Optimizing Grocery Sales Through Data Analytics

A Mid Term report for the BDM capstone Project

Submitted by

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1. Executive Summary:

The Neha Prem General Store is a small but essential grocery shop that provides food products, toiletries, and stationery supplies to over 100 local families every day. As a vital part of the community, the store has grown steadily and now aims to expand its customer base, introduce seasonal services, and eventually enter the wholesale market to support nearby retailers.

This project, now in its second phase, continues to apply Business Data Management (BDM) techniques to tackle common small business challenges such as unpredictable demand, inventory mismanagement, and tight profit margins. In the first phase, we laid the groundwork by collecting and organizing sales and stock data, identifying peak sales days, and recognizing frequently sold products.

Building on that foundation, the current phase focuses on more advanced analysis — including demand forecasting, competitor analysis, and regression modelling — to support strategic business decisions. These data-driven approaches allow the store to plan better for seasonal demand, optimize stock levels, and adopt smarter pricing strategies.

Key objectives moving forward include:

- Expanding the customer base through targeted promotions and personalized offers
- Introducing seasonal services like festival-based combos or discounts
- Setting up an additional store to serve a larger area and prepare for wholesaling

By continuing to analyse trends and make decisions backed by real data, Neha Prem General Store is on track to reduce waste, increase profitability, and transition into a well-positioned wholesale supplier in the local market.

This mid-term report highlights measurable progress and outlines a clear roadmap for the final phase of the project focused on implementing bulk purchasing strategies, boosting marketing efforts, and ensuring long-term business sustainability.

2. Proof of originality of the Data

1. Business Name: Neha Prem General Store
2. Address: Andauli, Darbhanga (847103), Bihar
3. Owner's Name: Mr. Shivam Jha

Video of Interaction with Business Owner: video

Picture of the shop and its owner and organisation letter: picture

The business owner currently uses the following primary methods to record and manage business-related data:

1. Lists: Maintained at the owner's residence, these lists are used to record detailed grocery data, including fixed costs and daily grocery expenses. Entries are made every few days depending on availability and need.
2. WhatsApp Messages: Used as a communication tool for tracking credit and repayment details with retail vendors. The frequency of updates varies—some vendors receive daily updates, while others receive weekly or accumulated summaries.
3. Notepad: Used for jotting down the quantity of goods purchased each day, helping track inventory movement and restocking requirements

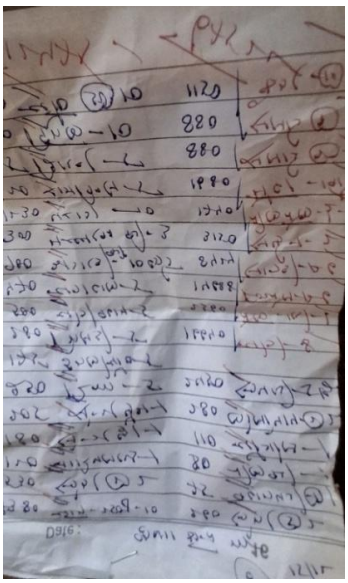

Fig 1,2: picture of various Data Recordings

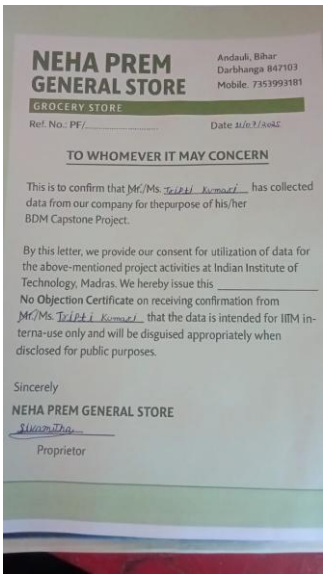

fig 4: picture of organisation letter

3.Metadata

- Data Format: CSV (Comma-Separated Values) and Excel Sheets (XLSX)
- Date Range: January 1, 2025 – January 31, 2025
- Unit of Measurement (for monetary features): Indian Rupee (INR)

