

Sparking Growth: A Data-Driven Strategy For Optimizing Sales, Inventory, and Logistics for Shri Hari Electric And Electronics

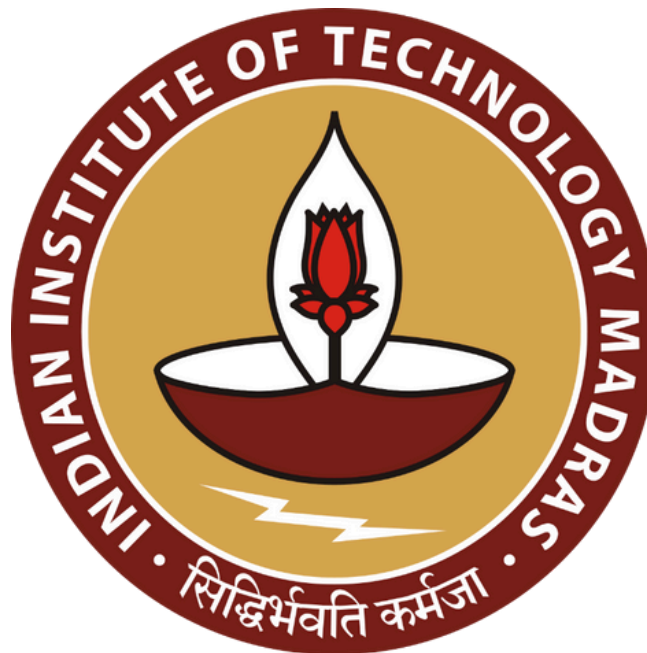
A Proposal report for the BDM capstone Project

Submitted by

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Declaration Statement

I am working on a project titled "**Sparking Growth: A Data-Driven Strategy For Optimizing Sales, Inventory, and Logistics for Shri Hari Electric And Electronics.**" I extend my appreciation to **Shri Hari Electric And Electronics**, 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.

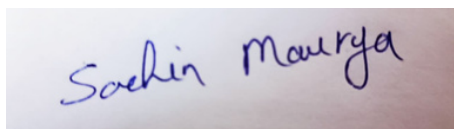
Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

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



Sachin Maurya

05-09-2025

1 Executive Summary

This project addresses the core operational challenges of Shri Hari Electric And Electronics, a B2C retail store established in 2022 in Mariyahu, Jaunpur. The store serves the local community with a diverse portfolio of electronics, furniture, and home wiring supplies. Despite its strategic location and product mix, the business faces significant hurdles to sustainable growth.

The primary problems stem from a combination of internal and external causes. Internally, the business relies on manual processes and intuition-based decision-making, lacking data-driven strategies. Externally, it is impacted by the highly seasonal purchasing behavior of a Tier-3 market and growing local competition. These factors result in three critical issues: severe revenue volatility with sales concentrated in festival seasons, inefficient inventory management leading to capital blockage and stockouts, and sub-optimal transportation logistics increasing operational costs.

To address these issues, this proposal outlines a data-driven, three-pronged analytical approach to be executed over an 11-week timeline. The methodology includes customer segmentation (RFM) and market basket analysis to stabilize revenue, a multi-criteria inventory classification (ABC-XYZ) to optimize stock, and a grid-based geospatial analysis to streamline logistics. The expected outcomes are a measurable increase in non-festival season profitability, a significant reduction in inventory holding costs, and enhanced operational efficiency. This will strengthen the store's competitive position and pave the way for long-term, sustainable growth.

2 Organization Background

Shri Hari Electric And Electronics was founded in 2022 by its proprietor, Mr. Santlal Maurya, to serve as a comprehensive one-stop shop for the electronic and home furnishing needs of residents in Mariyahu, Jaunpur. The store is strategically located at Mariyahu near Railway Fatak, Jaunpur, Uttar Pradesh 222161, a high-traffic area ensuring excellent visibility and customer access. Operating daily from 9:00 AM to 9:00 PM, the business is managed by a small team of four, including the owner.

The store operates on a Business-to-Consumer (B2C) model, targeting individual households. Its key market differentiator is a unique product mix that combines high-value consumer durables—such as refrigerators, coolers, and furniture—with a complete range of essential wiring materials for new home construction. This dual focus allows the business to cater to customers at different life stages, from furnishing a home to building one from the ground up. This positions the store as an essential partner for new home builders, creating a potential for consistent, project-based demand that can offset the seasonal, festival-driven sales cycle typical for consumer durables.

