Data-Driven Optimization of Sales and Inventory Management of a Mobile & Accessories Shop

A Mid -Term report for the BDM capstone Project

Submitted by

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Executive Summary

Located at C-2206, Rajajipuram, Lucknow, Uttar Pradesh, Shri Balaji Centre, a mobile and accessories shop which operates in the B2C segment selling Mobiles Phones, Smartwatches, and other mobile accessories is currently facing challenges related to inventory mismanagement, revenue problem and lost sales opportunities due to unfulfilled demand for second-hand mobile phones. It has been observed there are inefficiencies in stock movement, leading to frequent stockouts of high-demand products and overstocking of low-demand products.

To address these issues, six months of comprehensive data were collected, spanning November 2024 to April 2025. The datasets include detailed sales and inventory records as well as customer feedback on second-hand mobiles. Key metadata columns are: Product Name, Product Category, Brand, Quantity Sold, Unit Price, Discount (%), Payment Mode, Purchase Price, Selling Price, Total Amount, Profit, Opening Stock, Closing Stock, Lead Time, Customer Name, Model Name.

From Pareto analysis (products Iphone 16 and 15, One Plus 13T) 20% of products generate nearly 80% of profit. From time-series analysis, monthly and seasonal demands depict Jan'25 being the peak sales month and Dec’24 at lowest. The analysis of sales data was done using ABC analysis, which identified that Mobile Phone and smartwatch contributed to nearly 80% revenue generation. Based on Safety stock and ROP analysis, for fast-moving models like iPhone 16 and Samsung Galaxy M34, need to ensure that they are always in stock and minimize lost sales. In customer feedback analysis, in which monthly aggregation revealed peaks in demand for iPhone 12, iPhone 13, Samsung S21, and Realme models. Brand-wise, Apple accounted for nearly 24% of all requests. These methods help to create practical soultions to overcome the difficulties faced by Shri Balaji Centre.

Proof of Data Originality

To ensure the originality of the project, I have given the important and necessary documents below to prove the authenticity:

1. **Letterhead from the Organisation:** Mr. Shashank Tripathi, the owner of the Shri Balaji Centre has given me permission to use the past 6 month sales data and inventory data by signing the letterhead.

   Letterhead from the Owner
2. **Images of the Shop:** Below are the images of the business that is of the shop Shri Balaji Centre.

   Shop Pictures
3. **Interaction Video with the Business Owner:** I have interacted with the owner and discussed the business problems that they are facing.

   Interaction Video with the Owner.mp4
4. **Field Notes:** In this, I have handwritten the information that was discussed with the business owner, Mr. Shashank Tripathi.

   Handwritten Notes

Metadata and Descriptive Statistics

Mr. Shashank Tripathi, the owner of the shop Shri Balaji Centre has given me the access of sales data and inventory data of the months from November 2024 to April 2025 along with customer feedback data for second-hand mobiles (Feb'25-Apr'25) to analyse and solve the problem by providing strategic solutions to improve sales of upcoming months by solving issues related to inventory management. Also, I will be analysing customer feedback data to get a feasible solution for the customer who wants second hand products.

Metadata Overview

Dataset Information:

In workbook Shri_Balaji_Centre_Data,

1. **Dataset Name:**

   For Sales: Sales_rawData (Nov'24-Apr'25)

   For Inventory: Inventory_rawdata(Nov'24-Apr'25)

   For Demand-Supply problem: Customer Feedback Data (from Feb'25 to Apr'25)
2. **Data Time Period Covered:**

   For Sales and Inventory: November 2024 - April 2025

   For Demand-Supply problem: February 2025 to April 2025

3. **Data Source:** Sales record of Shri Balaji Centre of the months November 2024 to April 2025 and Inventory Stock data month wise from November 2024 to April 2025 along with Customer feedback data that they maintained between February 2025 to April 2025.
4. **Purpose of Collection:** The main purpose of Sales data collection is to analyse it and solve the problem by analyzing purchasing patterns, understanding seasonal and monthly trends and identifying the top products that contribute to maximum revenue. For Inventory data, the main goal is to analyse products which contribute to overall sales and will categorise it into classes and additionally, analyze stock quantities to identify which products are in understock and overstock. Also, by analysing customer feedback data we can introduce a pilot program. By taking these steps, we can develop a data-driven approach to address the challenges the shop is facing.
5. **Number of Sheets:** 3 + 2(cleaned sales and inventory data)
   Dataset Link: Shri_Balaji_Centre_Data.xlsx