3.1 Information about the Grocery Data

Link: grocery_data

A	B	C	D	E	F
Date	**Item**	**Category**	**Quantity Sold**	**Price Per Unit**	**Total Sales**
	Rice	Grains & Pulses (in kg)	7	₹ 70.00	₹ 490.00
	Wheat Flour	Grains & Pulses (in kg)	4	₹ 40.00	₹ 160.00
	Pulses	Grains & Pulses (in kg)	6	₹ 50.00	₹ 300.00
	Chickpeas	Grains & Pulses (in kg)	2	₹ 64.00	₹ 128.00
	Potato Chips	Snacks	10	₹ 10.00	₹ 100.00
01-01-2025	Cookies	Snacks	17	₹ 20.00	₹ 340.00
	Tea	Beverages	13	₹ 20.00	₹ 260.00
	Coffee	Beverages	8	₹ 78.00	₹ 624.00
	Dish Soap	Cleaning	10	₹ 45.00	₹ 450.00
	Laundry Detergent	Cleaning	7	₹ 40.00	₹ 280.00
	Body soap	Cleaning	12	₹ 20.00	₹ 240.00
	Rice	Grains & Pulses (in kg)	7	₹ 70.00	₹ 490.00
	Wheat Flour	Grains & Pulses (in kg)	4	₹ 40.00	₹ 160.00
	Pulses	Grains & Pulses (in kg)	5	₹ 50.00	₹ 250.00
	Chickpeas	Grains & Pulses (in kg)	1	₹ 64.00	₹ 64.00
	Potato Chips	Snacks	14	₹ 10.00	₹ 140.00
02-01-2025	Cookies	Snacks	13	₹ 20.00	₹ 260.00
	Tea	Beverages	12	₹ 20.00	₹ 240.00
	Coffee	Beverages	9	₹ 78.00	₹ 702.00
	Dish Soap	Cleaning	11	₹ 45.00	₹ 495.00
	Laundry Detergent	Cleaning	9	₹ 40.00	₹ 360.00

Fig 4: snapshot of the table containing my Data

Dataset Overview

- **Dataset Type**: Daily Sales Report
- **Data Source**: Sales transactions from Neha Prem General Store
- **Date Range Covered**: 01-01-2025 to 02-01-2025
- **Granularity**: Per item per day
- **Currency**: INR (₹)
- **Categories Present**:
    - Grains & Pulses (in kg)
    - Snacks
    - Beverages
    - Cleaning

Field Name	Column	Description
Date	A	The transaction date (DD-MM-YYYY). Grouping for each day's sales.
Item	B	Name of the product sold (e.g., Rice, Tea, Cookies, etc.).
Category	C	Product category (e.g., Grains & Pulses, Snacks, Cleaning, etc.).

Field Name	Column	Description
Quantity Sold	D	Number of units sold. Unit type is implicit (kg, items) based on category.
Price Per Unit	E	Selling price per unit of the item. Includes ₹ symbol for Indian Rupees.
Total Sales	F	Total revenue from that item = Quantity Sold × Price Per Unit.

3.2 Descriptive Statistics – Monthly Sales Performance

The monthly sales performance across 11 product items was analysed to understand trends in quantity sold, revenue generation, and price distribution. The key insights derived are summarized below:

Metric	Value
Total Quantity Sold	3,363 units
Total Revenue (Sales)	₹1,09,931.00
Maximum Quantity Sold (per item/day)	50 units (Cookies)
Minimum Quantity Sold (per item/day)	1 unit (Wheat Flour, Chickpeas)
Average Quantity Sold (across all items/day)	10 units
Lowest Price Per Unit	₹10.00 (Potato Chips)
Highest Revenue Item	Coffee – ₹18,798.00
Top Selling Item (by quantity)	Cookies – 678 units
Least Selling Item (by quantity)	Wheat Flour – 97 units

Product Performance Insights

- Top Performers:
    - Cookies recorded the highest quantity sold (678 units) and also had the highest daily sale count (50 units in a day).
    - Coffee contributed the most to overall revenue at ₹18,798, despite a relatively moderate quantity sold (240 units), highlighting its premium pricing.

    - Dish Soap and Potato Chips also had strong sales volumes, indicating consistent demand for both cleaning and snack items.