3 Problem Statement

3.1 Problem: Significant Revenue Volatility

Explanation: Sales are heavily concentrated in festive periods, causing sharp revenue declines and unpredictable cash flow during off-season months.

Objective: To design and validate a strategy to increase average monthly sales during non-festival seasons by 15% within six months of implementation.

3.2 Problem: Inefficient Inventory Management

Explanation: The lack of a systematic stock allocation policy results in overstocking of slow-moving items and stockouts of high-demand products.

Objective: To develop a dynamic inventory model that reduces overall holding costs by 10% and minimizes stockouts of key items to less than 5%.

3.3 Problem: Sub-optimal Transportation Logistics

Explanation: The reactive and unplanned process for delivering goods leads to inefficient routes, excessive fuel consumption, and potential service delays.

Objective: To streamline transportation operations to achieve a 15% reduction in delivery-related costs and improve the on-time delivery rate to over 95%.

4 Background of the Problem

The challenges confronting Shri Hari Electric And Electronics are symptomatic of a young, growing retail business in a semi-urban market. These problems are interconnected, creating a detrimental cycle where poor inventory management exacerbates revenue shortfalls, which in turn affects logistical planning. A comprehensive analysis reveals that the root causes are a mix of internal operational deficiencies and external market pressures.

Internal Causes:

As a recently established business, its operational processes are not yet mature. Critical decisions regarding purchasing, marketing, and stock allocation rely on the owner's intuition rather than historical data. Key processes, particularly inventory tracking between the main shop and warehouse, are performed manually, making them prone to error and lacking real-time visibility. This makes strategic stock placement nearly impossible. Furthermore, marketing efforts are likely concentrated around major festivals, with no structured customer engagement strategy to stimulate demand during leaner, non-festive periods.

External Causes:

The store operates in a market where consumer spending is heavily influenced by regional economic drivers, such as agricultural cycles, and the cultural importance of festival-based purchases. This creates a highly seasonal demand curve that is difficult to manage without proactive strategies. The competitive landscape consists of other local, unorganized retailers who compete aggressively on price, alongside the growing threat from e-commerce platforms. These issues are compounded by logistical challenges, including rising fuel costs and local infrastructure constraints, which inflate the cost and reduce the efficiency of last-mile delivery.

5 Problem Solving Approach

This project will adopt a structured, multi-faceted approach, broken down into three distinct parts for each objective: the methods to be used, the data required, and the tools for analysis.

5.1 Approach for Objective 1 (Revenue Stabilization)

- **Methods:**

- a. **RFM Analysis:** To segment customers based on Recency, Frequency, and Monetary value, enabling targeted off-season promotions.
- b. **Market Basket Analysis:** To identify product associations using metrics like support and confidence, informing product bundling and cross-selling strategies.
- c. **Sales Forecasting:** To establish a baseline of monthly sales using a Moving Average model, allowing for quantitative evaluation of new marketing initiatives against the forecast.

- **Data:** Anonymized transactional sales data from July 2024 to July 2025 will be collected. This includes Transaction_ID, Customer_ID, Date, Product_SKU, Quantity, and Price. This primary data is essential for analyzing customer behavior and sales patterns.
- **Tools:** The analysis will primarily use Python with the Pandas and NumPy libraries for data manipulation, modeling, and generating visualizations to illustrate findings.

5.2 Approach for Objective 2 (Inventory Optimization)

- **Methods:**

- a. **ABC-XYZ Analysis:** To classify inventory using a multi-criteria approach. ABC analysis will categorize items based on their contribution to revenue (e.g., the 80/20 rule), while XYZ analysis will categorize them based on demand volatility (Coefficient of Variation). This creates a nine-box matrix for a differentiated stocking policy.
- b. **Reorder Point (ROP) Calculation:** To determine optimal stock levels for high-value items using a statistical formula that accounts for average demand, lead time, and desired service level.

- **Data:** Historical product sales data (SKU, units sold), supplier lead times, and item cost data from July 2024 to July 2025 are required to accurately classify inventory and calculate control parameters.
- **Tools:** MS Excel will be used for initial data structuring. Python with Pandas and NumPy will be used for the quantitative analysis (CV, ROP) and for visualizing the inventory classification matrix.

