Unlocking Growth Potential: A Data-Driven Strategy for Inventory Optimization

A Final report for the BDM capstone Project

Submitted by

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Contents

1 Executive Summary

- In response to evolving market dynamics and business challenges, conducted a comprehensive analysis aimed at optimizing business performance and fostering growth. Our analysis focused on two key areas: addressing supply chain disruptions and enhancing customer satisfaction and retention. By delving into historical sales data, inventory management practices, supplier relationships, and customer engagement strategies, I aimed to uncover actionable insights to drive strategic decision-making and improve overall business outcomes.

Key Findings:

1. Supply Chain Optimization:

- The analysis revealed several opportunities to streamline supply chain operations and enhance efficiency. By leveraging historical sales data and inventory metrics, identified areas for improvement in inventory management, supplier relationships, and procurement processes. Strategic initiatives such as strengthening supplier relationships, implementing robust inventory management practices, and optimizing product offerings emerged as key priorities to mitigate supply chain disruptions and improve operational resilience.

2. Customer Satisfaction and Retention:

- Understanding customer behavior, preferences, and feedback was paramount in our efforts to enhance customer satisfaction and retention. Through detailed analysis of customer purchase patterns, loyalty trends, and feedback data, I gained valuable insights into customer needs and preferences. Personalized marketing initiatives, targeted promotions, and responsive customer support emerged as critical strategies to drive customer engagement, loyalty, and long-term retention.

Actionable Recommendations:

1. Supply Chain Enhancement:

- Strengthen supplier relationships to ensure timely and quality procurement.

- Implement robust inventory management practices to mitigate risks associated with expiring products.

- Develop targeted sales and marketing strategies based on seasonal revenue trends to capitalize on peak periods.

- Focus on optimizing inventory and promoting best-selling products to meet customer demand effectively.

- Leverage the popularity of top-selling brands to enhance brand visibility and customer engagement.

2. Customer Engagement Strategies:

- Implement customer-centric strategies to retain loyal customers, ensuring personalized experiences and incentives for continued patronage.

- Enhance responsiveness to customer feedback and queries to foster a culture of trust and loyalty.

- Leverage data-driven insights to tailor marketing campaigns, promotions, and product offerings to meet evolving customer preferences.

- Invest in technologies and tools to improve the overall customer experience, such as user-friendly online platforms, efficient order fulfillment processes, and seamless customer support channels.

Conclusion:

In conclusion, the analysis has provided valuable insights into key areas of opportunity for enhancing business performance and driving sustainable growth. By implementing the actionable recommendations outlined in this report, we can strengthen our competitive position, improve operational efficiency, and foster long-term relationships with both suppliers and customers. Through a strategic focus on supply chain optimization and customer-centricity, we aim to achieve our business objectives and deliver exceptional value to our stakeholders in the dynamic marketplace.

2 Explanation of Analysis Process/Method

Dataset Link- StockSummaryReport_11_12_23 (1)

Problem Statement 1: Supply Chain Disruptions

Objective:

The objective is to identify and address disruptions in the supply chain, enhancing product availability and ensuring timely delivery. The analysis focuses on optimizing inventory, improving supplier relationships, and establishing a reliable supply chain.

1. Data Collection and Preparation:

1.1 Collecting Historical Sales Data: Meticulously gathered historical sales data to form the foundational dataset. This information spans a significant 1 year period, providing a comprehensive view of the sales landscape. The owner Gave me online bills of the transactions.

1.2 Data Entry and Pre-processing in Excel: The raw data, procured from the owner, was meticulously entered into Microsoft Excel. During this phase, essential pre-processing tasks were conducted to ensure data cleanliness and integrity.

1.3 Structure of Data: The Dataset contains three sheets for Stock Summary, Sales Report and Purchase Report. Stock Summary has the details of the current stock in the inventory. Sales Report has the transaction information of the past 1 year from January 2023 to November 2023. Purchase Report is the transactions that the owner bought from suppliers for the past 1 year.

1.4 Calculation of Revenue and Expenditure:

● Using sales and selling price revenue for the day , average sales , selling price and total revenue can be calculated by formula :