Metadata Keys

Metadata	Description	Relevance to Problem Statement
Product Name	The name of the items.	Can be helpful in identifying which products are well.
Product Category	Categorising the products under different type	Helps in ABC analysis by product type.
Brand	The brand of the product	Can be helpful in trend analysis brand wise.
Quantity Sold	The number of units sold product name wise	Used in analysis of demand and stock movement.
Unit Price	Price per unit of the product	Helpful in analyzing pricing strategy.
Discount (%)	Percentage of discount given on the product	Important for understanding how it affects sales and profit.

Payment Mode	The payment method used by customers (e.g. UPI, Cash)	Gives insights into customer payment behaviour.
Purchase Price	The unit price at which the item was purchased.	Required for the calculation of cost and profit.
Selling Price	The price of the product at which it was sold	Used in revenue analysis.
Total_Amount	Selling Price × Quantity Sold	Used in calculation for revenue.
Final Amount (INR)	Total amount after applying discounts	Helpful in determining total revenue after deducting discounts.
Total Cost	The total cost of each product.	Used in calculating net profit for pareto analysis.
Profit	The new profit of each product	Helps to identify overall profit and top product contributors to profit.
Opening_stock	The product quantity available at the month's starting	Used in ROP and safety stock analysis.
Closing_stock	The product quantity available at the month's ending.	Used in Inventory Management problems.
Quantity	No. of second-hand mobiles demanded by the customer	Helpful in analysing the quantity of second-hand mobiles demanded.
Model Name	Name of the second- hand mobile preferred by the customer	Can be used to identify which mobile phones are in demand.

Descriptive Statistics

The following analysis gives an overall brief overview and summarizes the key sales and inventory metrics, which would help to identify the inefficiencies in the inventory and better forecast upcoming demand patterns.

Descriptive Statistics Measure & Definition:

Descriptive Statistics Measure	**Definition**
Sum	Total value of a particular metric.
Mean	Average of the values of a given metric.
Standard Deviation	Measures how the values are spread out.
1st Quartile (Q1)	The value below which 25% data falls.
Minimum	The lowest value.
Median (Q2)	The middle most value after arranging the data in ascending order.
3rd Quartile (Q3)	The value below which 75% data values falls
Maximum.	The highest value.

Overall Sales Data (November 2024 – April 2025)

Measure	Opening Stock	Closing Stock	Quantity Sold	Purchase Price	Selling Price	Total Revenue	Final_Amount (INR)	Total Cost	Profit
Sum	2413	683	1730	₹ 78,30,326.40	₹ 97,87,908.00	₹ 1,23,56,707.00	₹ 1,18,45,998.00	₹ 98,85,365.60	₹ 19,60,632.40
Mean	9.43	2.67	6.76	₹ 6,641.50	₹ 8,301.87	₹ 10,480.67	₹ 10,047.50	₹ 8,384.53	₹ 1,662.96
Standard Deviation	7.72	3.05	7.13	₹ 12,250.65	₹ 15,313.31	₹ 25,599.30	₹ 24,727.71	₹ 20,479.44	₹ 4,267.27
Minimum	1	0	1	₹ 159.20	₹ 199.00	₹ 199.00	₹ 189.00	₹ 159.20	₹ 29.80
1st Quartile (Q1)	5	0	2	₹ 799.20	₹ 999.00	₹ 1,299.00	₹ 1,156.00	₹ 1,039.20	₹ 167.60
Median (Q2)	8	2	5	₹ 1,519.20	₹ 1,899.00	₹ 2,398.00	₹ 2,324.00	₹ 1,918.40	₹ 329.80
3rd Quartile (Q3)	12	4	9.25	₹ 3,199.20	₹ 3,999.00	₹ 5,998.00	₹ 5,698.00	₹ 4,798.40	₹ 899.60
Maximum.	70	20	65	₹ 71,999.20	₹ 89,999.00	₹ 3,49,995.00	₹ 3,48,070.00	₹ 2,79,996.00	₹ 68,074.00

