Forecasting and Sentiment Analysis for HUL

A Proposal report for the BDM capstone Project

Submitted by

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1. Executive Summary

Hindustan Unilever Limited (HUL) is India's leading FMCG company, operating across diverse product categories such as personal care, home care, and foods. With a vast distribution network and a turnover exceeding ₹60,000 crores, HUL plays a pivotal role in the Indian consumer goods market.

The project focuses on addressing critical business challenges faced by HUL, including optimizing inventory through accurate demand forecasting, analyzing consumer sentiment on HUL products, and aligning production schedules with demand forecasts. These challenges impact profitability and operational efficiency in a highly competitive FMCG environment.

To tackle these issues, the project will leverage publicly available data such as quarterly financial reports, social media sentiment, and academic research. Analytical approaches including time series forecasting, sentiment analysis using natural language processing, and production-demand alignment frameworks will be employed. The expected outcome is to provide actionable insights that reduce inventory costs, improve consumer satisfaction understanding, and enhance production planning, ultimately contributing to increased profitability and operational excellence for HUL.

2. Organisation Background

Hindustan Unilever Limited (HUL) is a subsidiary of the global consumer goods giant Unilever and is headquartered in Mumbai, India. Established in 1933, HUL has grown to become the largest FMCG company in India, offering over 60 brands across categories such as personal care, home care, foods, and beverages. The company's products reach millions of consumers through an extensive distribution network comprising modern retail, traditional Kirana stores, and e-commerce platforms. HUL is known for its focus on sustainability, innovation, and digital transformation in supply chain and marketing. Its consistent financial growth and market leadership have made it a key player in India's fast-moving consumer goods sector.

3. Problem Statement (Objectives)

- **Demand Forecasting for Inventory Optimization:** To improve inventory management by accurately predicting product demand using available sales and market data. This objective focuses on utilizing historical sales data and market trends to forecast future demand, enabling effective inventory control and reducing capital blockage.

- **Consumer Sentiment Analysis on HUL Products:** To analyze consumer feedback and sentiment from digital platforms to understand brand perception and product reception. This involves mining social media and online reviews to gauge consumer opinions and satisfaction levels, social providing insights for marketing and product development.
- **Aligning Production with Demand Forecasts:** To enhance production planning by aligning manufacturing output with forecasted demand, reducing overproduction and stockouts. This aims to synchronize production schedules with demand predictions to optimize manufacturing efficiency and supply chain responsiveness.

4. Background of the Problem

In the highly competitive FMCG sector, companies like HUL face the challenge of balancing inventory levels to meet consumer demand without incurring excessive holding costs. Overstocking ties up capital and increases storage expenses, while understocking leads to lost sales and customer dissatisfaction. Demand forecasting is complicated by market volatility, seasonality, and consumer behavior shifts.

Consumer sentiment plays a crucial role in shaping demand and brand loyalty. Negative feedback or controversies can impact sales, while positive sentiment can drive growth. However, capturing and analyzing this sentiment from diverse digital sources is complex.

Production alignment with demand forecasts is essential to avoid inefficiencies such as idle capacity or rushed manufacturing. Internal factors like capacity utilization and external factors like supply chain disruptions influence this alignment. The lack of granular, real-time data often hinders precise synchronization.

Addressing these interconnected problems through data-driven approaches can significantly improve operational efficiency, reduce costs, and enhance customer satisfaction for HUL.

5. Problem Solving Approach

This project will employ a structured, data-driven approach combining three key business challenges at HUL: inventory optimization via demand forecasting, consumer sentiment analysis, and production alignment with demand forecasts. Each component will follow a systematic workflow based on data availability, analytical relevance, and feasibility of public data access.

1. Demand Forecasting for Inventory Optimization

To improve inventory planning, we will extract quarterly segment-wise sales data from HUL's investor reports and brokerage analysis. These will be transformed into a time-series format to build forecasting models using statistical and machine learning techniques. Seasonal trends and category-specific demand fluctuations will be captured using models like SARIMA or Prophet. The model will aim to predict future demand at the product category level, improving forecast accuracy and reducing working capital tied up in excess inventory.