$$Revenue = Selling\ price * Sales$$

$$Total\ Revenue = \sum_{i=0} Ri$$

$$where\ Ri = Revenue\ made\ at\ day\ i$$

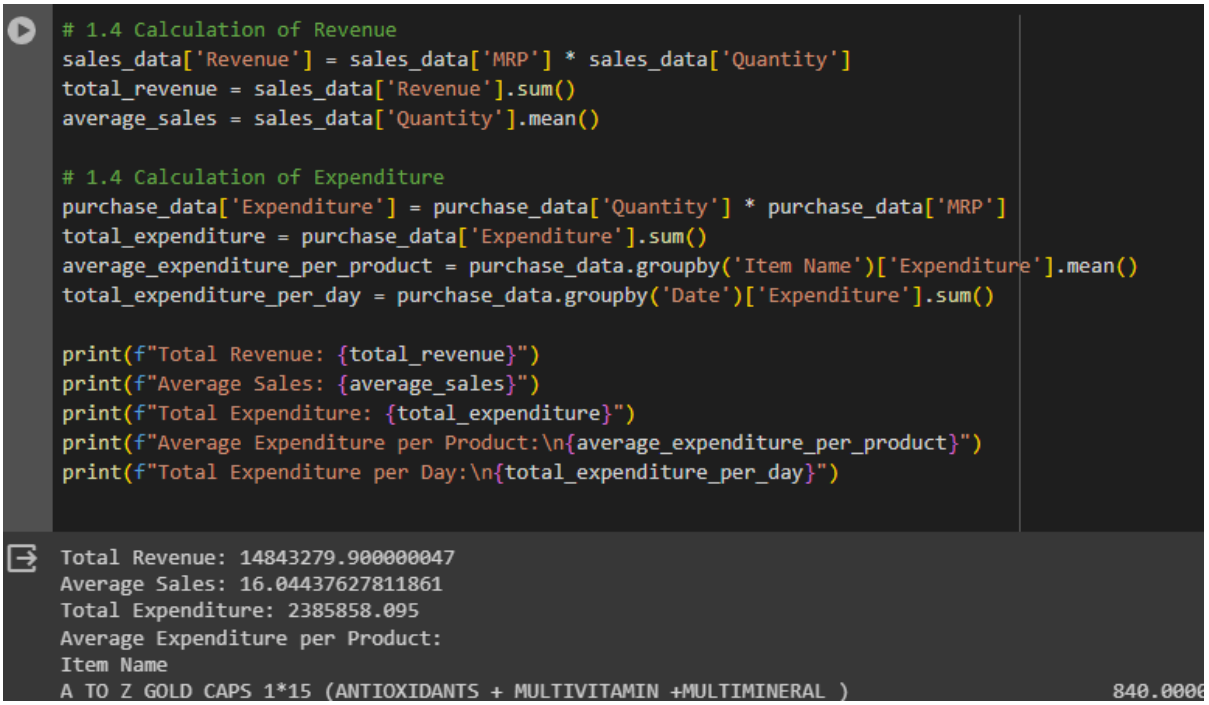
● Similarly purchase data has been collected for medicine which consists of purchase quantity and purchase price , using which expenditure is calculated on each product.

Along with expenditure Total expenditure for the day , average expenditure per product as well as Total expenditure is calculated using formula :

$$Expenditure = Purchase\ Quantity * Purchase\ Price$$

$$Total\ Expenditure = \sum_{i=0} E\ i$$

$$where\ E = Expenditure\ at\ day\ i$$



```
# 1.4 Calculation of Revenue
sales_data['Revenue'] = sales_data['MRP'] * sales_data['Quantity']
total_revenue = sales_data['Revenue'].sum()
average_sales = sales_data['Quantity'].mean()

# 1.4 Calculation of Expenditure
purchase_data['Expenditure'] = purchase_data['Quantity'] * purchase_data['MRP']
total_expenditure = purchase_data['Expenditure'].sum()
average_expenditure_per_product = purchase_data.groupby('Item Name')['Expenditure'].mean()
total_expenditure_per_day = purchase_data.groupby('Date')['Expenditure'].sum()

print(f"Total Revenue: {total_revenue}")
print(f"Average Sales: {average_sales}")
print(f"Total Expenditure: {total_expenditure}")
print(f"Average Expenditure per Product:\n{average_expenditure_per_product}")
print(f"Total Expenditure per Day:\n{total_expenditure_per_day}")
```

```
Total Revenue: 14843279.900000047
Average Sales: 16.04437627811861
Total Expenditure: 2385858.095
Average Expenditure per Product:
Item Name
A TO Z GOLD CAPS 1*15 (ANTIOXIDANTS + MULTIVITAMIN +MULTIMINERAL )                840.0000
```

