

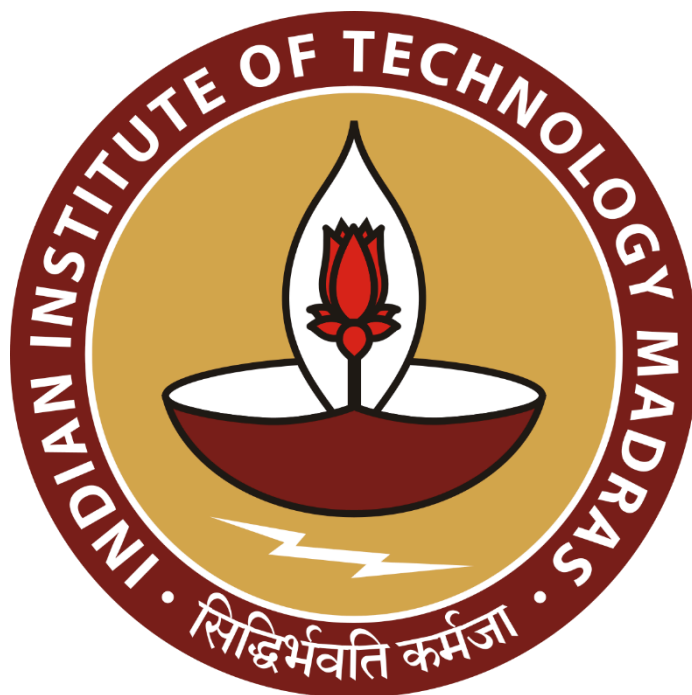
Optimizing Inventory and Pricing Strategies for Shree Balaji Mobile Care: A Data-Driven Approach

A Mid-Term report for the BDM capstone Project

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1 Executive Summary

Shree Balaji Mobile Care, founded in 2014 in Gandhi Market, Asind, Bhilwara, Rajasthan, is a retail mobile phone and accessories store operated by Mr. Sampat Lal Kumawat. The business faces two major operational challenges that impact profitability and long-term sustainability: 1) poor inventory management causing extreme amounts of slow-moving inventory while fast-moving products are sold through to good turnover and; 2) inconsistent pricing due to customer negotiation leading to multiple echelons of margins generating a loss of an average of 2.91% revenue per transaction and making financial recording systems cumbersome.

The comprehensive primary data collection includes transaction records over a three-month period (March-May 2025) with average 13 week inventory records in 14 different product categories, and 182 weekly transaction records tracking changes in price for various goods, and revenue streams. The data contains a significant amount of metadata including changes in stocked goods, and total stock movements where there were 1,351 total units purchased, 727 total units sold, and 624 total units remaining in all categories generating ₹4.42 million of total revenue. Important descriptive statistics identify severe inventory mismanagement issues with Screen Protectors where there were 217 units of unsold inventory (which was 80% of total purchases), USB Cables with 138 units (which was 76% of total purchases), and Phone Stands left with 75 units remaining (which was 83% total purchases).