The sales data contains overall 10 Product Categories. For Further analysis, Mobile Phones and Smartwatch category have been chosen to present in this report because it contributes to maximum revenue. The below descriptive statistics tends to give more clear insights regarding the distribution and trends of these categories.

Mobile Phones

Measure	Opening Stock	Closing Stock	Quantity Sold	Purchase Price	Selling Price	Total Revenue	Final_Amount (INR)	Total Cost	Profit
Sum	302	102	200	₹ 47,08,572.00	₹ 58,85,715.00	₹ 75,81,187.00	₹ 72,89,219.00	₹ 60,64,949.60	₹ 12,24,269.40
Mean	5.49	1.85	3.64	₹ 27,375.42	₹ 34,219.27	₹ 44,076.67	₹ 42,379.18	₹ 35,261.33	₹ 7,117.85
Standard Deviation	3.19	2.12	3.04	₹ 17,664.11	₹ 22,080.14	₹ 52,193.67	₹ 50,562.22	₹ 41,754.93	₹ 8,861.90
Minimum	2	0	1	₹ 7,199.20	₹ 8,999.00	₹ 8,999.00	₹ 8,819.00	₹ 7,199.20	₹ 1,399.80
1st Quartile (Q1)	3	0	1	₹ 13,599.20	₹ 16,999.00	₹ 16,999.00	₹ 16,149.00	₹ 13,599.20	₹ 2,699.80
Median (Q2)	5	1	3	₹ 19,995.60	₹ 24,994.50	₹ 29,999.00	₹ 28,199.00	₹ 23,999.20	₹ 4,199.80
3rd Quartile (Q3)	7	3	5	₹ 33,592.00	₹ 41,990.00	₹ 41,990.00	₹ 39,891.00	₹ 33,592.00	₹ 6,398.00
Maximum.	0	0	0	₹ 71,999.20	₹ 89,999.00	₹ 3,49,995.00	₹ 3,48,070.00	₹ 2,79,996.00	₹ 68,074.00

SmartWatches

Measure	Opening Stock	Closing Stock	Quantity Sold	Purchase Price	Selling Price	Total Revenue	Final_Amount (INR)	Total Cost	Profit
Sum	220	107	113	₹ 11,80,555.20	₹ 14,75,694.00	₹ 14,93,787.00	₹ 14,30,217.00	₹ 11,95,029.60	₹ 2,35,187.40
Mean	8.46	4.12	4.35	₹ 11,137.31	₹ 13,921.64	₹ 14,092.33	₹ 13,492.61	₹ 11,273.86	₹ 2,218.75
Standard Deviation	4.66	4.21	2.64	₹ 11,880.78	₹ 14,850.98	₹ 14,749.23	₹ 14,225.13	₹ 11,799.39	₹ 2,432.38
Minimum	3	0	1	₹ 1,999.20	₹ 2,499.00	₹ 2,499.00	₹ 2,324.00	₹ 1,999.20	₹ 324.80
1st Quartile (Q1)	5	1	2	₹ 2,239.20	₹ 2,799.00	₹ 2,799.00	₹ 2,631.00	₹ 2,239.20	₹ 391.80
Median (Q2)	6.5	4	4	₹ 2,799.20	₹ 3,499.00	₹ 3,499.00	₹ 3,289.00	₹ 2,799.20	₹ 489.80
3rd Quartile (Q3)	12.25	6.5	6	₹ 23,999.20	₹ 29,999.00	₹ 29,999.00	₹ 28,799.00	₹ 23,999.20	₹ 4,799.80
Maximum.	18	16	11	₹ 33,599.20	₹ 41,999.00	₹ 41,999.00	₹ 40,319.00	₹ 33,599.20	₹ 6,799.80

