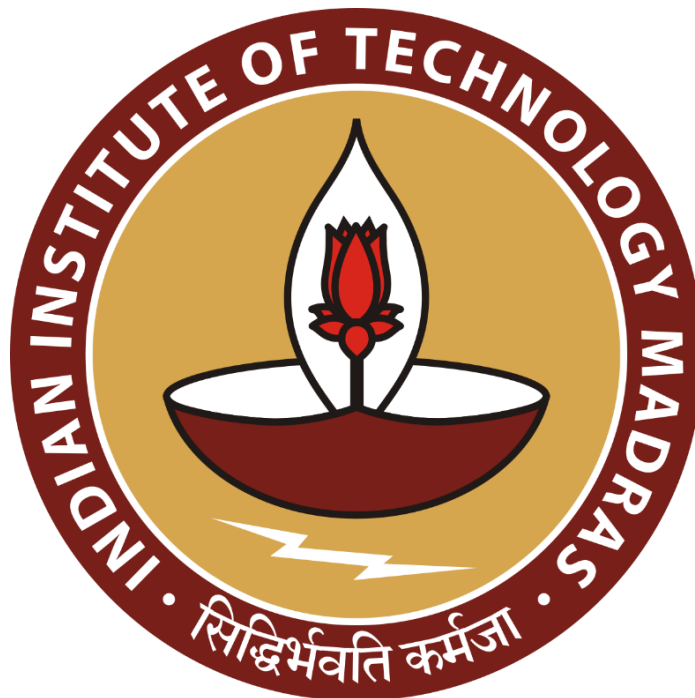# Advanced digital data management and Demand forecasting framework for optimizing inventory & sales in women's boutique

A Proposal report for the BDM capstone Project

Submitted by

Name: Vansh Verma

Roll number: 23f2005080

IITM Online BS Degree Program,

Indian Institute of Technology, Madras, Chennai

Tamil Nadu, India, 600036

Contents

Declaration Statement

I am working on a Project Title "Advanced data management and demand forecasting framework for optimizing inventory and sales in a women's clothing boutique.". I extend my appreciation to Pattern House women's boutique for providing the necessary resources that enabled me to conduct my project.
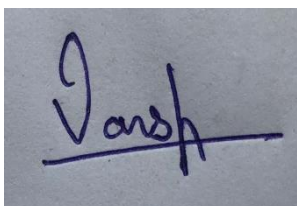
I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered through primary sources and carefully analyzed to assure its reliability.

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: Vansh Verma

Date: 13/10/2025

1 Executive Summary and Title

The project focuses on a women's clothing boutique located at Shanti tower 2nd floor, Chan gate, Beawar, Rajasthan, 305901. The business is B2C and deals directly to individual customer.

Currently, The organization faces two major issues: (1) all data such as sales, customer preferences and inventory are recorded manually in dairies, making it difficult to track trends, and (2) inventory mismanagement, inability to identify best-selling product, and lack of insight into seasonal demand fluctuations. These challenges directly affect inventory efficiency, customer satisfaction, and revenue.

To resolve these issues, the project purpose will be development of a cloud-based data management and analytics system using platform like Google Sheets and forms for digital data collection. Analytical dashboards will be created to visualize monthly product demand, identify high- and low-demand season period.

Tools like Python (pandas, scikit-learn, matplotlib), Excel, and possibly Streamlit will be employed.

The project is aims to help the boutique improve decision-making, optimize inventory, and plan season efficiently, ultimately improving satisfaction and business profitability

2 Organization Background

The company that I am working with is Pattern House women's clothing boutique founded in 2021 by Ms.Neelam Verma; which is a for-profit corporation and b2c business with 3 types of main products that are dresses, fabrics and dress rental stuff. The owner Ms.Neelam verma is a fashion designer and has 11+ years teaching fashion designing in a college. The shop recently opened in Shanti tower, Beawar, Rajasthan. The shop has large physical unstructured data in dairies. The unstructured data have

1. Customized designs and tailors service data
2. Inventory and stock details.
3. Seasonal and festival demands, especially during wedding seasons events.
4. Customer information.