Fig 1 : Calculation of Revenue and Expenditure

2. Increase Overall Profit:

2.1 Profit/Loss Calculation:

Determined daily profit/loss and profit percentages for each Stock Keeping Unit (SKU). The formula used:

$$Profit\ (Loss)\ =\ Sales\ Revenue\ -\ Purchase\ Cost$$

$$Profit\ Percentage\ =\ (Profit\ /\ Total\ Profit)\ *\ 100\ .$$

2.2 Purchase Calculation:

Calculated total purchases, considering initial and end inventory. The formula used:

$$Purchase\ =\ Total\ Purchase\ -\ Initial\ Inventory\ +\ End\ Inventory\ .$$

```python
# 2.1 Profit/Loss Calculation
sales_data['Profit'] = sales_data['Amount'] - sales_data['MRP'] * sales_data['Quantity']
total_profit = sales_data['Profit'].sum()
sales_data['Profit Percentage'] = (sales_data['Profit'] / total_profit) * 100
# 2.2 Purchase Calculation
purchase_data['Purchase'] = purchase_data['Amount']
initial_inventory = stock_data.groupby('Item Name')['Stock Quantity'].first().reset_index()
end_inventory = stock_data.groupby('Item Name')['Stock Quantity'].last().reset_index()
purchase_data = pd.merge(purchase_data, initial_inventory, on='Item Name', how='left')
purchase_data = pd.merge(purchase_data, end_inventory, on='Item Name', how='left')
purchase_data['Total Purchase'] = purchase_data['Purchase'].sum()
purchase_data['Initial Inventory'] = purchase_data['Stock Quantity_x'].sum()
purchase_data['End Inventory'] = purchase_data['Stock Quantity_y'].sum()
purchase_total = purchase_data['Total Purchase'].iloc[0]
initial_inventory_total = purchase_data['Initial Inventory'].iloc[0]
end_inventory_total = purchase_data['End Inventory'].iloc[0]
purchase_data['Net Purchase'] = purchase_total - initial_inventory_total + end_inventory_total
# 2.3 Cumulative Profit Calculation
cumulative_profit = abs(sales_data.groupby('Date')['Profit'].sum().cumsum())
print(cumulative_profit)
```

```
Date
2023-01-01       21832.77
2023-01-02       95901.25
```


Fig 2: Profit Calculation

2.3 Cumulative Profit and Pareto Chart:

Calculated cumulative profit for Pareto analysis, prioritizing efforts for maximum impact on overall profit.

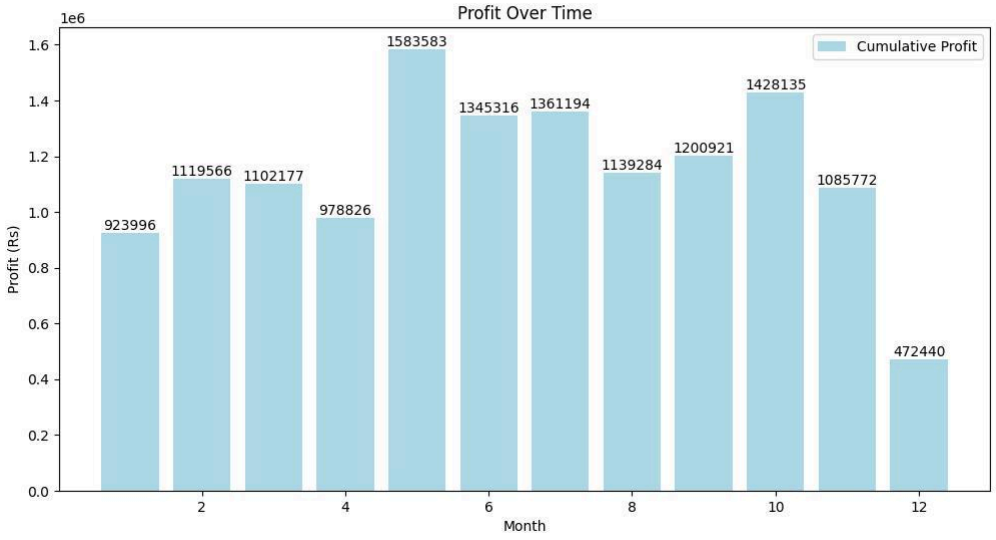


Fig 3: Cumulative Profit and Pareto Chart

Problem Statement 2: Enhancing Customer Satisfaction and Retention

Objective:

The primary objective is to counteract a dip in customer satisfaction levels, posing challenges in retaining devoted customers. The analysis is geared towards comprehending customer behavior, preferences, and feedback, with a focus on instituting personalized marketing initiatives and refining the overall customer experience.

3. Inventory Optimization:

3.1 Inventory Management Concerns: Identified challenges related to excessive stock accumulation and diminished profits attributed to procurement difficulties.

3.2 Inventory Data Calculation: Systematically gathered initial inventory data and performed calculations for daily and Stock Keeping Unit specific inventory levels.

4. Fixed Cost Analysis:

4.1 Fixed Cost Components:

I conducted a detailed analysis of the components constituting our fixed costs, presenting the following breakdown:

a. Transport Costs: ₹14,863 per month

b. Rent: ₹20,000 per month

c. Electricity Costs: ₹2,000 per month

d. Employee Costs: 3 employees at ₹15,000 each, totaling ₹45,000 per month

4.2 Total Fixed Cost Calculation:

Expanding on the meticulous examination of individual fixed cost components, I aggregated these specific costs to unveil a comprehensive understanding of our total fixed costs. This detailed approach provides insights into the magnitude of our fixed expenses and their collective impact on our overall financial structure.

