Business Requirements Document (BRD)

1. Document Control and Introduction

Attribute	Value
Project Title	Retail Sales Forecasting & Inventory Optimization
Document Version	1.0
Project By	Harsh Vijay Jha
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1.1 Purpose of this Document

The purpose of this Business Requirements Document (BRD) is to clearly define the high-level business needs, objectives, scope, and anticipated outcomes for the **Retail Sales Forecasting & Inventory Optimization System** project. This document serves as a foundational agreement between the business stakeholders and the project team, ensuring all subsequent functional and technical requirements align with the strategic goals outlined herein.

1.2 Executive Summary

Retail operations depend heavily on the accurate planning of sales, inventory, and pricing decisions. Poor visibility into demand patterns currently causes significant revenue loss, frequent stockouts, and unnecessary holding costs. This project aims to develop a comprehensive analytics system combining exploratory data analysis (EDA), advanced demand forecasting, inventory optimization, and pricing insights. By leveraging historical sales, inventory, pricing, and external factors like weather, holidays, and promotions, the system will enable businesses to plan proactively, significantly reduce costs, and improve product availability and customer satisfaction.

2. Business Context and Objectives

2.1 Business Problem

The organization currently struggles with several critical pain points directly impacting profitability and customer experience:

- **Demand Visibility:** Frequent stockouts are caused by poor, low-granularity demand visibility.
- **Holding Costs:** High overstock levels lead to excess inventory holding costs and potential markdowns.
- **External Factor Ambiguity:** There is a lack of clarity on how external factors (weather, holidays, promotions) directly influence sales volume.
- **Inefficient Pricing:** Pricing decisions are inefficient, relying on limited insight into true demand elasticity.
- **Disparate Reporting:** The business lacks a unified dashboard combining sales, inventory, pricing, and prediction metrics for holistic decision-making.

These issues directly affect customer satisfaction, overall revenue, and supply chain efficiency.

2.2 Business Objectives

Primary Objectives

1. **Accuracy Improvement:** Improve demand prediction accuracy at the individual product and store level.
2. **Cost Reduction:** Enable better inventory planning to reduce both stockouts and excess overstocking costs.
3. **Profitability:** Provide quantifiable insights to enable more effective pricing and promotion strategies that maximize revenue and margin.

Secondary Objectives

1. **Unified View:** Build a unified analytical view integrating sales, inventory, weather, and promotions.
2. **Data-Driven Culture:** Enable data-driven decision-making across supply chain, finance, and category teams.
3. **Efficiency:** Reduce dependency on reactive, manual planning processes.

3. Project Scope

3.1 In-Scope Functionality

The project will deliver an integrated analytical system encompassing the following components:

Component	Description

Exploratory Data Analysis (EDA)	Identification of trends, seasonality, demand spikes, and correlations between price, promotions, weather, and sales. Includes outlier detection and category/region/store-level comparisons.
Demand Forecasting	Implementation of time-series models (e.g., ARIMA, Prophet) and machine learning models (e.g., XGBoost, LSTM) to generate daily forecasts at the **Store** $\times$ **Product** level.
Inventory Optimization Logic	Development of logic for ABC/XYZ classification, safety stock calculation, reorder point estimation, and automated identification of stockout/overstock risks.
Pricing & Promotion Analysis	Measurement of price elasticity and calculation of promotion lift and impact on overall revenue and gross margin.
Dashboard Development	Creation of a Power BI dashboard providing interactive visualization of sales trends, Forecast vs. Actual comparison, inventory health, and pricing/promotion impact.
Documentation	All documentation, including this BRD, the Functional Requirements Document (FRD), EDA summary, and Final Project Report.

3.2 Out-of-Scope / Exclusions

The following areas are explicitly excluded from the scope of this project:

- Automated replenishment ordering system (e.g., sending POs to suppliers).
- Real-time data ingestion pipelines (the system will operate on batch-processed data).
- Direct integration with source systems (e.g., ERP or POS systems) for data extraction.
- Vendor/supplier performance and management analytics.
- Any changes to existing operational processes outside of decision-making support.