2. Consumer Sentiment Analysis on HUL Products

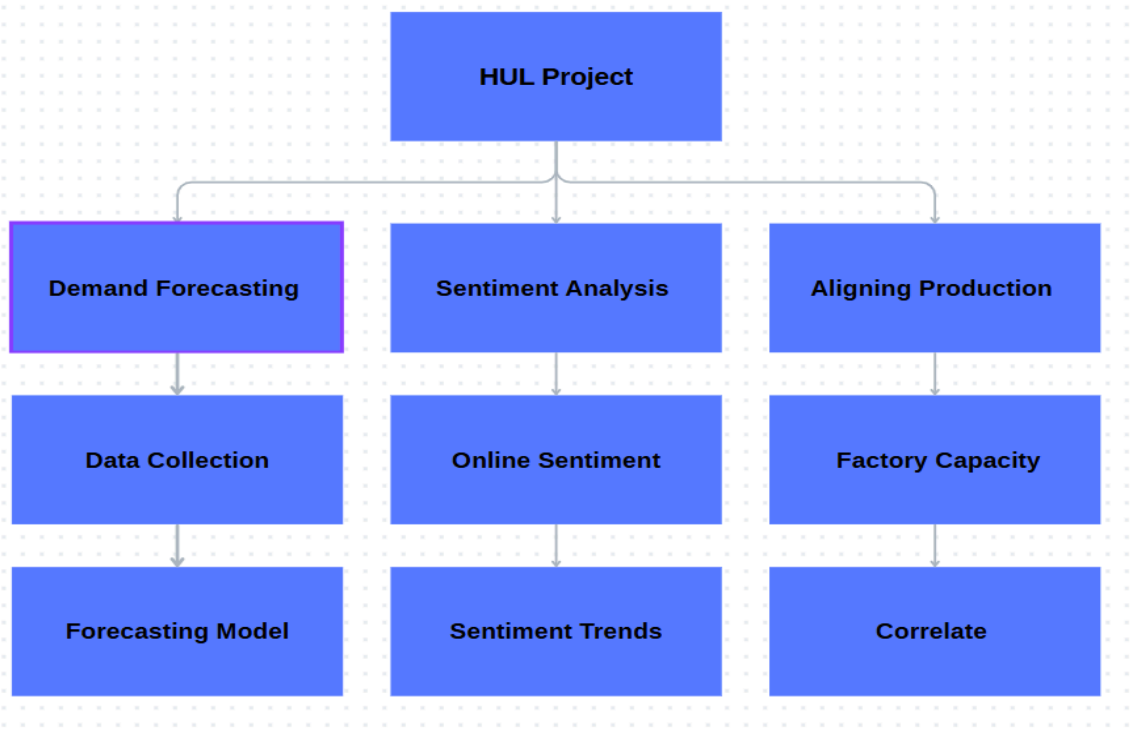
For understanding brand perception, data will be collected from online sources such as Twitter (via hashtags like #SurfExcel, #Dove), customer reviews from platforms like Amazon and Flipkart, and Reddit discussions. Natural Language Processing (NLP) techniques such as sentiment classification and topic modeling will be applied to categorize consumer feedback into positive, negative, or neutral. These results will be correlated with sales movement in those product categories to measure the impact of consumer sentiment on demand patterns. Tools like Vader, TextBlob, and LDA topic modeling will be used in Python.

3. Aligning Production with Demand Forecasts

The output of the forecasting models will be integrated into production planning logic. Publicly available information on HUL's 28 factories and their operational efficiency, drawn from annual reports and case studies, will be used to simulate factory-level production capacities. Optimization methods such as linear programming will align predicted demand with factory capacity, ensuring minimum underutilization or overproduction. Assumptions will be transparently documented where granular production data is unavailable.

The three components—demand forecasting, sentiment analysis, and production alignment—will be developed as independent yet interconnected models. Simulated datasets will be created using public data trends and reasonable assumptions. Forecasting accuracy and optimization outcomes will be evaluated using standard model metrics such as RMSE for time-series and classification accuracy for sentiment labels, based on labeled examples. While full real-world validation isn't feasible, the approach will demonstrate how business insights can be extracted using publicly available information, with clear documentation of assumptions and limitations.