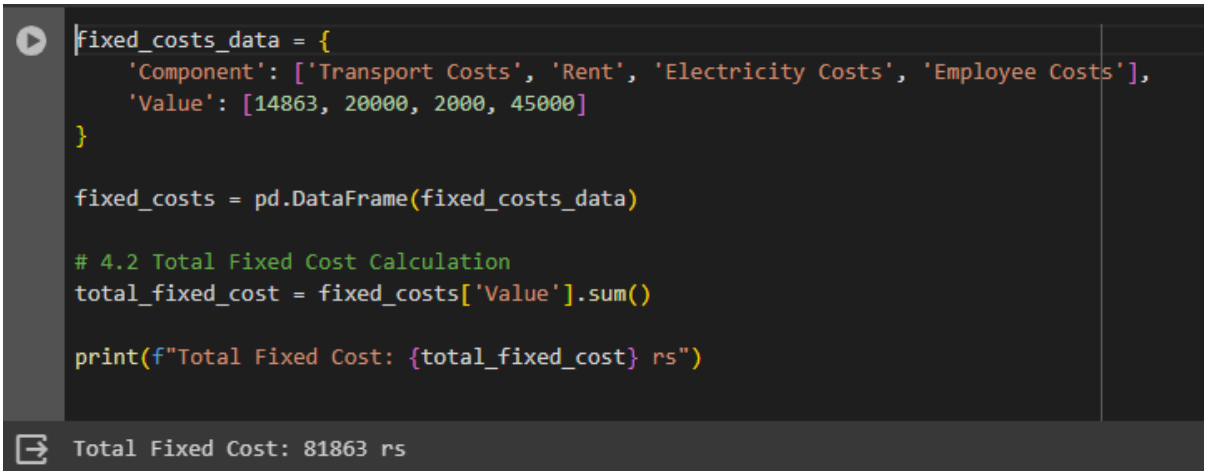


Fig 4:Total Fixed Cost Calculation

5. Overall Analysis for Supply Chain and Customer Satisfaction:

5.1 Root Cause Identification:

- Utilized diverse charts for supply chain analysis (e.g., sales distribution, top products, correlation heatmap).

- Applied customer-centric charts (e.g., top customers, purchase distribution) to delve into factors influencing customer satisfaction.

5.2 Data-Driven Strategies:

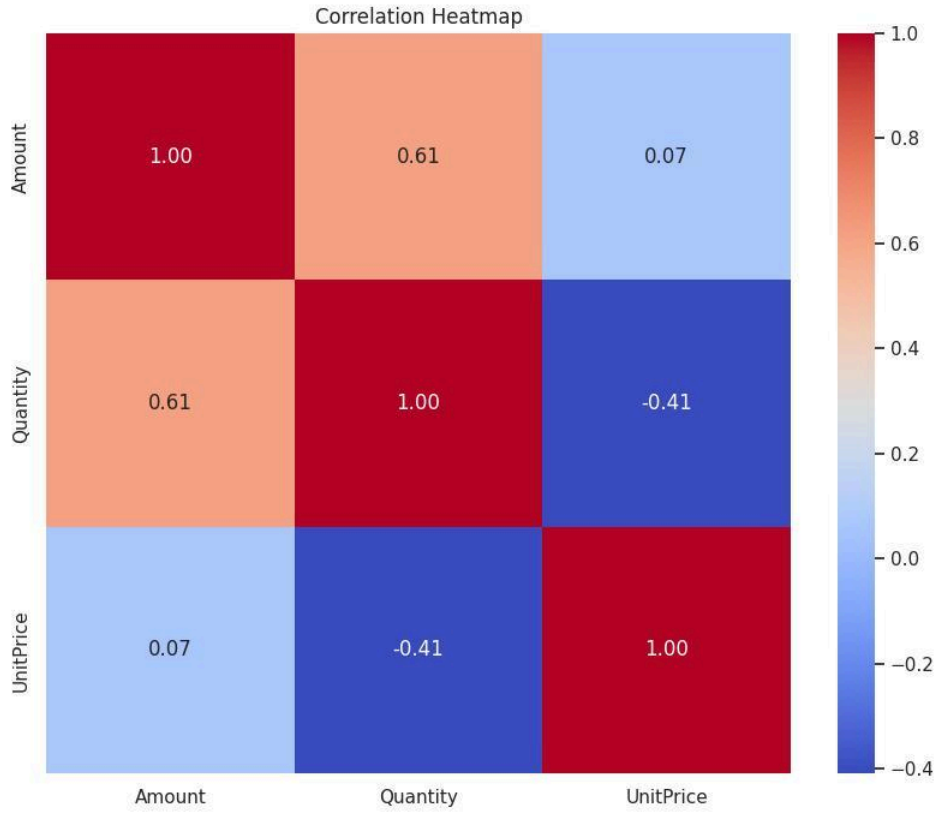
- Formulated data-driven strategies to optimize the supply chain and enhance customer satisfaction. These strategies are grounded in identified patterns and root causes.