- Low Performers:
    - Wheat Flour and Chickpeas showed the lowest overall sales quantities (97 and 91 units respectively), with only 1 unit sold on the lowest-performing days.
    - These items may require a review in terms of stocking, visibility, or promotional strategy.
- Price Sensitivity:
    - Products like Potato Chips and Cookies, priced at ₹10.00 and ₹20.00 respectively, show high volumes, suggesting customers are more responsive to lower-priced fast-moving consumer goods (FMCGs).
    - On the other hand, premium-priced products such as Coffee (₹78/unit) still perform well in terms of revenue, indicating brand loyalty or essential nature.

3.3 Information about the Monthly Stock Data

Link: Available in the 'Monthly Stock' sheet of the grocery_data

Dataset Overview

- **Dataset Type**: Inventory Stock & Cost Report
- **Data Purpose**: To track purchased vs. sold stock and calculate total procurement cost
- **Data Owner**: Likely part of Neha Prem General Store's operational records
- **Currency**: INR (₹)
- **Measurement Unit**: Kilograms or individual units depending on the item

Field Name	Column	Description
Item	A	Name of the inventory item (e.g., Rice, Tea, Dish Soap, etc.)
Category	B	Classification of the item (e.g., Grains & Pulses, Snacks, Beverages, etc.)
Purchased Stock	C	Total quantity procured (usually in kg or count)
Sold Stock	D	Quantity sold to customers
Closing Stock	E	Unsold stock remaining = Purchased Stock - Sold Stock

Field Name	Column	Description
Price Per Unit	F	Procurement price per unit
Total Price	G	Total procurement cost = Purchased Stock × Price Per Unit

Summary Metrics

- Total Procurement Cost: ₹93,250.00
- Highest Individual Item Cost: Coffee – ₹17,000.00
- Lowest Individual Item Cost: Wheat Flour – ₹2,000.00

Descriptive Statistical Analysis of Sold Stock

To understand sales performance across different items, a descriptive statistical analysis was carried out on the "Sold Stock" values. This analysis helps in identifying trends, variations, and sales behaviour for better inventory and business decisions.

Index	Value
Average (Mean)	305.91 units
Minimum (Min)	91 units
Maximum (Max)	680 units
Standard Deviation	178.32 units
First Quartile (Q1)	196.5 units
Second Quartile (Q2) *(Median)*	240 units
Third Quartile (Q3)	382 units

Interpretation and Business Implications

- Average Sales: Each item recorded an average sale of approximately 306 units. This provides a general benchmark to assess individual item performance.
- Sales Spread:
    - The minimum sold quantity was 91 units, which highlights the lowest-selling item.
    - The maximum sold quantity was 680 units, representing the best-selling product.

- Sales Variability:
  The standard deviation of 178.32 units indicates a wide variation in sales volumes. Some items are performing significantly better or worse than others, which is crucial for planning procurement and promotions
- Quartile Distribution:
  - Q1 (25%): 25% of the items sold fewer than 196.5 units, suggesting lower-performing products.
  - Q2 (Median): Half of the items sold fewer than 240 units, and the other half sold more. This marks the central point in the sales distribution.
  - Q3 (75%): 75% of the items sold fewer than 382 units, meaning the top 25% of items exceeded this number and can be considered high performers.

4. **Detailed Explanation of Analysis Process/Method:**

To improve the operational efficiency and sales performance of Neha Prem General Store, a limited but focused set of Business Data Management techniques has been applied. These methods were selected based on their relevance to the current scale of operations and their ability to provide actionable insights using available data.

4.1 Demand Forecasting

Justification:
This method was used to analyse historical sales data and identify patterns in product demand. Given the store operates in a rural area with seasonal variations and local events (e.g., festivals), forecasting helps anticipate demand shifts more accurately.

Approach:

- Monthly sales quantities of each product were analysed.
- High-demand periods were identified based on quantity sold and revenue trends.
- Products such as Cookies, Dish Soap, and Potato Chips showed consistently higher sales, especially at lower price points.

Why it is appropriate:
It helps avoid overstocking slow-moving items and ensures fast-moving items are always available, leading to better inventory management and customer satisfaction.

4.2 Stock and Inventory Optimization

Justification:
With limited shelf and storage space, managing inventory efficiently is critical. This method allows the store to minimize waste, reduce excess inventory costs, and improve cash flow.

Approach:

- Each product was analysed using quantity sold, closing stock, and pricing.