4. Stakeholders and Success Measurement

4.1 Key Stakeholders

Stakeholder	Role	Primary Interest
Head of Supply Chain	Sponsor	High-level planning, cost reduction, and minimizing stock issues.
Inventory Managers	Primary User	Better, data-driven replenishment and safety stock decisions.
Category Managers	User	Volume planning, promotion effectiveness, and margin analysis.
Store Managers	User	Accurate stock availability and on-shelf product presentation.
Finance Teams	Secondary User	Tracking cost reduction, capital efficiency, and project ROI.
Data/BA Team	Project Team	System performance, data accuracy, and model development.
IT/BI Team	Support	Infrastructure stability and dashboard deployment.

4.2 Key Performance Indicators (KPIs)

Project success will be measured against the following metrics:

Area	KPI	Description

Forecasting	Forecast Accuracy (%)	Target accuracy at the product/store level.
	MAPE / RMSE / Bias %	Model performance tracking metrics.
Inventory	Stockout Rate	Percentage reduction in stockout occurrences.
	Overstock (%) / DOI	Reduction in excess inventory and Days of Inventory.
	Service Level	Percentage of demand met from stock.
Pricing	Price Elasticity Coefficient	Measured sensitivity of demand to price changes.
	Promotion Lift %	Quantifiable increase in sales due to promotions.
	Gross Margin %	Impact of optimized pricing on product margins.

5. High-Level Business Requirements

The following are the essential high-level business requirements that the proposed system must fulfill:

ID	Requirement Description
BR-1.0	The system **shall** provide detailed exploratory data analysis (EDA) insights covering sales, pricing, inventory, promotions, holidays, and weather impacts.
BR-2.0	The system **must** utilize machine learning and time-series models to generate daily

	product-level demand forecasts for each store.
BR-3.0	The system **shall** calculate and recommend optimal inventory levels, including safety stock and reorder points, based on ABC/XYZ classification.
BR-4.0	The system **must** provide actionable insights into pricing impact, competitor pricing effects, and the effectiveness of executed promotions (promotion lift).
BR-5.0	The system **must** include a unified, interactive dashboard interface (Power BI) with drill-down capabilities for all key metrics.
BR-6.0	The system **shall** automatically track and report key performance indicators (KPIs) for forecasting accuracy, revenue impact, and inventory health.

6. Project Governance and Deliverables

6.1 Assumptions

1. **Data Quality:** Historical sales, pricing, and inventory data is assumed to be consistent, complete, and readily available for analysis.
2. **External Data:** External variables (weather, holidays, promotions) are available and significantly influence demand, providing meaningful predictive lift.
3. **Lead Time:** Lead times for product replenishment are static or accurately tracked.
4. **Update Frequency:** Demand forecasts are expected to be updated at least on a daily or weekly basis.

6.2 Constraints

1. **Synthetic Data:** The initial model will be built on a synthetic dataset; therefore, performance in a real-world scenario may require further tuning to account for complex distortions.
2. **Data Dependency:** Model performance and EDA findings are strictly dependent on the

quality, integrity, and availability of all source data and external variables.
3. **External Factors:** Pricing impact analysis may require external assumptions regarding competitor behavior, which may not be fully verifiable within the system.

6.3 Project Deliverables

The successful completion of the project will result in the following deliverables:

- Detailed EDA Report and cleaned, ready-to-use Dataset.
- Finalized Forecasting Model (Code and trained weights for ARIMA / Prophet / ML / LSTM).
- Documented ABC/XYZ Classification and Inventory Optimization Logic.
- Pricing Elasticity and Promotion Effectiveness Report.
- Operational Power BI Dashboards.
- Final Project Report and Presentation.
- Version-Controlled GitHub Repository.

7. Approval and Sign-Off

By signing below, the stakeholders confirm that they have reviewed this Business Requirements Document (BRD) and agree that the contents accurately reflect the project's objectives, scope, and high-level requirements.

Role	Name	Signature	Date
Project Sponsor	Head of Supply Chain		
Business Lead	Category Manager		
Technical Lead	Data/BA Team Lead		
Finance Approver	Finance Team Lead		