Analysing the Financial Performance of Top Shelf: A Stationery Retail Business

A Final Submission for the BDM Capstone Project

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Contents

1. EXECUTIVE SUMMARY

Top Shelf, a stationery retail business in Delhi University's North Campus, faces significant operational challenges due to seasonal demand fluctuations, inefficient inventory management, and a suboptimal product assortment. These issues lead to inconsistent sales, capital lock-up in slow-moving stock, and missed profitability opportunities, necessitating a data-driven approach to optimize its inventory and sales strategy.

This project leveraged historical sales and inventory data from March to June 2025, collected directly from Top Shelf. Utilizing Python libraries such as Pandas, Matplotlib, and Seaborn, the data underwent rigorous preprocessing and analysis. Key methodologies included descriptive statistics, monthly trend analysis, ABC analysis for inventory valuation, and comprehensive product profitability assessment to derive actionable insights.

Our analysis revealed pronounced sales peaks in May, influenced by academic cycles, alongside a surprising revenue resilience in June despite lower sales volumes, indicating a shift towards higher-value items. A critical finding was the systemic overstocking, particularly in categories like Art Supply, where closing inventory exceeded sales. Furthermore, while A4 paper products are high-revenue drivers, Notebook and Art Supply categories emerged as the most profitable, highlighting a disconnect between sales volume and margin.

Based on these interpretations, we recommend a dynamic, multi-peak inventory and marketing strategy, differentiated inventory management, and a profit-centric product assortment. Implementing these recommendations is expected to stabilize seasonal revenue, streamline inventory and capital use, and significantly increase overall profitability, transforming Top Shelf into a more efficient and data-driven business. This strategic shift will enable the business to adapt proactively to market demands and enhance its competitive edge.

2. DETAILED EXPLANATION OF ANALYSIS/METHOD

2.1 Overview of Analysis/Methods

The analysis began with manual data collection from Top Shelf, followed by data cleaning and preprocessing using Python. Descriptive statistics, ABC analysis, and sales forecasting were applied to evaluate inventory performance, sales velocity, and product profitability.

Visualizations such as line charts, bar graphs, and box plots were used to highlight category trends, stock inefficiencies, and revenue drivers. This structured approach provided clear, actionable insights for improving inventory strategy and product mix.

All related datasets and analysis are available at: **LINK**

2.2 Data Collection and Preprocessing:

The foundation of any robust analysis is clean, reliable data. Given the manual nature of Top Shelf's record-keeping, this initial phase was of critical importance.

Data Collection: Sales and inventory data from March to June 2025 were collected directly from the business's internal records. This raw data was then manually digitized into Microsoft Excel spreadsheets to create a structured format suitable for computational analysis.

Data Structuring: Two primary datasets were created:

A Sales Dataset containing transaction-level details: Item Name, Category, Sales Date, Quantity Sold, and Unit Price. An Inventory Dataset containing month-end stock details: Product Name, Category, Opening Stock, Incoming Stock, Total Sales, and Closing Stock for each of the four months.

Data Cleaning and Preparation: This crucial step was performed using the Pandas library in Python. The process involved:

Handling Missing Values: A product catalog was used to cross-verify and manually fill in any missing Unit Price or Quantity values to ensure the integrity of revenue calculations.

Standardizing Data Formats: The Sales Date column was standardized to a consistent DD-MM-YYYY format using Pandas' datetime functions to enable accurate time-based trend analysis.

Categorization: Products were logically grouped into predefined categories (e.g., all pens and pencils into 'Writing Essentials') to facilitate high-level analysis.

Outlier Detection: The Interquartile Range (IQR) method was employed to identify and handle potential outliers in sales quantity and price data, preventing them from skewing the analysis.

Removing Duplicates: The duplicated() and drop_duplicates() functions were used to ensure that each transaction was unique, guaranteeing the accuracy of sales and revenue totals.

These preprocessing steps transformed the raw, potentially inconsistent data into a clean, well-structured, and reliable dataset, forming a solid foundation for all subsequent analysis.

2.3 MetaData and Descriptive Statistical Analysis

The finalized dataset included 400 rows and 7 columns for sales, along with a secondary inventory file containing 100 rows and 21 columns. These captured key information such as product name, category, quantity sold, unit price, total revenue, and monthly stock movement from March to June 2025.

Basic descriptive statistical analysis was performed using Python's pandas library to understand the distribution of sales and inventory values. Key measures like mean, median, mode, and standard deviation were used to analyze central tendencies and variability across categories and products.

Product categories such as Writing Essentials, Paper, and Notebooks were included in the scope. Specific items like Apsara Non-Dust Eraser, UHU Glue Tube, and Luxor Chalk Marker were used for item-level analysis during monthly comparisons.