They daily record data for upcoming stock for all fabric and customer information. They do suffer from problems with the data analysis part due to physical data and lack of information in using tools.

3 Problem Statements

Problem statement :
1. Physical data written in dairies which are unstructured :
   The boutique currently maintains sales and inventory data manually in dairies, resulting in disorganized and no upcoming sales prediction.
2. The lack of demand forecasting leads :
   There is no data-driven insight into which dress types are in high demand during specific months or seasons (specially wedding season).

4 Background of the Problem

Major cause of problems:

1. Major causes arise due to lack of digital data management, the owner has to predict demand without proper use of data scientist tools.

1. Manual Record-keeping:

   The boutique still depends on handwritten diaries for recording order, sales, and expenses. This outdated method often leads to missing data, duplication, and difficulties in retrieving historical records.

2. Lack of centralized data System:

   Without a unified digital platform, sales, inventory, and customer information remain scattered, preventing the identification of best-selling product and accurate demand analysis.

3. Inability to forecasting Demand:

   The absence of analytical tools makes it impossible to predict which dress types will be in demand during specific months, resulting in overstocking, under stocking, and un-predicting workload during different seasons.

2. Major causes arise due to single handling of all work by the owner.

Internal problems:

1. Overdependence on the Owner:

   The owner manages stitching, sales, customer interaction, and data entry single-handedly, leaving limited time for data analysis or business planning.

2. Lack of Technical knowledge or tools:

   The boutique lacks familiarity with data management software, hindering the adoption of efficient analytical system for growth.

3. Major causes arise due to seasonal and marketing influences.

External problems:

1. Seasonal demand fluctuations:

   Sales spike during festival and wedding seasons but drop sharply in off-peak months, leading to uneven workload and resource utilization.

2. Rapidly changing fashion trends:

   The boutique struggles to anticipate fast-changing customer preferences without systematic data tracking and trend analysis.

5. Problem Solving Approach (400 Words)

To address the dual challenges of stock-out issues and expired inventory mismanagement, the project follows a structured approach comprising three key stages: **Data Collection**, **Methods**, and **Analysis Tools**.

5.1 Data Collection and Digitization

The first step involves extracting unstructured data such as daily sales, fabric stock, dress categories, and customer information will be collected from handwritten records and converted into digital format

- Type and quantity of products

- Date and time of purchase

- Inventory remaining after each transaction

- Returned or canceled items with respective dates with feedback.

Additional manual logs (if available) may be used to complement missing fields:

- Missing or null values

- Duplicate customer entries

- unsold dresses and fabrics

This results in a cleaned, time-indexed dataset suitable for trend and predictive analysis.

5.2 Methods

After data preparation, exploratory data analysis (EDA) will be performed to identify sales trends, seasonal patterns, and common stock-out triggers. Based on these insights:

- A **regression model** (like Linear Regression or Random Forest) will be trained to forecast sales requirements for each fabric and dresses based on past sales.

- A **classification or rule-based model** can be applied to identify which product categories are high or low performers.

- If regression models underperform, give poor results due to limited data, a fallback to **time-series visualization and trend extrapolation** will be applied to estimate future demand based on historical pattern.

The predictions will be validated using historical data to simulate reordering decisions and minimize error.

5.3 Analysis Tools

The primary tools used will include:

- **Python** (pandas, scikit-learn, matplotlib/seaborn) for modeling and data preprocessing

- **Excel** (Google sheets) for storing data online and data exploration

- **Flask** for building a simple dashboard that shows:

  - Customer and sales summary

  - Fabric and dress stock information

  - Seasonal demand graphs

The final objective is to deliver a practical, tested decision-support tool that easily use by non-technical boutique staff, helping improve day-by-day operational efficiency and more accurate business planning.

5   Expected Timeline

The following Gantt chart visually outlines the key activities and durations from October 10, 2025, through December 11, 2025. Tasks are organized in sequential blocks.