Statistical Parameters and Context:

- Correlation Matrix:

- Use: Identified relationships between different variables (UnitPrice, quantity and price).

- Context: Facilitated an understanding of how variables are interconnected, informing decisions for supply chain optimization.



- Profit Percentage:

  - Use: Evaluated profitability for each SKU.

  - Context: Assisted in pinpointing the most and least profitable SKUs, offering guidance for inventory and sales strategies.

- Inventory Metrics (Total, Average):

  - Use: Monitored inventory levels.

  - Context: Informed decisions regarding stock replenishment, addressing concerns related to excessive stockpiling and procurement challenges.

- Pareto Chart:

  - Use: Highlighted significant contributors to cumulative profit.

  - Context: Aided in prioritizing efforts for maximum impact on overall profit.

3 Results and Findings

1. Top 10 Suppliers by Purchase Amount

- Analysis Process: Grouped data by Party Name and calculated the total purchase amount for each supplier and created a horizontal bar chart to display the top suppliers.

- Results and Findings: Highlights suppliers contributing the most to the overall purchase amount. Kamal Medical Agencies was the most efficient supplier in terms of purchase amount. Higher purchase amount signifies that the supplier has maintained a good relationship with the owner.

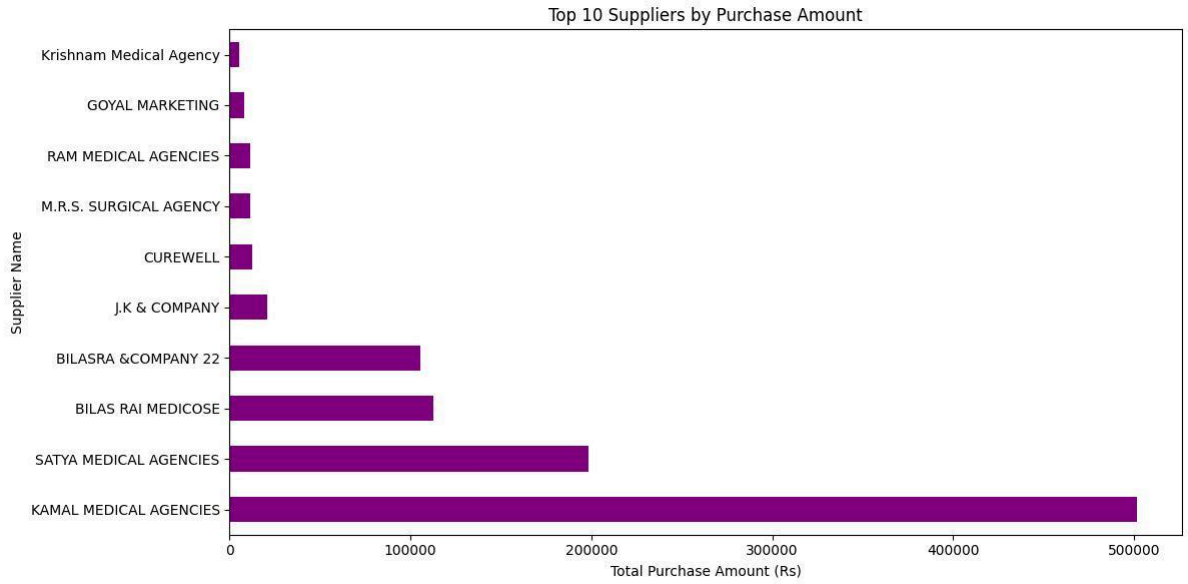


Figure 5. Top 10 Suppliers By Purchase Amount

2. Inventory Status

- Analysis Process: Converted Date to datetime format and calculated total, expired, and nearing expiry quantities and Plotted a bar chart to visualize the inventory status.

- Results and Findings: Clearly shows the distribution of items in stock, expired, and nearing expiry. Approx 2952 Products have expired and 40544 products expiring in the next 3 months. Essential to keep a check on expiring products.