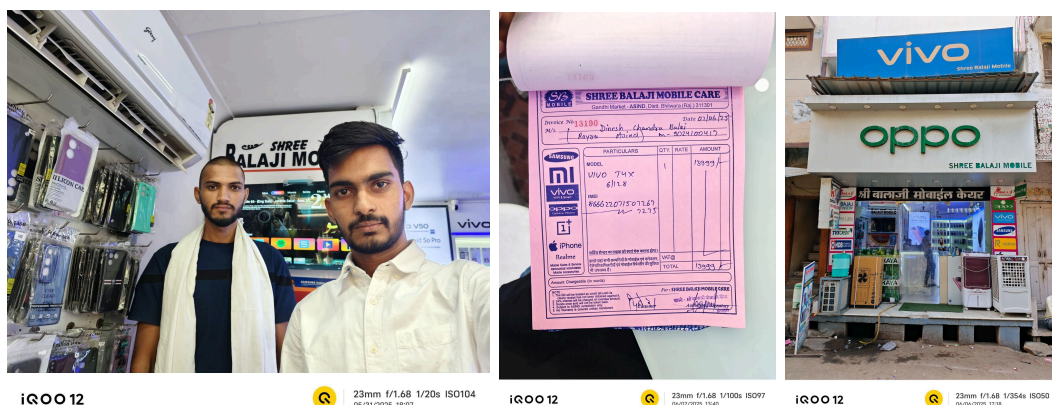
The analysis strategy utilized quantitative analysis using Excel for the inventory processing and Python with pandas for complex statistical analysis and matplotlib for comprehensive analysis. Multiple analysis methods were employed - inventory turnover, ABC analysis, price variance, trend analysis, and product segmentation - to answer the fundamental business problem and provided preliminary results which show limited inventory spilling all the way up to ₹1,138,800 in slow moving inventory and price analysis shows an annual loss in revenues of ₹527,760 as a result of price negotiations. The analysis indicates stark contrast in product segmentation of top performing products (Smartphones, Earphones, Power Banks with turnover of 94-100%) and others languishing and in need of urgent attention due to historical losses needing a structured way to get rid of and a cost based pricing strategy.

2 Proof of Originality of the Data

- Business Name : Shree Balaji Mobile Care
- Address : Gandhi Market, Asind, 311301
- Owner's Name : Sampat Lal Kumawat

Video of Interaction with Business Owner :- [Link](#)

Letter :- [Link](#)



3 Metadata

The collected dataset have two data sheets specifically designed to address the identified core problem statements of the inventory managements inefficiencies and pricing irregularities affecting market performance of Shree Balaji Mobile Care.

Sheet 1 - Monthly Inventory Performance Data : [sheet 1 link](#)

- Month: Categorical time-series variable covering March, April, and May 2025 enabling comprehensive time-series inventory analysis
- Product: 14 different product category representing complete business portfolio with varying price points from ₹300 (USB Cables) to ₹54,980 (Laptops)
- Stock_Purchased: Integer values ranging from 8-100 units tracking purchased by business and supplier relationship management patterns
- Stock_Sold: Integer values ranging from 2-65 units measuring actual sales count and customer demand fulfillment across different category

- Stock_Remaining: Integer values ranging from 0-217 units identifying critical inventory bottlenecks and capital tie-up issues
- Revenue (₹): Financial performance metric ranging from ₹3,960-₹397,100 representing actual business income across product categories

Sheet 2 - Weekly Pricing and Sales Data: [sheet 2 link](#)

- Week Start: DateTime variable spanning 13 consecutive weeks provides detailed time series pricing and sales analysis
- Product: Consistent product categorization provides seamless cross-referential analysis with stock data
- Units_Sold: Weekly sales volume ranging from 0-19 units tracking demand pattern identifying and sales quantity
- Base_Price(₹): Standard pricing structure ranging from ₹350-₹55,000 before customer negotiation
- Avg_Selling_Price(₹): Average of all sales price of a product in week after bargaining interactions showing price variations up to ₹4,350 per unit
- Weekly_Revenue(₹): Revenue generated per product category per week ranging from ₹0-₹117,400 for cash flow analysis

4 Descriptive Statistics [\(collab notebook\)](#)

Monthly Inventory Performance Analysis:

Metric	Stock_Purchased	Stock_Sold	Stock_Remaining	Revenue (₹)
Mean	32.17	17.31	27.66	₹105,187
Median	20.00	12.00	9.50	₹63,050
Std Dev	24.41	16.38	45.02	₹117,233
Min	8.00	0.00	0.00	₹3,960
Max	100.00	65.00	217.00	₹397,100

Weekly Sales Performance Analysis:

Metric	Units_Sold	Base_Price(₹)	Avg_Selling_Price(₹)	Weekly_Revenue (₹)
Mean	3.99	₹10,596	₹9,997	₹24,274
Median	3.00	₹4,150	₹3,850	₹13,549
Std Dev	3.96	₹14,547	₹14,213	₹49,883
Min	0.00	₹350	₹0	₹0
Max	19.00	₹55,000	₹54,980	₹117,400

Product-Wise Performance Analysis:

Product Category	Total Purchased	Total Sold	Total Remaining	Turnover Ratio
Smartphones	51	51	0	1.00
Earphones	135	130	5	0.96
Power Banks	90	85	5	0.94
Screen Protectors	270	53	217	0.20
USB Cables	180	42	138	0.23
Phone Stands	90	15	75	0.17

Critical Statistical Insights:

- Severe Inventory Polarization: Three products (Smartphones, Earphones, Power Banks) show perfect or near-perfect turnover (94-100%), while three others (Screen Protectors, USB Cables, Phone Stands) show critical accumulation (17-23% turnover).
- Capital Efficiency Disparity: High-value products demonstrate efficient capital utilization, while low-value accessories tie up significant working capital with Screen Protectors alone representing ₹108,500 in tied capital.
- Pricing Impact Quantification: Average revenue loss of ₹ 181 on each transaction, which is causing 2.91% margin erosion, with annual impact projected at ₹527,760 across all product categories.

5 Detailed Explanation of Analysis Process

Data Cleaning and Preprocessing

A systematic data validation process was implemented to ensure analytical accuracy and reliability. Initial assessment identified data type inconsistency, missing values represented as "#VALUE!" entries in pricing columns where no sales in the whole week for a product affecting 8.2% of records, and formatting variations across time series variables.

Structured Preprocessing Implementation:

- Data Types Standardisation: Convert all numerical column using pandas.to_numeric() with error handling for mixed data
- Missing Value Treatment: Systematically convert all entry of "#VALUE!" to 0 value due to no sale for a week, for proper statistical calculation
- Temporal Data Processing: convert to Standard date formats for Week Start column enabling proper systematic analysis
- Currency Validation: Verify all monetary value to maintain consistent ₹ format and eliminated anomalies

Comprehensive Analysis Process and Methodological Framework

Inventory Turnover Efficiency Analysis

Mathematical Formulas for analysis:

- Inventory Turnover Ratio = **Stock_Sold ÷ Stock_Purchased**
- Capital Efficiency Index = **Total_Revenue ÷ (Stock_Remaining × Estimated_Unit_Cost)**
- Deadstock Classifications = **Products with Turnover_Ratio < 0.5 AND Stock_Remaining > 50% of Stock_Purchased**
- Method Justification: This quantitative approach directly address Problem Statement1 by establishing measurable benchmark for inventory performance. The turnover ratio provides immediate identification of efficient vs. inefficient product categories, while capital efficiency quantifies the financial impacts of poor inventory management.

Price Variance Impact Assessment

Mathematical Formulas for analysis:

- Price Variance Percentage = **(Base_Price - Avg_Selling_Price) ÷ Base_Price × 100**

- Weekly Revenue Loss = $\Sigma(\text{Units_Sold} \times (\text{Base_Price} - \text{Avg_Selling_Price}))$
- Annualised Impact Projection = **Weekly_Revenue_Loss** \times **52 weeks**
- Statistical Validation: Applied one-sample t-test to validate the statistical significant in price variation across all product category. Confirm a systematic approach rather than a random bargaining impact.
- Method Justification: These analytical method quantifies the exact financial impacts of Problem Statement², provides a solid metric for the revenue optimization potential and pricing standardisation benefit..