This initial analysis set the foundation for deeper insights into revenue patterns, inventory behavior, and category performance covered in later sections of the report.

2.4 Revenue Enhancement Based on Better Demand Forecasting:

To improve revenue, demand forecasting was applied to align stock availability with customer needs during peak academic periods. Historical sales data from **March to June 2025** was analyzed to identify demand spikes around semester starts and exams.

Using trend analysis and category-wise performance tracking, high-demand items were forecasted based on past sales behavior. This enabled more accurate planning for fast-moving products while reducing investment in low-demand stock.

Better forecasting supported timely restocking, minimized lost sales opportunities, and allowed the store to capitalize on peak periods ultimately enhancing revenue without expanding inventory or increasing operational complexity.

2.5 Inventory Performance and Sales Velocity Analysis:

To analyze inventory performance and sales velocity, a two-pronged methodology was employed, combining financial prioritization using ABC analysis with an operational review of sales performance. The first step involved classifying all product categories using ABC analysis. This method segments items based on their contribution to the total inventory value, allowing for a strategic allocation of management resources.

Class A includes the high-value categories that together account for approximately 80% of the total capital invested.

Class B consists of moderate-value categories contributing the next 15%.

Class C represents low-value categories with 5% capital allocation.

The mathematical process for this ABC analysis involves these steps:

$$\text{TotalValue (Category)} = \sum (\text{UnitCost} \times \text{Quantity on Hand})$$

The second part of the methodology was to cross-reference this financial classification with operational data from the *Category-wise Sales vs. Final Inventory* chart. By comparing a category's financial importance (its ABC class) with its sales velocity, a clear, data-driven picture of inventory performance emerges, highlighting critical areas for strategic intervention.

2.6 Product Assortment and Profitability Optimization:

To enhance overall profitability, SKU-level sales data was analyzed to evaluate each product's contribution to revenue. High-selling and high-margin items like Writing Essentials and Paper were found to drive the bulk of profits, while certain products in Sticky Notes, Art Supplies, and Office Accessories occupied shelf space without meaningful returns.

Using basic contribution analysis, underperforming SKUs were flagged for possible removal or downsizing, while high-performing items were prioritized for visibility and restocking. This strategic assortment optimization ensures better shelf utilization, improved return on investment, and a more targeted product mix aligned with actual customer demand.

2.7 Visualisations of Findings:

Visualizations were created using Python (matplotlib, seaborn) to uncover and communicate key business patterns. Line graphs illustrated monthly sales trends, while bar charts compared category-wise performance and product profitability. Box plots highlighted revenue variability and stock inconsistencies, and pie charts displayed category contributions to total sales and volume.

These visuals offered intuitive insights into seasonal demand shifts, fast-moving vs slow-moving items, and category-level profitability. They also supported strategic decisions regarding inventory planning, shelf optimization, and SKU prioritization making complex data easier to interpret and act upon for business improvement.

3. RESULTS AND FINDINGS

3.1 Managing Seasonal Demand Fluctuations

This dual-axis chart shows both sales quantity and total revenue peaking in May 2025. A key insight appears in June, where despite a sharp drop in the quantity of items sold, total revenue remained resilient with only a minor decline. This divergence strongly suggests an increase in the average price or value of items sold during that final month.

Key Insights

The dual-axis chart *Monthly Sales Performance: Quantity vs. Revenue* offers a clear view of the business's seasonal rhythm, aggregating all categories to highlight macro trends from March to June 2025. Both total quantity sold and total revenue follow a consistent pattern, rising from March to a peak in May recording nearly 6,000 units sold and over ₹250,000 in revenue followed by a decline in June, due to the semester break during that period.

A deeper insight lies in the shifting relationship between quantity and revenue. Although both metrics follow similar trajectories, their rates of change diverge. From May to June, sales volume drops by around 10 percent, while revenue falls by only 6 percent. This suggests a higher average selling price in June, possibly due to a shift toward premium products or fewer discounts.

