

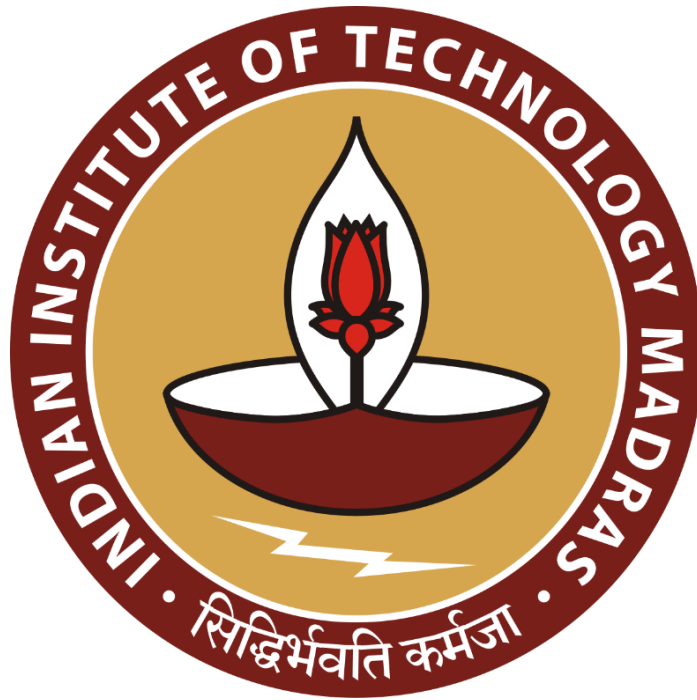
**Data-Driven Demand Forecasting and Stock Optimization  
for an Army CSD**

**A Proposal report for the BDM capstone Project**

Submitted by

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## **Declaration Statement**

I am working on a Project Title “Data-Driven Demand Forecasting and Stock Optimization for an Army CSD”. I extend my appreciation to **HQ Pashchim MP Sub Area Unit Run Canteen**, 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:



Name: Akshata Kumar

Date: 3/11/24

## **1 Executive Summary**

The project focuses on the Army Canteen Stores Department (CSD) particularly the MP Sub Area Unit Run Canteen, a B2C organization located in Bhopal Cantt serving as a retail chain for military personnel and their families. Operating across the country, CSD provides essential goods at discounted rates, catering to the unique needs of its customer base.

The primary issue faced by the CSD is the challenge of maintaining optimal inventory levels. Due to varying demand patterns and a wide range of products, the department often struggles with either stockouts of high-demand items or surplus inventory of low-demand items. These inefficiencies can result in increased storage costs, delayed stock replenishment, and a mismatch between supply and demand, impacting customer satisfaction and operational costs.

This project aims to tackle these challenges through data-driven demand forecasting and inventory optimization. By leveraging historical sales data and employing analytical techniques such as trend analysis and demand forecasting, this study seeks to improve stock replenishment processes and predict future demand with accuracy. The expected outcome is an optimized inventory management strategy that will not only minimize overstock and understock situations but also reduce holding costs, improve operational efficiency, and enhance customer satisfaction within the canteen.

## **2 Organization Background**

The organization for this project is the MP Sub Area Unit Run Canteen, located in Bhopal Cantt, Madhya Pradesh, India. As part of the larger network of the Canteen Stores Department (CSD), this unit serves military personnel (both serving and retired) and their families by providing essential goods and products at subsidized rates. CSD was established in 1948, and over the years, it has expanded to hundreds of retail outlets across India, primarily located within army cantonments and bases.

The canteen operates under a structured chain of command with dedicated administrative and supply staff to oversee daily operations. It offers a range of goods, including groceries, electronics, household items, and personal care products, focusing on quality and affordability for its unique customer base. The canteen's mission is to ensure welfare by maintaining affordability and convenience for military families. It embodies the vision of CSD by promoting the well-being of the armed forces community through reliable, cost-effective access to necessary goods.

### 3 Problem Statement

The MP Sub Area Unit Run Canteen in Bhopal faces challenges in effectively managing its inventory, leading to inconsistencies in stock availability and increased holding costs. The inability to accurately predict demand for various products has resulted in either surplus inventory or stockouts, impacting customer satisfaction and operational efficiency. Additionally, there is a need to streamline replenishment cycles to better meet demand and reduce waste.