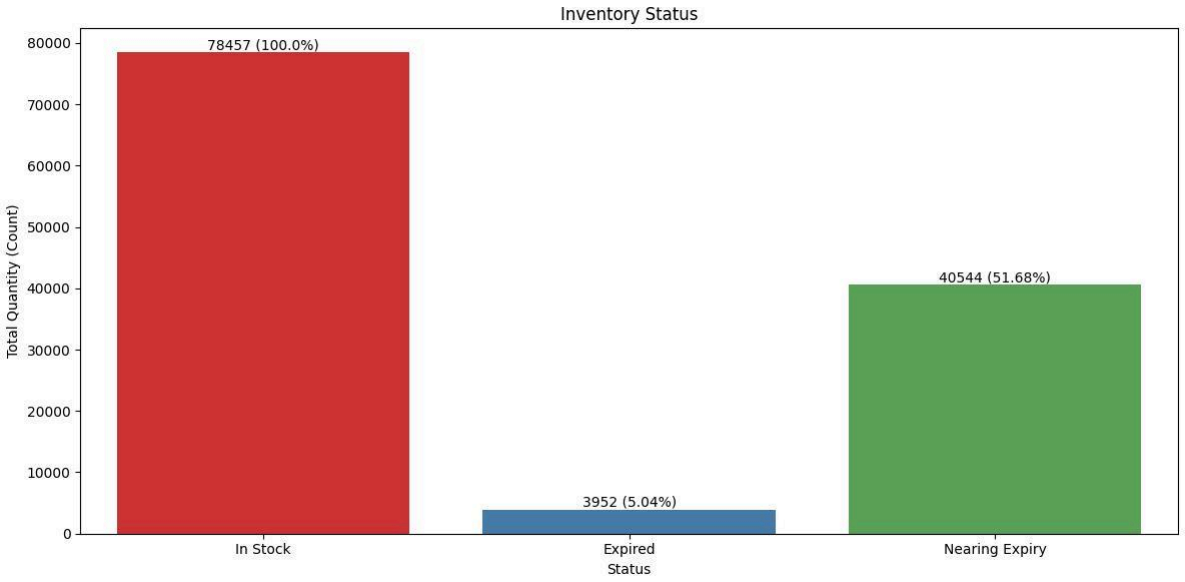


Figure 6. Current Inventory Status

3. Month Wise Revenue with Seasons

- Analysis Process: Extracted the month from the Date column and mapped seasons accordingly. Calculated month wise revenue and plotted a line chart for the overall trend and a bar chart for seasonal revenue.

- Results and Findings: Illustrates the revenue trend throughout the year with seasonal variations. Revenue peaked in the Spring season and in the month of May.

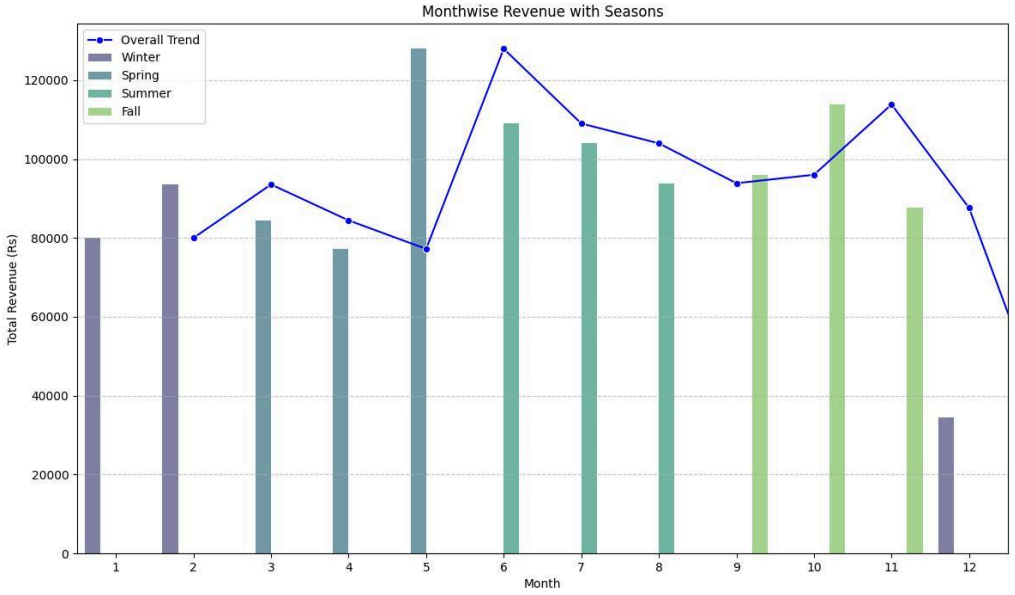


Figure 7. Month Wise revenue with seasons

4. Top 10 Selling Products

- Analysis Process: Grouped data by Item Name and summed the Quantity to identify top-selling products and then Plotted a horizontal bar chart to visualize the quantities sold for each product.

- Results and Findings: Clearly identifies the products with the highest sales. Pantoprazole Tablet is the most selling product for the past year.