ABC Analysis for Strategic Prioritization

Classification Method:

- Category A (High Priority): Product those contribute more than 70% in revenue with high number of sells
- Category B (Medium Priority): Product contribute 20% of revenue with medium efficiency
- Category C (Low Priority): Products contributing 10% of revenue with lows sells

Mathematical calculation:

$$\text{Revenue_Contribution_}\% = (\text{Product_Total_Revenue} \div \text{Total_Business_Revenue}) \times 100$$

Time-based Trend Analysis

Mathematical Approaches:

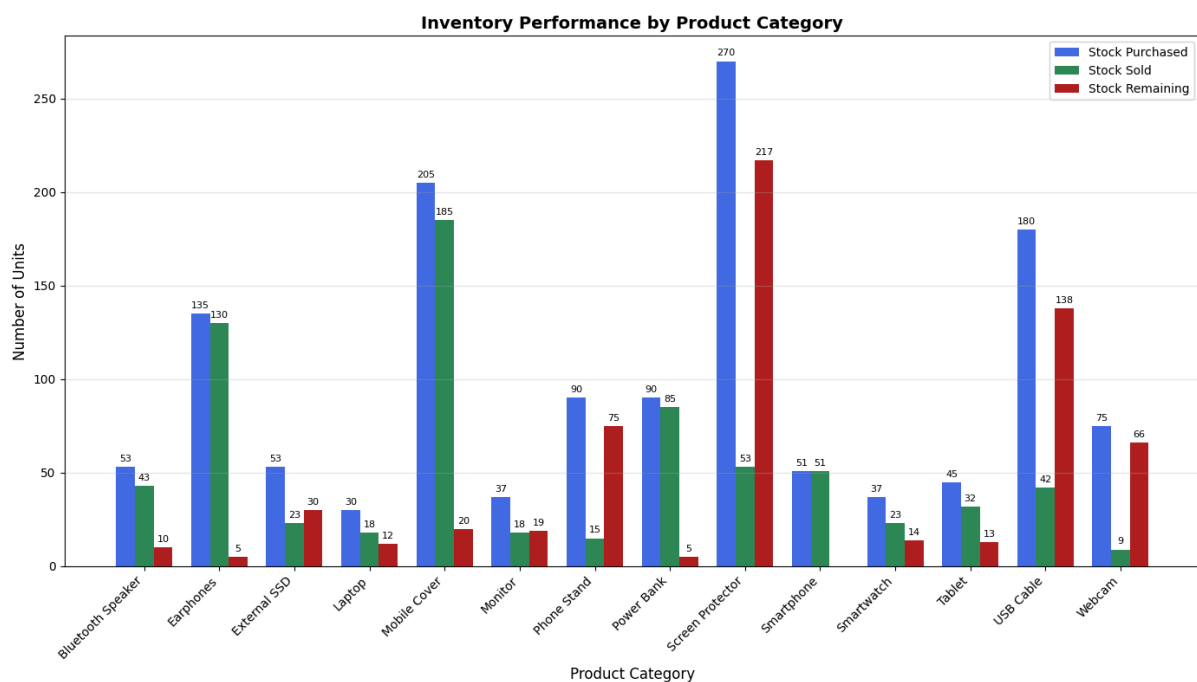
- Weekly Growth Rate = $(\text{Current_Week_Revenue} - \text{Previous_Week_Revenue}) \div \text{Previous_Week_Revenue} \times 100$
- Moving Average Smoothing = $(\text{Sum of 4-week periods}) \div 4$ to identify the seasonal patterns
- Coefficient of Variation = $(\text{Standard_Deviation}) \div \text{Mean} \times 100$ for the assessment of stability of demands

- **Method Justifications:** This time series analysis reveals the seasonal demands pattern and sales trend. That is crucial for optimized purchase timing and inventory planning decision

6 Results and Findings:

The following charts and observations highlight key business trends, as a consequence of in-depth analysis of Shree Balaji Mobile Care's available and priced stock, those are directly related to the challenges already presented.

