Improving Inventory Management and Operational Efficiency for a Fertilizer and Pesticide Business

A Proposal report for the BDM capstone

Project Submitted by

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Contents

Declaration Statement

I am working on a Project Title "**Improving Inventory Management and Operational Efficiency for a Fertilizer and Pesticide Business**". I extend my appreciation to **Jyoti Trading Company**, 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: (**Digital Signature**)

Name: Abhishek

Date: 5 September, 2024

1. Executive Summary and Title

Title: Improving Inventory Management and Operational Efficiency for a Fertilizer and Pesticide Business

This project aims to enhance inventory management and operational efficiency for Jyoti Trading Company, a small fertilizer and pesticide business. The primary focus is on addressing inventory mismanagement, which leads to issues such as overstocking and stockouts, resulting in financial strain and inefficiencies. The project involves analyzing historical data recorded manually and identifying patterns that can inform better inventory practices. By leveraging these insights, practical recommendations will be provided to optimize stock levels, improve cash flow, and increase overall operational efficiency. The expected outcomes include cost reduction, better product availability for customers, and improved financial stability for the business.

2. Organization Background

Jyoti Trading Company, located in Kithana, Haryana, was established by two brothers, Dalbir and Balraj. The business operates in the B2C sector, providing fertilizers and pesticides to local farmers and has built a reputation for providing reliable products. Over the years, the company has experienced both growth and challenges. Initially, they employed an accountant and a helper, but financial pressures forced them to downsize, letting go of the accountant a couple of years ago and the helper last year. The business also struggles with customers failing to return payments. Despite these setbacks, Jyoti Trading Company continues to serve the local agricultural community, aiming to remain competitive in the face of growing challenges from larger, more technologically advanced suppliers.

3. Problem Statement

Problem Statement 1: Inefficient inventory management leading to overstocking and stockouts.
Explanation: The business struggles with overstocking and stockouts due to outdated inventory practices, leading to higher costs and missed sales.

Problem Statement 2: Poor cash flow management due to inconsistent inventory practices.
Explanation: Excess inventory ties up capital, while stockouts result in lost sales, causing cash flow issues and financial instability.

Problem Statement 3: Reliance on manual data recording leading to inaccuracies.
Explanation: Manual tracking errors lead to inaccurate inventory records, complicating stock management and decision-making.

4. Background of the Problem

Effective inventory management is crucial for the smooth operation of a fertilizer and pesticide business. The business currently relies on manual methods for tracking inventory, which leads to frequent discrepancies and inefficient stock levels. Overstocking results in higher holding costs and tied-up capital, while stockouts lead to lost sales and customer dissatisfaction.

Internal problems include outdated practices and lack of technological integration, causing inaccuracies and inefficiencies. External factors such as fluctuating demand and supply chain disruptions also exacerbate the issues.

5. Problem Solving Approach

1. **Data Collection and Preparation:**
    - Digitize Data: Convert two seasons of paper records into Excel spreadsheets.
    - Data Cleaning: Standardize formats, handle missing values using interpolation or imputation, and organize data into structured tables to ensure accuracy for analysis.
2. **Demand Forecasting:**
    - Time Series Analysis: Use Python's statsmodels for forecasting. Implement ARIMA models to predict future demand based on historical data.
    - Model Validation: Evaluate model performance with AIC and BIC. Consider alternative methods like Moving Averages or Exponential Smoothing if ARIMA is insufficient due to limited data.
3. **ABC Analysis:**
    - Categorize Inventory: Apply Python to perform ABC analysis, classifying items into:
      A Items: High-value, low-quantity items needing close monitoring.
      B Items: Moderate-value items with moderate sales frequency.
      C Items: Low-value, high-quantity items.
    - Focus Management: Prioritize efforts on A items for detailed oversight and manage C items with routine checks.
4. **Inventory Optimization:**
    - Calculate Optimal Levels: Develop a Python script to determine:
      Reorder Points: Levels at which new stock should be ordered to avoid stockouts.
      Safety Stock: Extra stock to cover demand variability.
    - Economic Order Quantity (EOQ): Use the EOQ model to find the most cost-effective order size by balancing ordering, holding, and shortage costs.
5. **Cash Flow Analysis:**
    - Create Model: Build an Excel cash flow model that incorporates inventory costs, sales projections, and payment cycles.
    - Sensitivity Analysis: Assess how different inventory strategies impact cash flow through scenario analysis, understanding financial implications of various inventory levels and order frequencies.

