Enhancing Supermarket Profitability by Optimizing Product Categories, Operational Efficiency, and Customer Loyalty Programs

A Proposal report for the BDM capstone Project

Submitted by

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Contents

Declaration Statement

I am working on a Project titled “Enhancing Supermarket Profitability by Optimizing Product Categories, Operational Efficiency, and Customer Loyalty Programs”. I extend my appreciation to Supermarket, 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 through primary sources and carefully analyzed to assure its reliability.

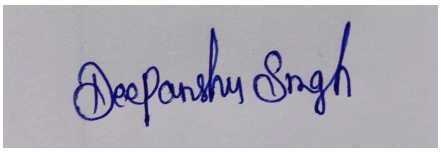
Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the information 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 agree that all the recommendations are business-specific and limited to this project exclusively, and cannot be utilized for any other purpose with an IIT Madras tag. I understand that IIT Madras does not endorse this.

Signature of Candidate:



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Date: 10/10/2025

1. Executive Summary and Title

This project analyzes a B2C supermarket chain operating three branches across Myanmar, offering six product categories including Food and beverages, Electronics, Fashion, Health and beauty, Home lifestyle, and Sports items.

The supermarket faces three critical business challenges: inefficient product category resource allocation limiting profitability, inadequate understanding of peak operational hours causing service quality degradation and staffing inefficiencies, and underutilized customer segmentation strategies resulting in missed revenue opportunities from both Member and Normal customer segments. This BDM capstone project addresses these issues using secondary data from Kaggle containing 1,000 transactions spanning three months (January-March 2019).

This proposal presents a data-driven approach to address these challenges by analyzing transactional sales, customer behavior, and temporal patterns. The project aims to increase product category profitability by 15-20%, enhance operational efficiency by 25-30% through optimized staff scheduling, and boost customer lifetime value by 20% through targeted Member conversion programs and segmentation strategies. Outcomes will be measured using specific KPIs including revenue per category, hourly transaction efficiency, and membership conversion rates, ensuring actionable and sustainable business improvements.

2. Organization Background

The Myanmar Supermarket Group is a multi-branch B2C retail chain operating three outlets (Alex, Giza, and Cairo) strategically located in Myanmar's major commercial hubs: Yangon, Naypyitaw, and Mandalay. Established in early 2019, the supermarket positioned itself as a modern retail destination offering diverse product categories including Food and beverages, Fashion accessories, Electronic accessories, Health and beauty, Home and lifestyle, and Sports and travel equipment.

The business adopted a customer-centric approach by introducing a membership loyalty program alongside traditional walk-in shopping, successfully enrolling 56.5% of its customer base within the first quarter. The supermarket embraces payment flexibility by accepting Cash, Credit card, and digital Ewallet transactions, catering to Myanmar's evolving digital payment landscape. During its first three months of operation (January-March 2019), the chain processed 1,000 transactions generating $322,966.75 in revenue. However, rapid expansion without data analytics infrastructure has created challenges in inventory optimization, operational efficiency, and customer retention strategies.

3. Problem Statement

3.1 Problem Statement 1: Inefficient Product Category Resource Allocation

Inefficient product category resource allocation limits profitability due to lack of insights into category-wise performance, leading to suboptimal inventory investments and shelf space utilization across six product lines.

Objective: Identify top-performing and underperforming product categories to optimize inventory budgets, shelf space allocation, and marketing expenditure, targeting a 15% improvement in category-level profitability.

3.2 Problem Statement 2: Operational Inefficiency Due to Unknown Peak Patterns

Absence of time-based sales analytics causes inadequate staffing during peak hours and overstaffing during slow periods, negatively impacting customer service quality and operational costs.

Objective: Determine hourly and daily sales patterns to implement data-driven staff scheduling, plan time-specific promotions, and improve customer satisfaction ratings by 20% during peak hours.

3.3 Problem Statement 3: Untapped Revenue Potential from Customer Segmentation

Untapped customer segmentation potential results in missed revenue opportunities as the supermarket fails to leverage behavioral differences between Member and Normal customers for targeted marketing and conversion strategies.

Objective: Analyze purchasing behaviors across customer segments to design effective loyalty enhancement strategies for Members and conversion programs for Normal customers, targeting a 25% increase in membership conversion rates and 18% growth in average Member transaction values.

4. Background of the problem

Internal Problems:

1. Lack of Business Intelligence Framework: The supermarket collects transactional data but lacks analytical capabilities, resulting in intuition-based inventory decisions causing stockouts of high-demand items and overstocking of slow-movers. Food and beverages generates highest gross income ($2,673.56) but this insight remains hidden.