- Products were categorized into:
    - High-demand: Cookies, Potato Chips, Dish Soap
    - Medium-demand: Tea, Laundry Detergent
    - Low-demand: Chickpeas, Wheat Flour
- This helped decide stocking priorities and purchase quantities.

Why it is appropriate:
Rather than using complex algorithms, this method uses actual sales behaviour to guide purchasing decisions, which is more suitable for small stores with limited digital infrastructure.

4.3 Visualization through Excel Tools

Justification:
Understanding data through tables alone can be difficult. Using Excel tools helped visualize and interpret patterns quickly and clearly.

Approach:

- Pivot tables were used to summarize total sales, quantity sold, and per-item performance.
- Bar graphs and pie charts visualized product-wise sales and revenue contribution.
- These visuals supported decisions in stocking, pricing, and identifying high-performing products.

5. Results and Findings

Neha Prem General Store – Sales and Inventory Analysis (January 2025) The sales and inventory data of Neha Prem General Store was analysed using Excel tools such as Pie Charts, Bar Charts, and Line Graphs. The objective was to identify key performance trends, stock efficiency, and actionable improvements for future business decisions.

5.1 Purchased Stock Distribution by Category

This chart displays the proportion of stock purchased across different product categories.

Key Observations:

- The highest volume of stock was allocated to Potato Chips, Dish Soap, and Coffee.
- Cookies and Laundry Detergent were purchased in relatively lower quantities.

Interpretation:

- The stock distribution reflects a focus on essential and fast-moving consumer goods.
- Lower stock levels in some categories may indicate either lower anticipated demand or storage constraints

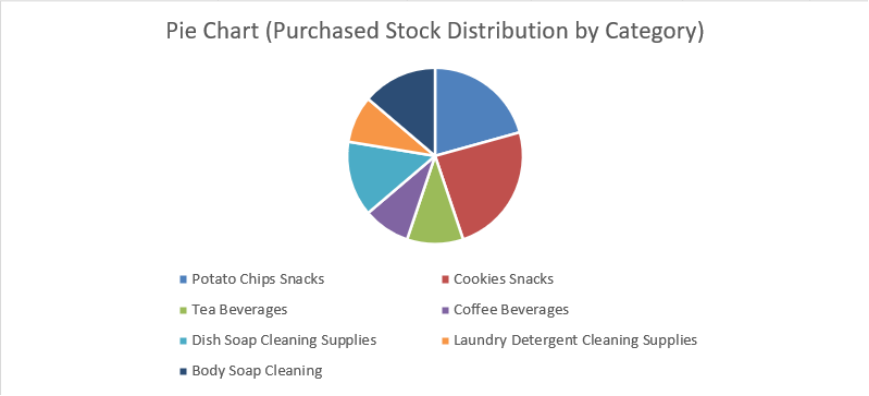

Fig 5.1: pie chart (Purchased Stock Distribution by Category)

Key Insights:

- Coffee and Dish Soap have the highest total price values, indicating strong financial performance.
- Cookies also performed well due to consistent sales and moderate price.
- Wheat Flour and Chickpeas had low sales and low revenue contribution.

Interpretation & Action:

- Products like Coffee can be categorized as high-margin items—they sell in lower volume but generate more revenue.
- Dish Soap and Cookies are fast-moving essentials with good profit turnover.
- Underperforming products (e.g., Chickpeas) may need promotion, price adjustment, or lower purchasing volume.
- This chart justifies which products to stock more or less, based on profitability.