5.3 Approach for Objective 3 (Logistical Enhancement)

- **Methods:**

- a. **Grid-Based Zone Analysis:** To group daily deliveries into geographical zones by overlaying a conceptual grid on the service area and assigning each delivery to a grid cell.
- b. **Nearest Neighbor Heuristic:** To determine an efficient delivery sequence within each zone by calculating a distance matrix and iteratively selecting the closest unvisited point.
- c. **Cost-Benefit Analysis:** To compare the Total Cost of Ownership (TCO) of the in-house delivery model against outsourcing to a local third-party provider.

- **Data:** Delivery logs (customer addresses, dates) from July 2024 to July 2025, vehicle expense reports, and quotations from local logistics providers will be used for this analysis.
- **Tools:** MS Excel will be used for the cost-benefit model. Python with Pandas and NumPy will be used for the grid analysis, distance calculations, and implementing the route sequencing algorithm. Charts will be used to support the final recommendations.

6 Expected Timeline

Here is the Work breakdown structure and Gantt chart that will provide the expected timeline for this project.

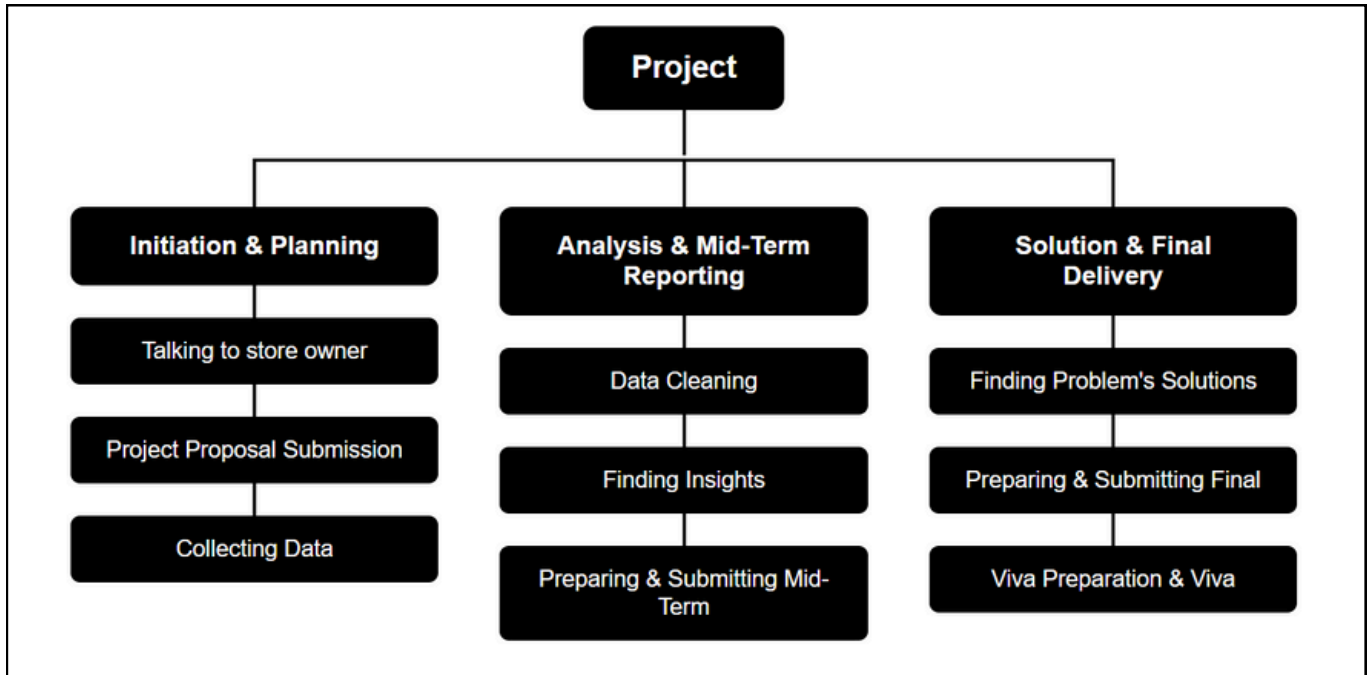


Figure 1: Work Breakdown Structure

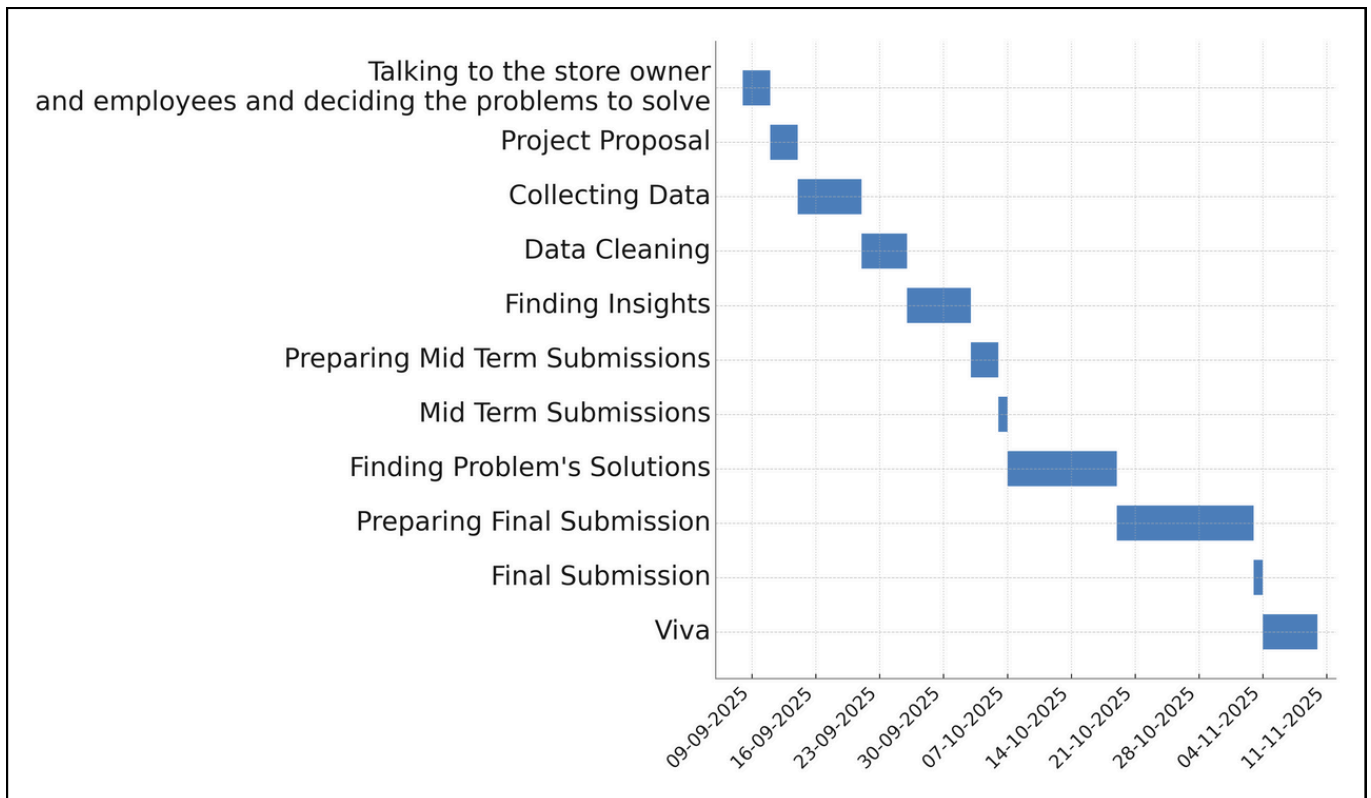


Figure 2: Proposed Gantt chart illustrating the project timeline and key milestones.

7 Expected Outcome

7.1 Enhanced Profitability and Cash Flow

- **7.1.1 Stabilized Revenue Streams:** The implementation of targeted marketing strategies based on customer segmentation and market basket analysis is projected to reduce the business's dependency on seasonal peaks.
- **7.1.2 Improved Year-Round Cash Flow:** By smoothing out sales throughout the year, the project will contribute to greater financial stability and more predictable cash flow.

7.2 Optimized Capital Allocation

- **7.2.1 Reduced Inventory Holding Costs:** A dynamic inventory policy will minimize capital locked in slow-moving or obsolete stock, directly reducing associated storage and maintenance costs.
- **7.2.2 Improved Return on Investment:** The capital freed from inefficient inventory can be strategically reinvested into high-demand, high-margin products, thereby improving the overall return on investment.

7.3 Increased Operational Efficiency and Customer Satisfaction

- **7.3.1 Quantifiable Operational Cost Savings:** Streamlined logistics through route optimization will lead to measurable reductions in fuel consumption and time spent on deliveries.
- **7.3.2 Enhanced Customer Loyalty:** Faster, more reliable deliveries, combined with better product availability, will directly boost customer satisfaction, fostering loyalty and creating a sustainable competitive advantage in the local market.

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