2. Inefficient Staff Scheduling: Fixed scheduling patterns ignore hourly traffic variations. Peak hour 7:00 PM (113 transactions, $351.32 average sales) shows customer ratings dropping to
6.72 due to understaffing, while 8:00 PM (75 transactions) indicates overstaffing.

3. Underutilized Membership Program: Members contribute 58.7% revenue despite being only 56.5% of customers. Normal customers report higher satisfaction (7.04 vs 6.92), indicating unmet Member expectations without systematic analysis to identify root causes.

External Problems:

1. Competitive Disadvantage: Myanmar's retail landscape demands operational excellence. Competitors with advanced analytics offer personalized experiences, dynamic pricing, and optimized product assortments, creating competitive disadvantage.

2. Changing Consumer Preferences: Digital payment shift (Ewallet constitutes 34.5% of transactions) requires adaptive strategies that cannot be developed without understanding payment-transaction value correlations.

3. Unexploited Seasonal Opportunities: Seasonal demand fluctuations and local festivals create sales opportunities. The three-month dataset (January-March) captures potential variations, but without temporal analysis, future demand cycles cannot be anticipated.

5. Problem Solving Approach

5.1 Data Collection and Preparation

The project analyzes a Kaggle dataset of 1,000 supermarket transactions with 17 attributes including Invoice ID, Branch, Customer type, Product line, Sales, and Rating. With zero missing values, the dataset ensures analytical integrity.

Preprocessing converts Date and Time into datetime formats for temporal analysis. Derived variables include hourly patterns, weekday trends, transaction value tiers, and customer segments. Validation procedures identify outliers to maintain result accuracy.

5.2 Product Category Performance Analysis

Statistical analysis calculates revenue, transaction volumes, ratings, and gross income across six product lines. Bar charts compare revenue, pie charts show market share, and scatter plots reveal rating-sales relationships.

Profitability rankings identify top performers (Food and beverages, Sports and travel) and areas needing improvement (Health and beauty). Branch-specific analysis enables targeted inventory management, addressing Problem 1 through optimized resource allocation.

5.3 Peak Hour and Temporal Pattern Analysis

Time-series analysis aggregates sales data hourly (10:00 AM - 8:00 PM) and daily, calculating revenue and transaction counts. Operating hours are categorized as Peak (>100 transactions), Moderate (85-100), or Off-Peak (<85).

Staffing projections establish transaction-per-staff ratios for optimal scheduling. Weekly analysis identifies Saturday's peak revenue ($56,120.81) versus Wednesday's low ($43,731.14), suggesting targeted promotional strategies. This addresses Problem 2 by enhancing operational efficiency.

5.4 Customer Segmentation and Behavioral Analysis

Comparative analysis examines Member (565) versus Normal (435) customer segments. Independent t-tests and chi-square analysis evaluate spending differences ($335.74 vs $306.37) and category preferences.

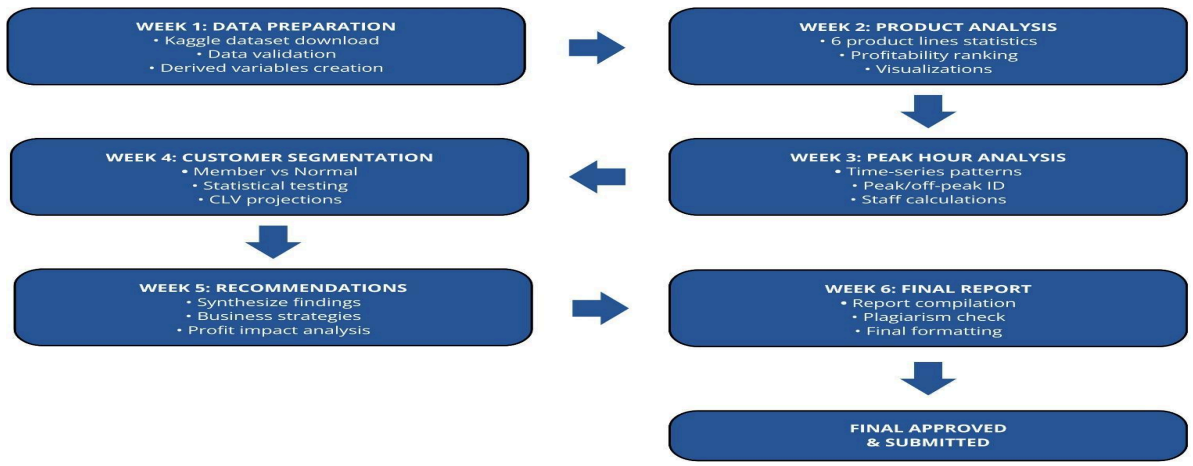
Members favor Food and beverages ($34,822.39) while Normal customers prefer Electronic accessories ($25,142.78). Investigation of higher Normal customer satisfaction (7.04 vs 6.92) through cross-tabulation provides conversion insights. This addresses Problem 3 by maximizing segmentation value.