6. Expected Timeline

6.1 Work Breakdown Structure:

	Task Name	Duration	Start Date	End Date
1	**Proposal Submission**	**1 day**	**2024-09-05**	**2024-09-05**
2	**Data Collection and Initial Analysis**	**2 days**	**2024-09-06**	**2024-09-07**
2.1	Gather historical data from paper records	1 day	2024-09-06	2024-09-06
2.2	Cleanup and structure the data	1 day	2024-09-07	2024-09-07
3	**Analysis and Mid-Term Report Preparation**	**2 days**	**2024-09-08**	**2024-09-09**
3.1	Analyze collected data	1 day	2024-09-08	2024-09-08
3.2	Prepare mid-term report	1 day	2024-09-09	2024-09-09
4	**Mid-Term Submission**	**1 day**	**2024-09-10**	**2024-09-10**
5	**Incorporate Feedback and Finalize Report Preparation**	**4 days**	**2024-09-11**	**2024-09-14**
5.1	Review feedback from mid-term submission	1 day	2024-09-11	2024-09-11
5.2	Refine analysis	2 days	2024-09-12	2024-09-13
5.3	Prepare final report	1 day	2024-09-14	2024-09-14
6	**Final Submission**	**1 day**	**2024-09-15**	**2024-09-15**

Figure 1 Work Breakdown Structure of Project

6.2 Gantt chart

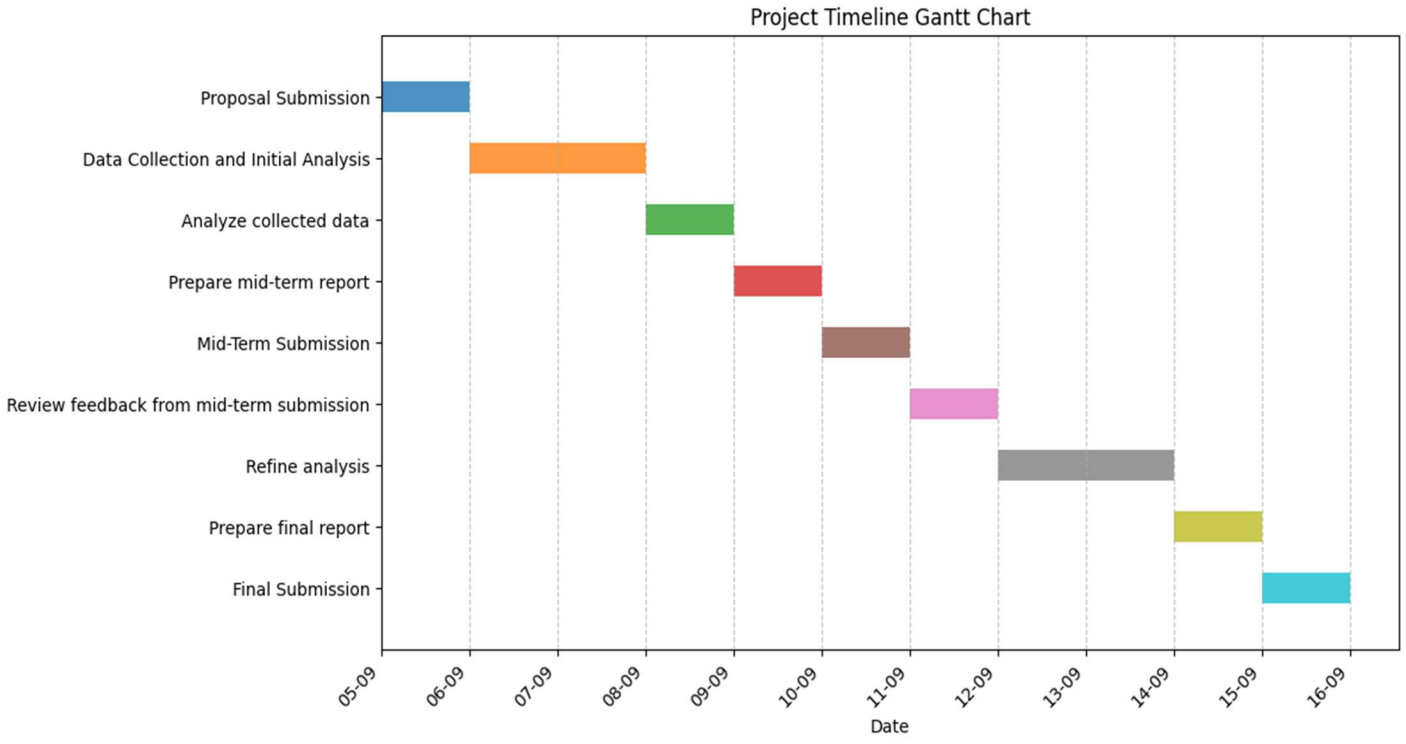

Figure 2 Expected timeline for completion of project.

7. Expected Outcome

The project will deliver practical recommendations aimed at improving inventory management and operational efficiency for the fertilizer and pesticide business. The outcomes will include:

1. **Optimized Inventory Levels:**
   Recommendations based on historical data to adjust stock levels and reorder points, reducing overstocking and stockouts.
2. **Enhanced Cash Flow Management:**
   Suggestions for better cash flow management by optimizing inventory practices and resource allocation.
3. **Improved Sales and Customer Satisfaction:**
   Strategies to ensure key products are consistently available, enhancing customer satisfaction and boosting sales.
4. **Operational Efficiency:**
   Practical advice for streamlining inventory management processes and reducing manual errors.
5. **Actionable Insights:**
   Data-driven insights to aid in making informed decisions and improving overall business performance.

These recommendations will be feasible and easy to implement without requiring advanced technology or extensive training, providing the business with clear steps to improve its operations.