The overall descriptive statistics and product wise shown above gives important insights regarding inventory and sales pattern across a time period of 6 months from november 2024 to April 2025. By analyzing the mean and standard deviation in quantity sold, we can identify which products are good performers and which face fluctuations. Analyzing profit helps in identifying high-profit and low-profit products, which is essential for increasing business profitability. These measures help to identify significant stock movement patterns and profitability, which would eventually help to create data-driven strategies to increase the overall performance of business.

Detailed Explanation of Analysis Process

The project's main goal is to create data-driven strategies to address and solve the problems facing Shri Balaji Centre, a mobile and accessories shop regarding revenue maximization, inventory mismanagement and loss of sales due to second hand mobile phones demand.

The analysis starts with the data collection of sales data of 6 months, that is from November 2024 to April 2025. After getting the raw data, I have done the data cleaning and transformation of it for further ease of analysis. Below are the cleaning and preprocessing steps:

- Special characters like commas (,) and (\,@,#,$,\\) removed from the column Product Name and Brand using the function Substitute() and corrected the Inconsistent

formatting such as trimming extra spaces in column Payment Method using the function Trim(). Corrected the Product Category Value using Proper() to standard form.

- In the Quantity Sold column, there were 3 missing values, so I took the mean value in those rows. Also, changed the Text-based numbers (like "8,999") to proper Currency format. Crosschecked for the duplicates and have removed irrelevant rows to prevent double counting in the data.

By doing the Data cleaning process the overall data quality and accuracy gets improved for further analysis by eliminating duplicates, handling missing values, and standardizing to correct formats improves consistency, accurate analysis, better insights, and confident decision-making. For the analysis part, below mentioned analysis techniques used to solve each problem statement:

Analysis Workbook: Dataset_shri_balaji_shop_analysiswork.xlsx

1. **Revenue Improvement**:
    a. **Pareto Analysis** was done on Product Name on sales data which helped in identifying the 20% products name which account for the 80% sales. The main objective of using this method is to identify the high-contribution products for targeted marketing.
    b. **Time-Series Analysis:** was performed to track seasonal and monthly revenue trends. This resulted in clear seasonal patterns and is helpful in identifying peak demand months for better planning. Helps in forecasting for the next month.
    c. **Monthly Trend Analysis** was done using pivot tables to get insights of product category wise quantity sold, and overall products sold in 6 months. Additionally, month-wise product purchases by category and brand-wise sales were analysed. After doing the analysis, a very useful insight I have got about the seasonal patterns and trends monthwise.
2. **Inventory Management**:
    a. **ABC Analysis** was done to categorize the products based on their revenue contribution into A-class, B-class and C-class. This categorisation made it easier

to prioritize inventory decisions and focus on items that significantly impact the business's overall growth.

b. **Safety Stock & Reorder Point (ROP) Analysis** was done to prevent stockouts and manage inventory levels more efficiently and accurately. Using lead time data, safety stock levels were calculated. Then calculated the Reorder points, ensuring timely restocking of high-demand products and minimizing lost sales due to stockouts.

3. **Demand-Supply Gap**:

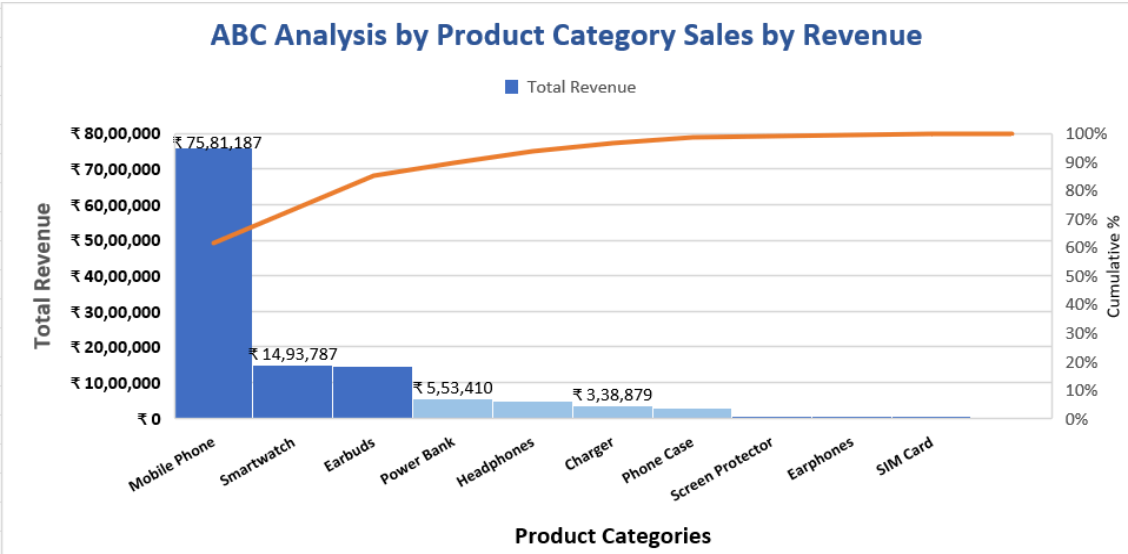
a. Using the customer feedback data, it was grouped by month, brand, and model to identify demand patterns. Aggregation techniques were used to calculate the total number of requests for each brand and model.

Microsoft Excel has been used and its functions like pivot tables and more were used for organization and analysis of data. For Visualization, I have used excel charts.

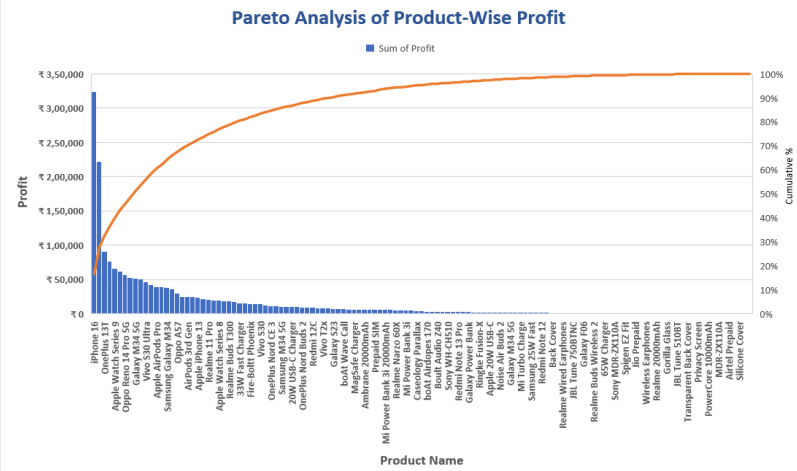
Results and Findings

Below are the result and findings from the sales and inventory analysis:

- Based on the ABC Analysis, Mobile Phones (61.4%), Earbuds (11.8%) and Smartwatches (12.1%) contributed to nearly 80% of revenue and formed the "A-Class" category which collectively contributed more than 85% of the shop's revenue. These products should be restocked on-time during peak sales periods.