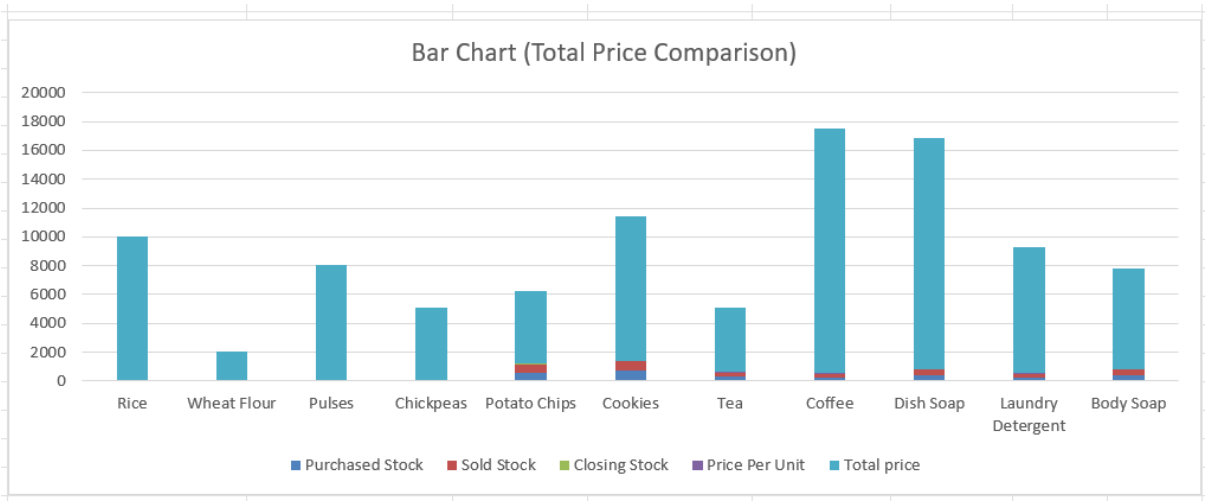

Fig 5.2: Bar Chart (Total Price Comparison)

5.3 Daily Quantity Sold (Trend Over Time)

This graph shows the quantity of products sold each day during January 2025.

Key Observations:

- Daily sales were consistent, with noticeable peaks on 21st, 25th, and 28th January.
- Frequent fluctuations suggest variability in daily customer flow or purchasing behaviour.

Interpretation:

- High sales activity on certain days may correspond to weekends, market days, or specific promotional events.
- Restocking strategies should consider these peak periods to avoid missed sales opportunities.

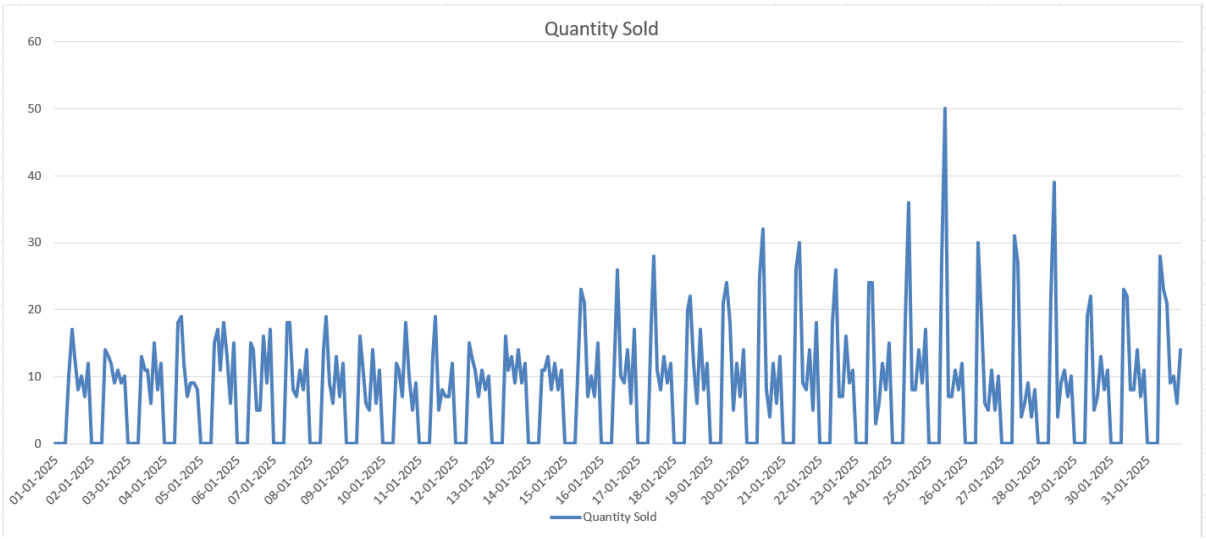

Fig 5.3: Line Chart (Purchased vs Sold vs Closing Stock)

The analysis reveals that the store benefits from a mix of high-margin products (e.g., Coffee) and high-volume essentials (e.g., Dish Soap, Cookies). Optimizing stock levels and focusing on top-performing items can significantly improve profitability and reduce wastage.

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