Distributor Segmentation. The approach taken by the project is based on data collecting, analytical estimation, and actionable insights to enhance operations and overcome the challenges.

Data Collection and Preparation:

The first step involves gathering data from the past one year, including sales, purchase records and distributor billing information. This data will be cleaned and standardized to create the needed dataset that accurately reflects sales patterns, distributor behaviours, and product movement. Ensuring high-quality data will lay the foundation for reliable insights. Only then we will proceed to the next step where we start solving problems one by one.

Early Warning System for Near-Expiry Products:

To minimize losses from expired stock, the project will implement an early warning system for near-expiry products. This will use time-based analysis to track product shelf life and identify slow-moving items. Techniques like simple classification will help flag products approaching expiry which can classify products into categories such as "high risk," "medium risk," and "low risk" based on expiration dates, sales velocity, and stock levels. Based on these insights, the company can prioritize rotating stock and implement discounting strategies to move products before expiration, reducing inventory waste and optimizing turnover rates.

Predictive Model for Order Placement:

Only ordering based on current distributors orders can cause both excess stock and the likelihood of stockouts. So, for better order management, a predictive model will be

developed to forecast demand and optimize stock levels. Using historical sales data, the model will apply time series analysis and regression-based models, to predict future sales trends. This model will identify seasonal trends, peak demand periods, and likely stock requirements. By using these predictions, R L Associates can streamline its ordering processes, reducing both excess stock and the likelihood of stockouts, hence, aligning inventory with actual demand.

Distributor Segmentation Analysis:

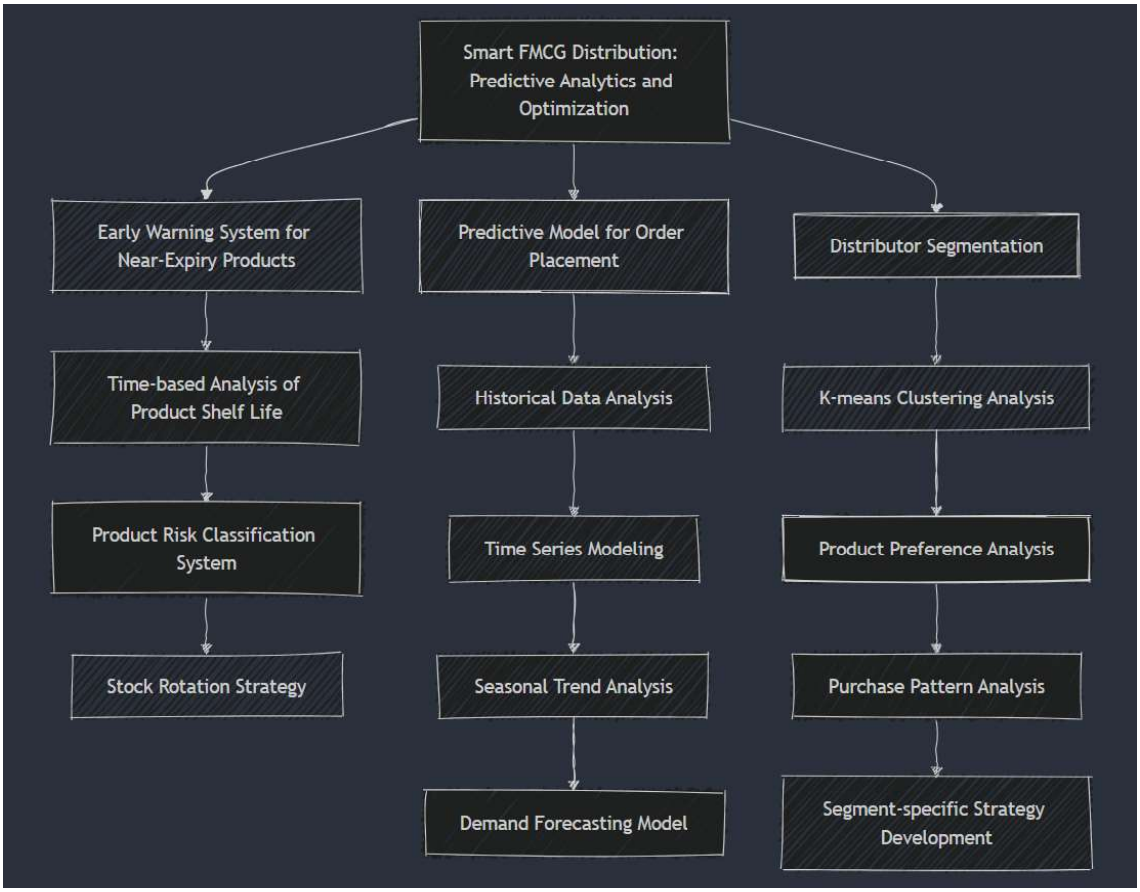
To enhance distributor engagement, clustering algorithms such as K-means clustering will be used to segment distributors based on product preferences, ordering frequency, and purchase patterns. This segmentation will help R L Associates develop targeted strategies for each distributor group, targeting their specific needs and product interests. Segment-specific insights will enable the company to offer customized promotions and improve distribution efficiency, strengthening distributor relationships.