6. Expected Timeline



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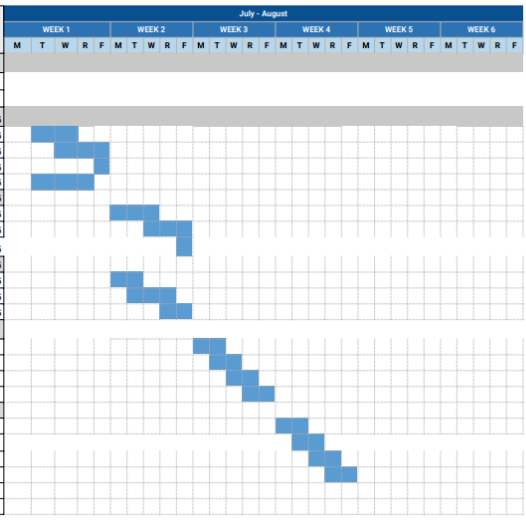
PROJECT TITLE	BDM Project
DATE	25-06-2025

WBS NUMBER	TASK TITLE	START DATE	DUE DATE
0	Proposal Phase	03/06/25	25/06/25
0.1	Finding the company for the project	05/06/25	18/06/25
0.2	Making the Proposal for HUL	19/06/25	25/06/25
1	Data Collection and Setup	01/07/25	05/07/25
1.1	Extract Sales & Financial Data	01/07/25	02/07/25
1.2	Scrape Reviews & Social Media	02/07/25	04/07/25
1.3	Production Planning Research	04/07/25	05/07/25
1.4	Setup Environment & Libraries	01/07/25	03/07/25
2	Forecasting Model Development	08/07/25	12/07/25
2.1	Preprocess & Structure Data	08/07/25	09/07/25
2.2	Build SARIMA/Prophet Models	09/07/25	11/07/25
2.3	Validate & Tune Forecasts	11/07/25	12/07/25
3	Sentiment Analysis Pipeline	08/07/25	12/07/25
3.1	Clean & Tokenize Text Data	08/07/25	09/07/25
3.2	Perform Sentiment Scoring	09/07/25	11/07/25
3.3	Correlate with Forecast Trends	11/07/25	12/07/25
4	Production Alignment Modeling	15/07/25	19/07/25
4.1	Link Forecast to Production Plan	15/07/25	16/07/25
4.2	Build Capacity Constraints Logic	16/07/25	17/07/25
4.3	Run Simulated Scenarios	17/07/25	18/07/25
4.4	Document Results & Efficiency	18/07/25	19/07/25
5	Final Integration & Reporting	22/07/25	26/07/25
5.1	Merge Forecast, Sentiment, Plan	22/07/25	23/07/25
5.2	Write Execution Guide + Tools	23/07/25	24/07/25
5.3	Prepare Graphs & Final Charts	24/07/25	25/07/25
5.4	Prepare Project Report / Slides	25/07/25	26/07/25



7. Expected Outcome

The project is expected to yield several valuable outcomes for HUL:

- **Improved Inventory Planning:** Accurate demand forecasts will enable better inventory control, reducing capital tied up in excess stock and minimizing stockouts.
- **Enhanced Consumer Insights:** Sentiment analysis will provide a nuanced understanding of consumer preferences and pain points, informing product development and marketing strategies.
- **Optimized Production Scheduling:** Aligning production with demand forecasts will improve capacity utilization, reduce wastage, and increase operational efficiency.
- **Strategic Decision Support:** The integrated analytical framework will empower HUL's management with data-driven insights to respond proactively to market changes.
- **Financial Benefits:** Overall, the project will contribute to increased profitability by reducing operational costs and improving customer satisfaction.

By leveraging publicly available data and advanced analytics, this project will demonstrate how data science can address complex business challenges in the FMCG sector, providing a replicable model for continuous improvement.