Timeline Overview:
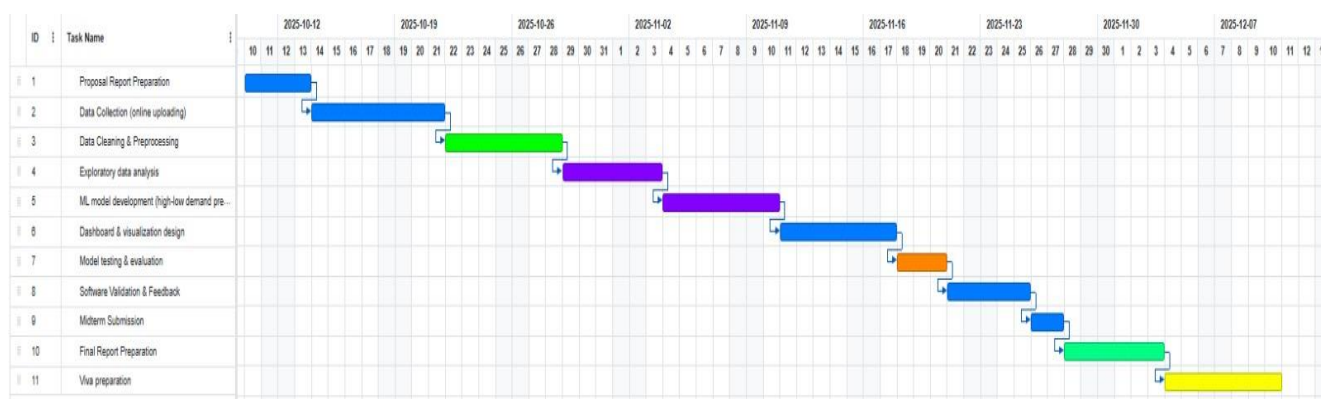
Gantt Chart

Task	Start	End	Duration	Dependency
Proposal Report Preparation	October 10	October 14	4 days	—
Data Collection	October 14	October 21	7 days	After Proposal

Data Cleaning & Preprocessing	October 22	October 28	6 days	After Collection
Exploratory Data	October 29	November 3	4 days	After Cleaning
Analysis				
ML Model development (high-low predictor)	November 4	November 10	6 days	After EDA
Visualization Dashboard	November 11	November 17	4 days	After ML devlopment
Model Testing & Evaluation	November 18	November 20	2 days	After ML & Viz
Software Validation & Feedback	November 21	November 25	4 days	After Testing
Midterm Submission	November 26	November 27	1 days	After Validation
Final Report Preparation	November 28	December 03	4 days	After Midterm
Viva Preparation	December 04	December 11	6 days	After Final Report

Work breakdown structure (WBS)-
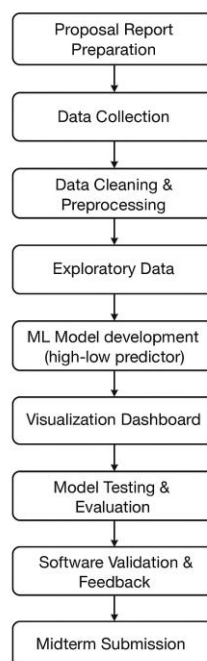
7. Expected Outcomes

1. **Optimized Inventory Planning**
   The digital system will enable accurate tracking of fabric stock and finished dresses, reducing overstocking or shortages though data-driven reorder alerts and monthly demand patterns.

2. **Efficient data management and decision support**
   All customer, sales, and expense data will be organized in a centralized digital platform. This will make it easier to retrieve and update records, improving daily operation efficiency and decision-making.

3. **Forecasting Models**
   A regression-based predictive model will forecast future sales and seasonal peaks. If regression performance is weak, trend extrapolation using time-series methods will be applied for reliable forecasting.

4. **Visualization Dashboard**
   A user-friendly dashboard using Streamlit will display:

   - Pie charts: Display product-wise sales distribution.

   - Bar charts: Shows month-wise sales trends and comparison between different dress types.

   - Filters: Allows users to view data by time range, fabric type, or customer segment.

5. **Validated Tool**
   Final software will be tested with the shop owner and refined for real-world use, offering actionable insights and ready for real-world use.