5.5 Analytical Tools

SQL for data extraction, Python libraries (Pandas, NumPy, Matplotlib, Seaborn, SciPy) for statistical analysis and visualization, Excel for calculations, and Word for documentation.

6. Expected Timeline

6.1 Work Breakdown Structure:



6.2 Gantt Chart:

1 Task	Start Date	End Date	Duration
1.1 Data Preparation	13-Oct-25	15-Oct-25	2
1.2 Data Cleaning	16-Oct-25	18-Oct-25	2
1.3 Product Category Analysis	19-Oct-25	22-Oct-25	3
1.4 Peak Hour Analysis	23-Oct-25	26-Oct-25	3
1.5 Staff requirement calculations	27-Oct-25	30-Oct-25	3
1.6 Customer Segmentation Analysis	1-Nov-25	5-Nov-25	4
1.7 Business recommendations	6-Nov-25	8-Nov-25	2
1.8 Calculate profit impacts	10-Nov-25	17-Nov-25	7
1.9 Final Report Submission Prep	17-Nov-25	20-Nov-25	3
2 Final Report Submission Prep	20-Nov-25	1-Dec-25	11

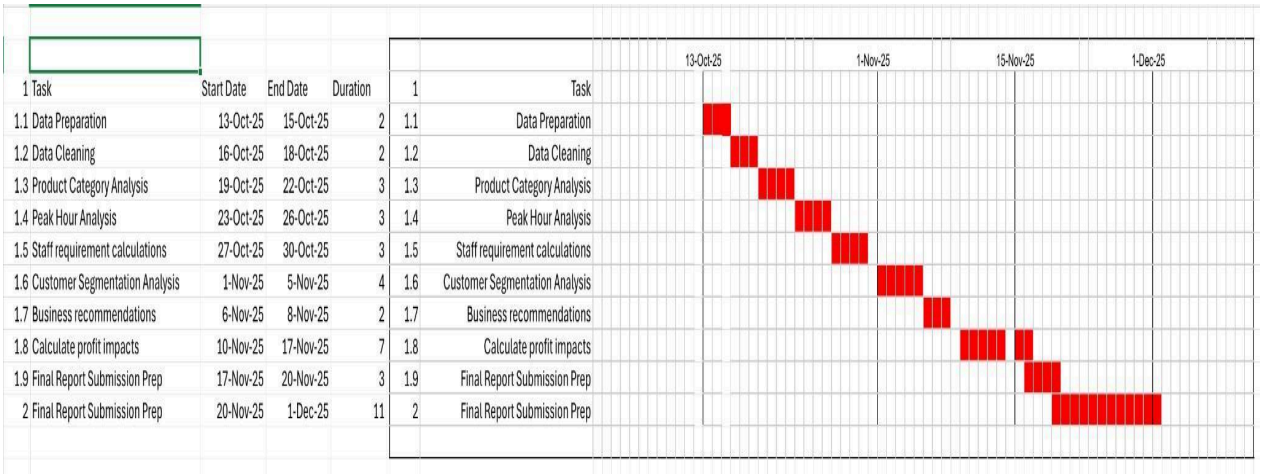


Figure 1: Expected timeline for completion of project

7. Expected Outcome

7.1 Better Inventory Management and Product Category Optimization

The analysis will identify high-performing and underperforming product categories among the six product lines, enabling optimized inventory allocation and shelf space management. Food and beverages category shows highest profitability while Health and beauty requires strategic intervention, allowing targeted resource investment to improve overall category performance by 15-20%.

7.2 Improved Operational Efficiency Through Data-Driven Staff Scheduling

The project will deliver data-driven staff scheduling recommendations based on hourly transaction patterns, addressing peak hour service quality issues (particularly 7:00 PM with low ratings despite high traffic). This optimization will reduce operational costs during off-peak periods while improving customer service during high-traffic hours, projecting 20-25% improvement in operational efficiency.

7.3 Enhanced Customer Value Through Strategic Segmentation

The customer segmentation analysis will develop targeted strategies for Member retention and Normal customer conversion. By understanding spending differences ($335.74 vs $306.37 average transaction) and satisfaction patterns, the supermarket can design effective loyalty programs and promotional campaigns to increase membership conversion rates by 20-25% and boost customer lifetime value by 15-20%.

END OF REPORT