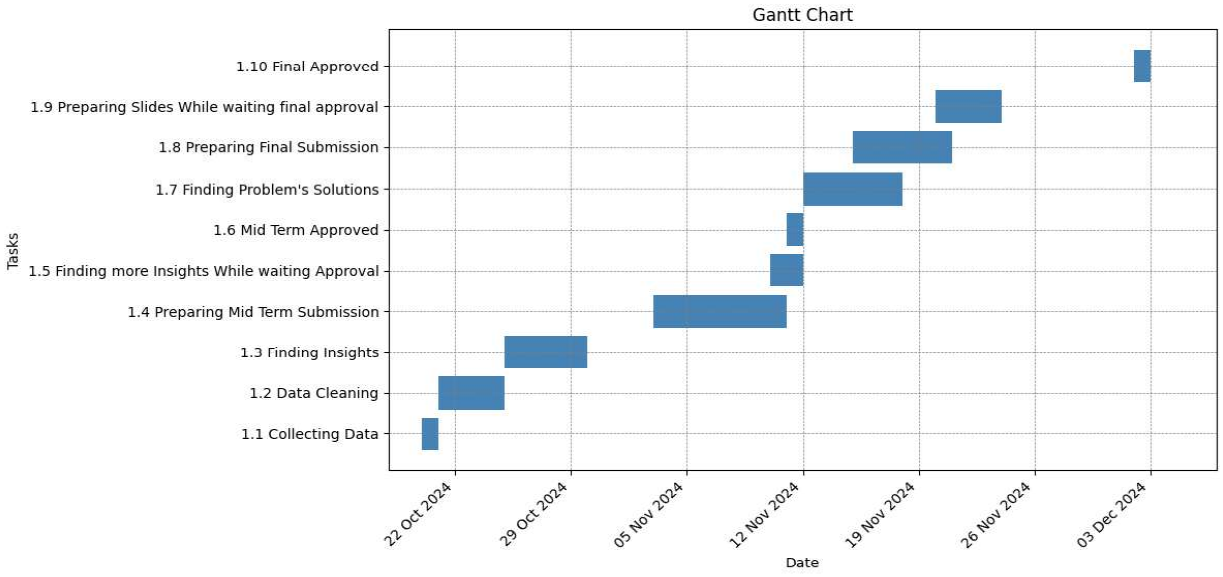
Hence, we can solve the problems and challenges faced by the company using a data driven approach.

6 Expected Timeline

Task	Task Description	Start Date	End Date
1.1	Collecting Data	20-10-2024	20-10-2024
1.2	Data Cleaning	21-10-2024	24-10-2024
1.3	Finding Insights	25-10-2024	29-10-2024
1.4	Preparing Midterm Submission	03-11-2024	10-11-2024
1.5	Finding more Insights While waiting Approval	10-11-2024	11-11-2024
1.6	Mid Term Approved	11-11-2024	11-11-2024
1.7	Finding Problems Solutions	12-11-2024	17-11-2024
1.8	Preparing Final Submission	15-11-2024	20-11-2024
1.9	Preparing Slides While waiting final approval	20-11-2024	23-11-2024
1.10	Final Approved	02-12-2024	02-12-2024

Following is the Work Breakdown Structure and Gantt chart of my project:





7 Expected Outcome

The project is expected to deliver significant improvements analyzing the problems and implementing the required solutions in inventory and distribution management for RL Associates through the following:

1. **Inventory Management**:
    - An early warning system for near-expiry products to reduce waste.
    - Recommendations for optimal stock levels and strategies to improve inventory turnover.

2. **Predictive Ordering**:
    - A sales prediction model to forecast demand accurately.
    - Order recommendations and seasonal trend insights for timely stock replenishment.

3. **Distributor Insights**:
    - Segmentation of distributors to understand product preferences.
    - Targeted distribution strategies to enhance relationships and satisfaction.

4. **Business Impact**:
    - Lower risk of expired stock.
    - better turnover.
    - efficient order placement.
    - potential cost savings.

These outcomes will give RL Associates data-driven insights to streamline operations and enhance decision-making.