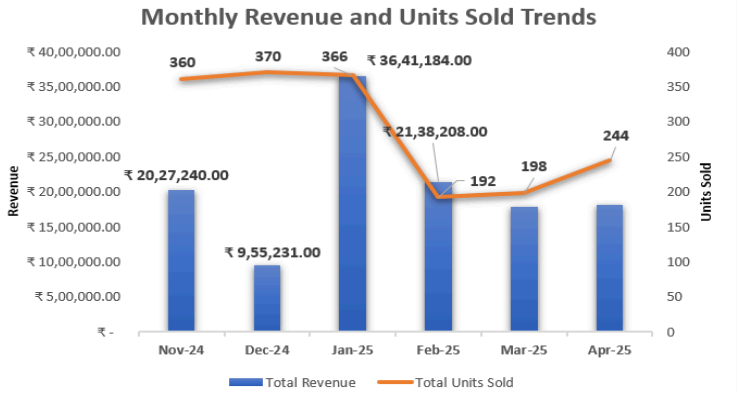


- B-Class products such as Power Banks (4.5%) and Headphones (3.9%) provide moderate but significant revenue and require balanced inventory management to avoid both stockouts and overstocking. C-Class comprises low-demand products such as Chargers, Phone Cases, Screen Protectors, SIM Cards, and Earphones which should be stocked cautiously to avoid overstocking.
- The Pareto principle clearly depicts the top 20% of products (by profit) that generate nearly 80% of total profits. Products like iPhone 16, OnePlus 13T, and Apple Watch Series 9 are the most profitable, with iPhone 16 alone contributing over ₹3.24 lakh in profit.

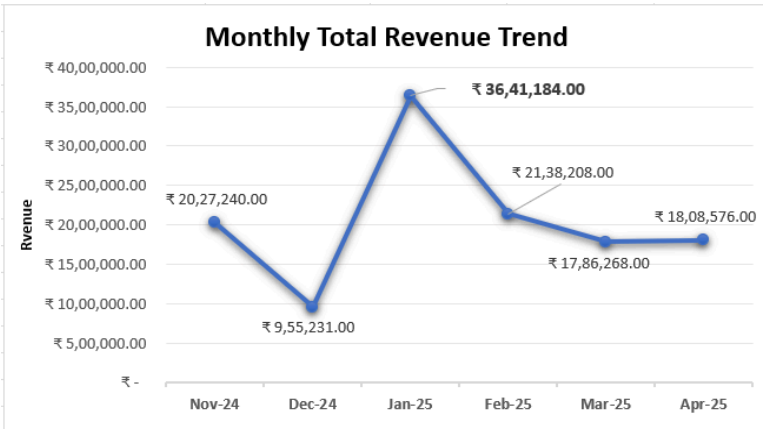


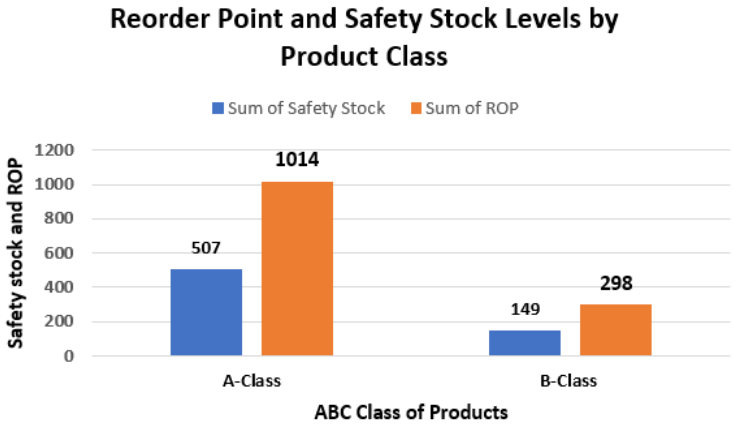
These top performers are critical for overall profitability and should receive focused attention in marketing, stock planning, and customer service.

- Based on the Time-Series Analysis, the highest sales was recorded in January 2025, which in total for 366 units sold and ₹36.4 lakh in revenue, because of a post-New Year peak likely due to gifting and new device launches.
- December 2024 was the lowest-performing month in terms of revenue index (46.4% of the average), suggesting a pre-festival down or reduced consumer spending before the year-end.