5.1 Critical Inventory Accumulation Analysis



This clustered column chart reveal a severe about inventory management disparities across all product categories. The analysis demonstrates :

Critical Accumulation Issue :

- Screen Protector : 270 units purchased, only 53 sold, 217 units accumulated space (80% waste)
- Mobile Cover : 205 units purchased, only 20 sold, 185 units remains (90% accumulation)
- USB Cables: 180 units purchased, 42 sold, 138 units remains unsold (77% accumulations)
- Phone Stands: 90 units purchased, 15 sold, 75 units unsold (83% sales inefficiency)

Optimal Performance Category:

- Smartphones : Perfect balance with 51 purchased and 51 sold (100% turnover)

- Earphones: Near-perfect performances with 135 purchased quantity and 130 sold (96% efficiency)
- Power Banks :The Excellent turnover with 90 purchased and 85 sold (94% efficiency)

5.2 Capital Distribution in Tied Inventory

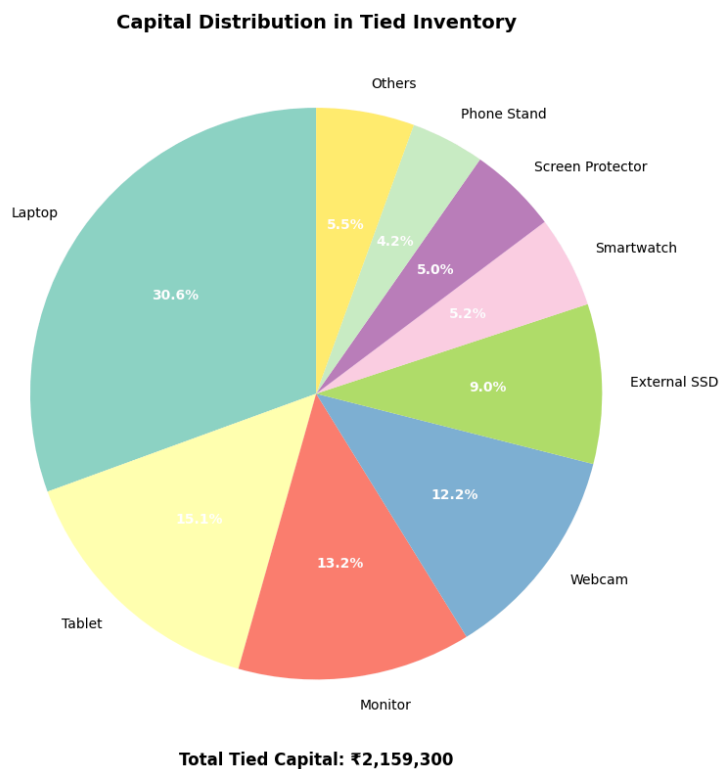
This pie chart visualise proportion of total capital tied in the unsold inventory for each product category. Total tied capital is ₹ 2,159,300

Key Insights:

Laptops (30.6%) and Tablets (15.1%) hold nearly half of the tied-up capital, despite not being the highest in unsold units.

Monitors (13.2%), Webcams (12.2%), and External SSDs (9.0%) also represent significant capital hold.

Accessories like USB Cable and Screen Protectors tie up less capital individually but are still notable due to high unsold quantities which accumulated unnecessary space .