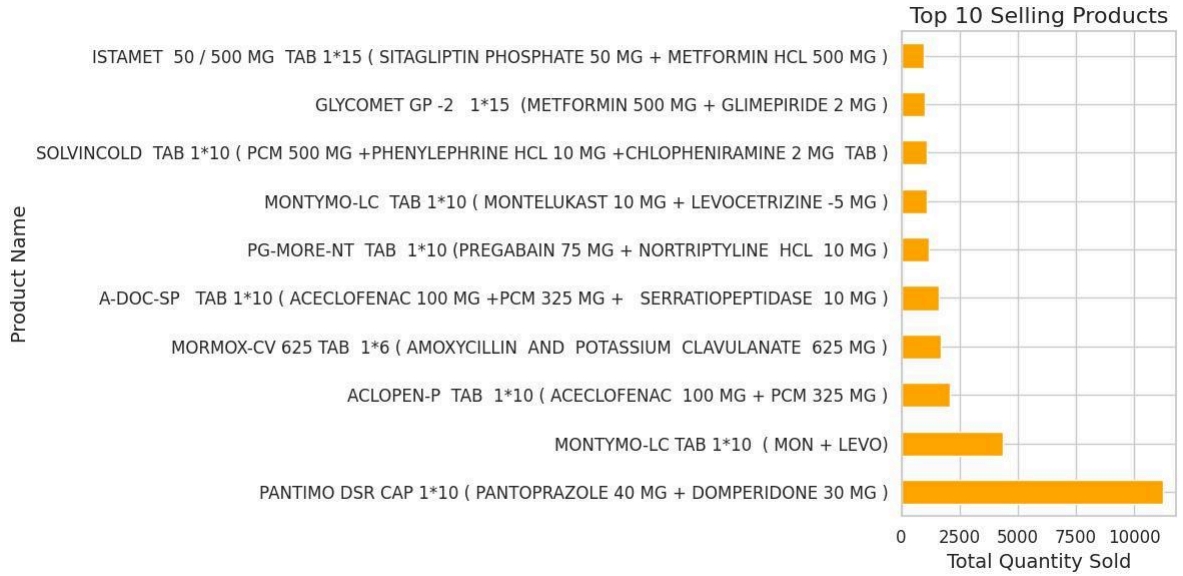


Figure 8: Top 10 Selling Products

5. Top Brands by Sales

- Analysis Methodology : The dataset was grouped by brand names to aggregate the total sales quantity for each brand. This process allowed us to identify the top-selling brands. Subsequently, a horizontal bar chart was created to provide a visual representation of the sales quantities attributed to each brand.

- Key Insights :

- The analysis reveals the brands that contribute the most to sales revenue.

- Among all brands, products from Morpen emerged as the top revenue generators.

- This insight highlights the significant contribution of Morpen brand products to overall sales performance.

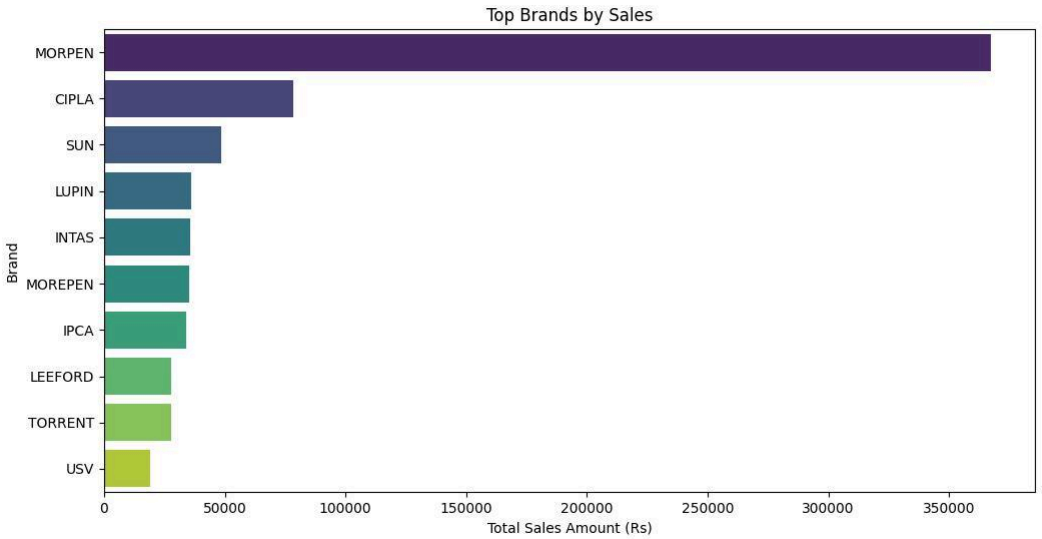


Figure 9: Top Brands by Sales

6. Top 10 Loyal Customers

- Analysis Methodology : Data was grouped by the names of customers to aggregate the total purchase amounts, thus identifying the most loyal customers. A horizontal bar chart was then created to visualize the purchase amounts attributed to the top customers.