#### Objectives:

1. **To improve inventory management efficiency** by identifying optimal stock levels for high-demand items.
2. **To enhance demand forecasting accuracy** by analysing historical sales data for patterns and trends.
3. **To minimize holding costs and reduce stockouts** by improving stock replenishment strategies aligned with demand.

### 4 Background of the Problem

The MP Sub Area Unit Run Canteen in Bhopal faces some challenges in managing inventory and ensuring consistent stock availability. This problem arises primarily due to a lack of effective demand forecasting and streamlined inventory control practices. Due to varying demand patterns and limited predictive capabilities, the canteen occasionally experiences stockouts of popular items and surplus stock of low-demand items, leading to increased holding costs and customer dissatisfaction.

Key factors contributing to the problem include inconsistent supply chain management, which affects the timely replenishment of stock, and the broad range of goods offered, making it challenging to accurately predict demand. Additionally, seasonal demand fluctuations and limited infrastructure escalate the issue by creating bottlenecks during peak demand periods.

Internal factors contributing to the problem include insufficient data-driven strategies for inventory control and forecasting. The canteen relies on historical sales records without leveraging advanced analytical methods, which limits its ability to adapt quickly to changing demand.

External factors impacting the problem are supply chain disruptions, which are common in the retail sector and affect timely product availability, and competitive pricing pressures, which demand that the canteen operate efficiently to maintain affordability. Addressing these issues is essential to optimize operations and meet customer expectations effectively.

## 5 Problem Solving Approach

To address the inventory management and demand forecasting challenges faced by the CSD, I plan to implement a multi-step data-driven approach. This approach focuses on leveraging historical sales data, exploring customer demand patterns, and employing analytical techniques to improve the efficiency of inventory control and stock replenishment.

### 1. Data Collection and Cleaning:

The first step involves collecting historical sales data, inventory records, and customer purchase trends. Data cleaning will be critical to ensure the dataset is accurate, consistent, and devoid of outliers or missing values. This step also includes categorizing products by demand levels, seasonal variability, and turnover rates, laying the foundation for insightful analysis.

### 2. Demand Forecasting Analysis:

Once the data is prepared, I plan to apply demand forecasting models to predict future sales patterns. Techniques such as time-series analysis, moving averages, and seasonality adjustments will be employed to assess trends and forecast short- and long-term demand. Machine learning algorithms like ARIMA (AutoRegressive Integrated Moving Average) could be used to improve forecast accuracy and adjust predictions based on previous patterns and external factors.

### 3. Inventory Optimization Models:

Using the demand forecasts, I plan to develop inventory optimization models to define optimal stock levels for various products. The Economic Order Quantity (EOQ) model, which minimizes the combined cost of ordering and holding inventory, will be employed to determine the optimal order size. Safety stock calculations and reorder points will be established to ensure high-demand items are consistently available while minimizing excess stock of low-demand items. This will reduce holding costs and improve cash flow within the canteen's inventory system.