5.3 Revenue Loss Due to Pricing Inconsistencies

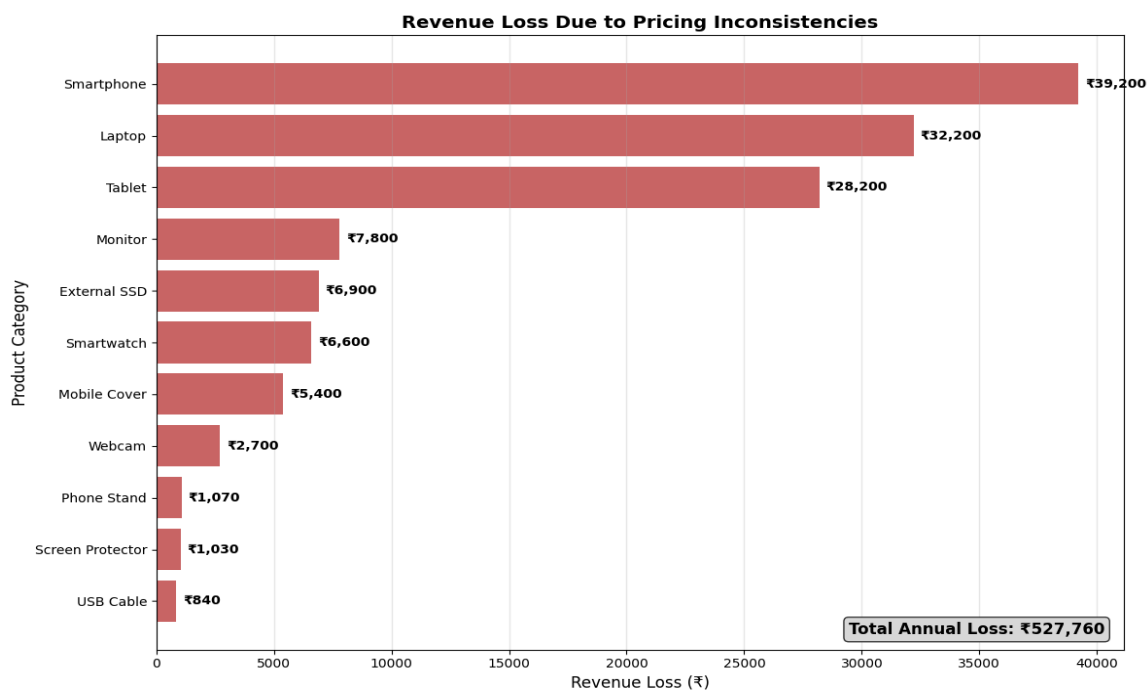
This waterfall chart demonstrates the cumulative revenue loss across product categories due to bargaining practices:

Revenue Loss Analysis:

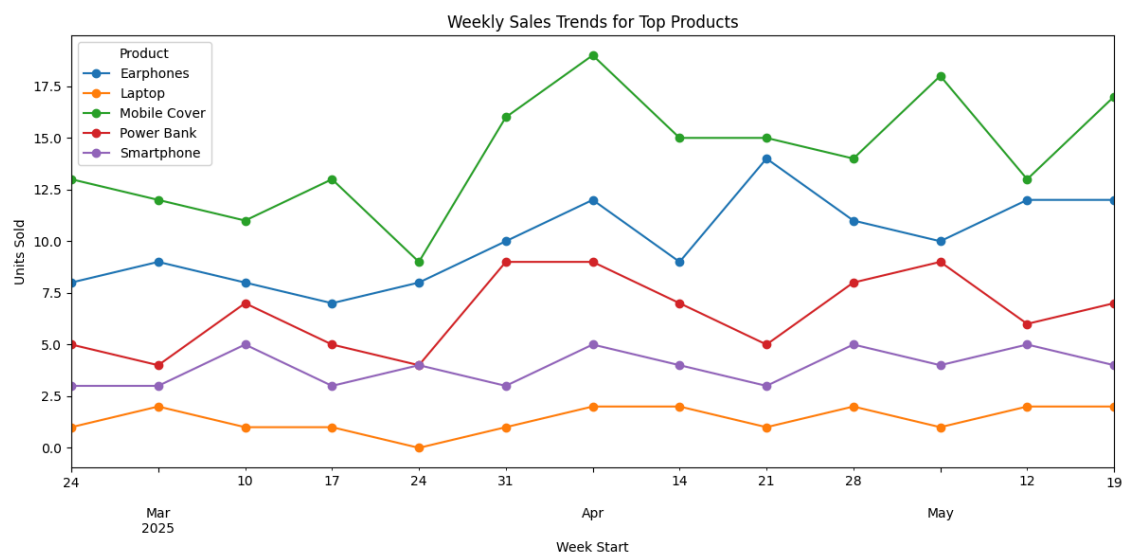
- Smartphones: Highest absolute loss of ₹39,200 quarterly, despite good turnover