- Key Findings :

- The analysis highlights the top 10 loyal customers based on their purchase amounts.
- Tarachand emerges as the most loyal customer among all, indicating consistent and substantial purchases.
- This insight underscores the importance of customer loyalty and identifies key individuals driving business revenue through their continued patronage.

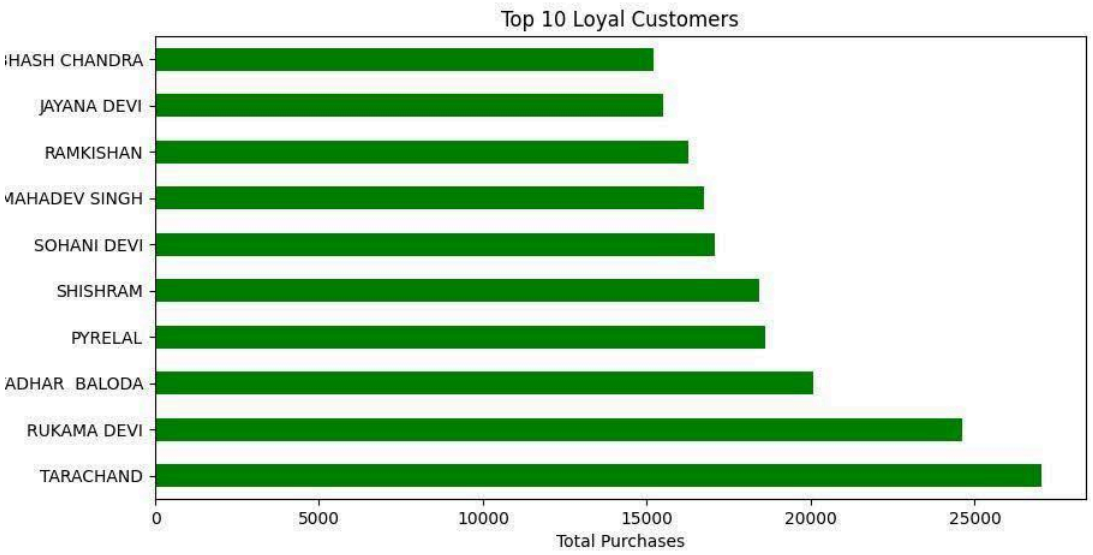


Figure 10:Top 10 Loyal Customers

4 Interpretation of Results and Recommendation

Actionable Recommendations for Business Improvement

1. Strengthen Supplier Relationships:

- The success of our business relies heavily on timely and quality procurement from our suppliers. To ensure seamless operations, it's imperative to foster stronger ties with efficient suppliers like Kamal Medical Agencies. By establishing open communication channels and cultivating trust-based relationships, we can enhance collaboration and reliability in our supply chain.

2. Inventory Management:

- Effective inventory management is critical to mitigating risks associated with expiring products and optimizing stock levels. Implementing robust inventory management practices, such as regular stock audits, real-time monitoring of expiry dates, and strategic product placement, will enable us to minimize wastage and maximize profitability. By staying vigilant and proactive, we can ensure that our inventory remains lean and efficient.

3. Seasonal Strategies:

- Our sales data has revealed distinct seasonal revenue trends, indicating opportunities for targeted sales and marketing initiatives. By developing seasonal strategies tailored to capitalize on peak periods, we can maximize revenue generation and enhance customer engagement. This may involve launching seasonal promotions, introducing seasonal product offerings, and aligning marketing campaigns with seasonal themes to resonate with our target audience effectively.

4. Product Optimization:

- Optimizing our product offerings is essential for meeting customer demand and driving sales growth. Focusing on best-selling products like Pantoprazole Tablet allows us to leverage existing demand and capitalize on market trends. By ensuring adequate stock levels, implementing effective merchandising strategies, and actively promoting these products, we can enhance customer satisfaction and increase overall profitability.

5. Brand Management:

- Our analysis has identified top-selling brands like Morpen that significantly contribute to our sales revenue. Leveraging the popularity of these brands is crucial for enhancing brand visibility and customer engagement. By investing in brand-building activities, such as targeted marketing

campaigns, brand partnerships, and product endorsements, we can strengthen our brand presence in the market and cultivate a loyal customer base.

6. Customer Engagement:

- Retaining loyal customers like Tarachand requires a proactive approach to customer engagement and satisfaction. Implementing customer-centric strategies, such as personalized experiences, loyalty programs, and responsive customer support, demonstrates our commitment to delivering exceptional service. By understanding and addressing the unique needs of our customers, we can foster long-term relationships and drive repeat business.