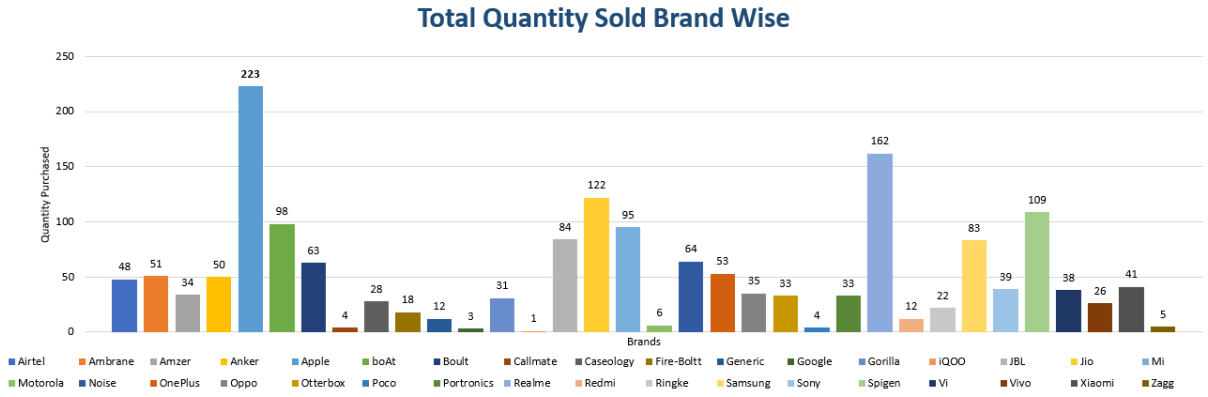


- Sales volumes remained steady in February, March, and April, with moderate fluctuations, reflecting a stable base demand outside of peak seasons.

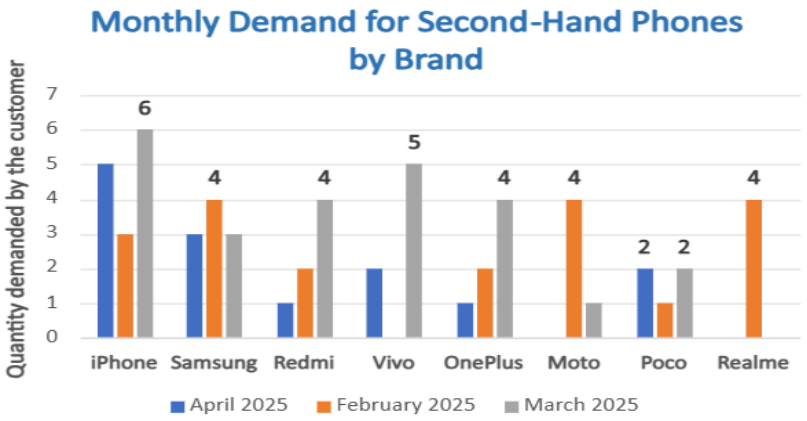




- Reorder Point (ROP) and Safety Stock calculations show that A-Class products maintain higher ROPs to ensure availability, while B-Class products have moderate ROPs, balancing risk and capital investment. C-Class products are not prioritized for frequent reordering, reducing the risk of overstock.



- Based on the chart above, Apple is the most profitable brand with a total quantity sold 223 over the months and other contributors such as Jio (122), Realme (162), Spigen (109) also achieved high sales volumes indicates a significant market share within their respective categories This insight suggests that focusing on top-performing brands while strategically managing lower-performing ones can enhance sales efficiency and profitability
- Apple, Samsung, Realme, and Spigen are the leading brands in terms of both units sold and revenue, reflecting strong consumer preference and market positioning.



- The analysis revealed that Apple iPhones (particularly iPhone 12, 13, and 14 models) accounted for the highest number of customer requests, followed by Samsung Galaxy S21 and S24 Ultra, and Realme models. Out of the 59 total inquiries, over 60% were for Apple and Samsung devices.
- Importantly, none of these requests were fulfilled, as the shop does not currently offer second-hand phones, resulting in missed sales opportunities. This finding highlights a significant gap in the shop's product offerings and suggests that introducing a certified pre-owned phone segment-focusing on high-demand brands like Apple and Samsung-could immediately address a large portion of customer needs and increase overall sales.
- We can launch a pilot program in which we will introduce the above products from the preferred brand and will do a marketing campaign through their instagram page to attract new customers and will contact the previous customers as well.