- Laptops: ₹32,200 quarterly loss on high-value transactions
- Tablets: ₹28,200 quarterly loss on tablets
- Total Annual Impact: ₹527,760 in lost revenue across all categories

Critical Insight: The 2.91% average discount rate appears minimal but compounds to significant annual losses, particularly on high-value electronics where absolute discount amounts are larger.



5.4 Weekly Sales Performance Trends



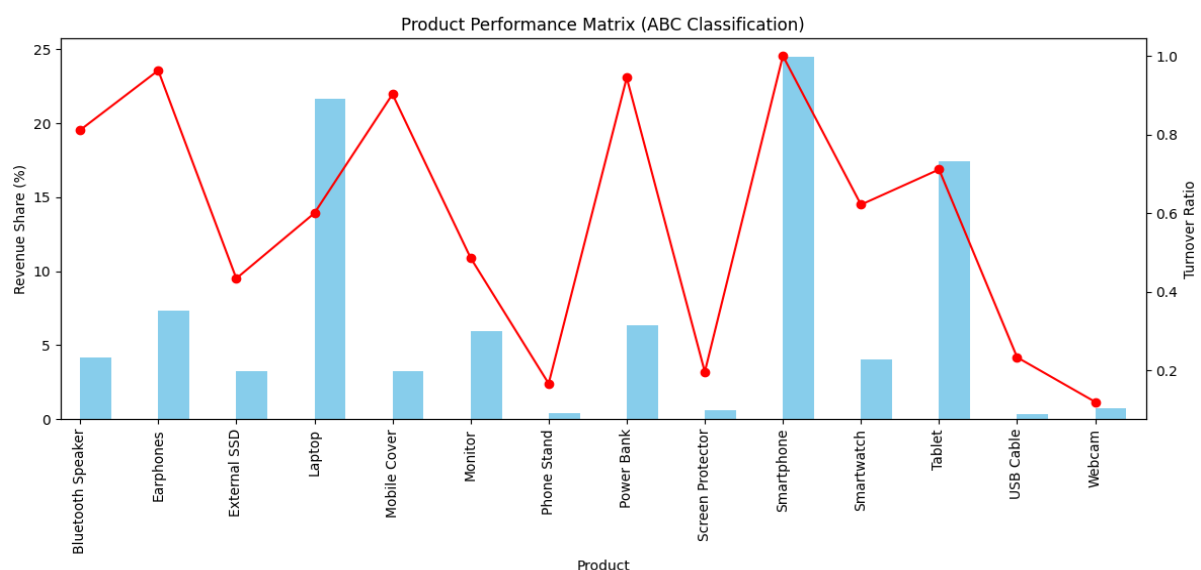
This line-chart demonstrates the weekly sales performance trends of top product. The analysis demonstrates:

Revenue Loss Analysis:

- Mobile covers: Highest and most consistent sales. Indicates that it is high demand and fast moving product
- Earphones : show steady growth, sales hikes from late april
- Power Banks: show medium but steady sales, and temporary spikes with earphones, hinting a high potential of cross-selling effects
- Laptops: Lowest volume in overall sales, but still each unit carries high revenue and margins

Critical Insight: These weekly trends shows a strong, stable demands for mobile covers and earphones, while other high value products like smartphone and laptop shows fewer units sells still contribute high revenue

5.5 Product Performance Matrix Analysis



Key Insights:

A-category: Smartphones, Laptops, Tablets (high revenue, high turnover)

B-category: Earphones, Power Banks, Mobile Covers (medium revenue, good turnover)

C-category: Accessories and slow mover (low revenue, poor turnover)