### 4. Stock Replenishment Strategy:

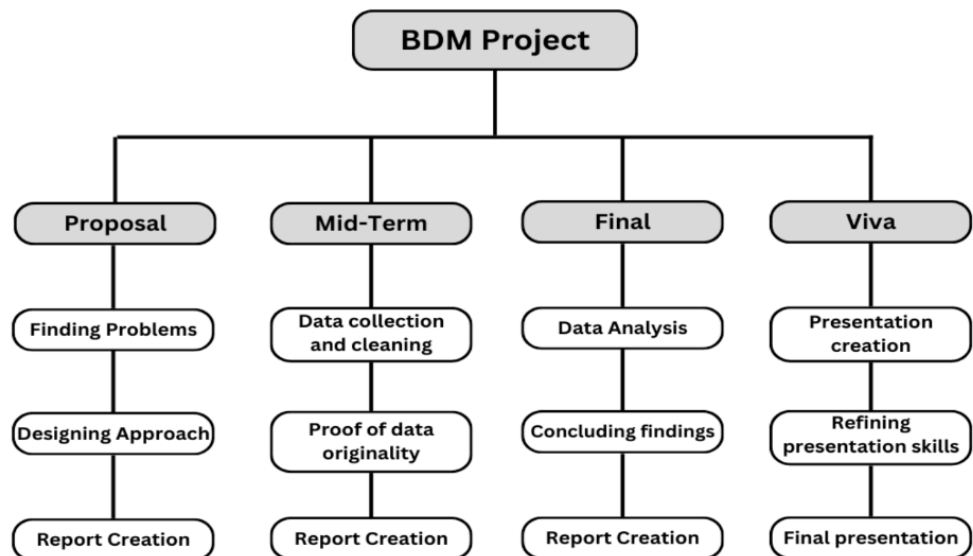
To streamline the replenishment process, I think of using a just-in-time (JIT) approach, where stock is ordered based on demand forecasts and reorder levels. Collaborating closely with suppliers and establishing better communication channels will be integral to this approach.

### 5. Performance Monitoring and Adjustment:

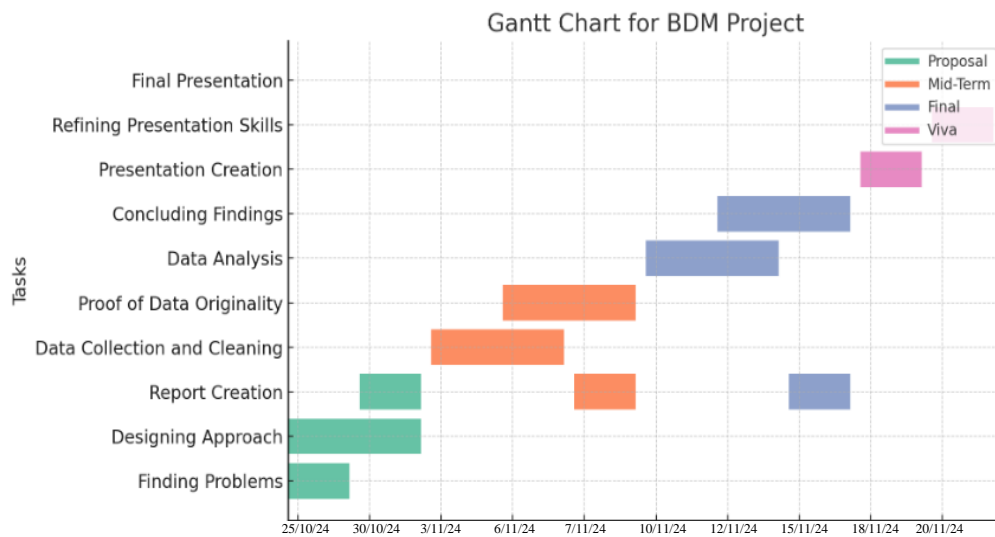
Post-implementation, I could employ a performance monitoring system to track key performance indicators (KPIs) such as stock turnover rates, stockout incidents, and holding costs. Regular audits of inventory data will help identify discrepancies, and demand forecasting models will be adjusted periodically to account for new trends or seasonal shifts. In addition to this, continuous feedback from customers regarding product availability will provide qualitative insights to improve inventory decisions further.

## 6 Expected Timeline

### 6.1 Work Breakdown Structure



### 6.2 Gantt Chart



## **7 Expected Outcome**

The expected outcome of my BDM Capstone project is to significantly enhance inventory management within the MP Sub Area Unit Run Canteen. By applying advanced data analysis and demand forecasting techniques, the project aims to provide the canteen with a robust method for predicting product demand accurately. This will reduce both stockouts of high-demand items and the overstocking of low-demand items, thus optimizing storage space and lowering holding costs. Additionally, the project will implement efficient stock replenishment strategies, ensuring timely restocking based on actual demand patterns and seasonality. The overall result will be an increase in customer satisfaction due to better product availability, a reduction in waste, and improved cash flow management within the canteen. Ultimately, this data-driven approach will lead to a more streamlined, cost-effective, and responsive inventory management system, aligned with the unique needs of the Army CSD's customer base.