The data indicates that even in periods of lower volume, profitability per unit can remain strong, reinforcing the importance of managing product mix and pricing strategy alongside volume.
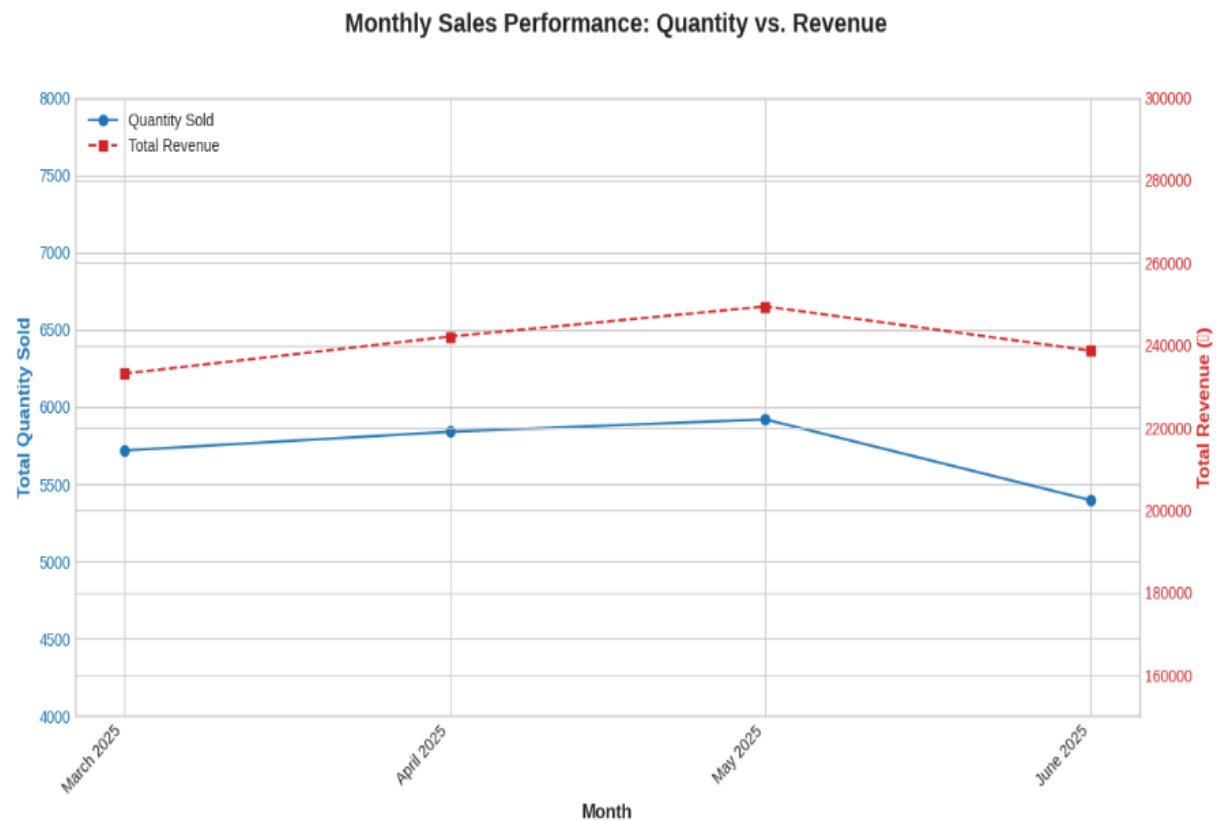
Graph 1: Monthly Sales Trend

This chart compares monthly revenue across product categories from March to June 2025. Sticky Notes consistently dominated sales, while the Paper category showed a strong growth trajectory, becoming the second-highest performer by June. Most other product lines displayed more modest revenues with varying monthly fluctuations, highlighting distinct performance trends across the portfolio.

Key Insights

The chart *Graph 2* titled *Category Revenue Over Time* provides a clear view of monthly revenue trends across various product categories from March to June 2025. Office Supply consistently leads in revenue, peaking in April, indicating its central role in overall sales. Notebook and Paper follow closely, with Paper experiencing a sharp increase in June,

suggesting a possible seasonal or promotional influence. File and Instruments remain steady mid-range performers, showing consistent market demand.

On the other hand, Art Supply, Sticky Notes, and Adhesive consistently generate the lowest revenues, which may reflect lower market interest or limited promotion. A minor overall dip in revenue across several categories in May could point to external factors such as holidays or reduced demand.

Graph 2 : Category Revenue Over Time

These trends indicate strong opportunities for growth in top-performing categories, while low-performing segments may require reevaluation, improved marketing strategies, or product repositioning to drive future performance.

## 3.2 Optimizing Inventory Through Sales Trend Analysis:

This ABC analysis classifies inventory by value, revealing a significant concentration in a few key areas. The Class A categories, led by Writing Essentials and Paper, represent the vital few, with just five categories accounting for 78% of the total inventory value. This identifies them as the most critical areas for focused inventory management and control.

Key Insights

The *ABC Analysis by Inventory Value per Category* offers crucial insights into how inventory capital is distributed across product lines. It shows that nearly 80 percent of total inventory value is concentrated in five Class A categories: Writing Essentials, Paper, File, Office

Supply, and Instruments.However, this high-value segment includes categories with notable risks. Paper shows volatile demand and recent overstocking, while Instruments delivers one of the lowest profit margins.

This suggests a significant portion of working capital is tied up in categories with limited financial return or unpredictable behavior.
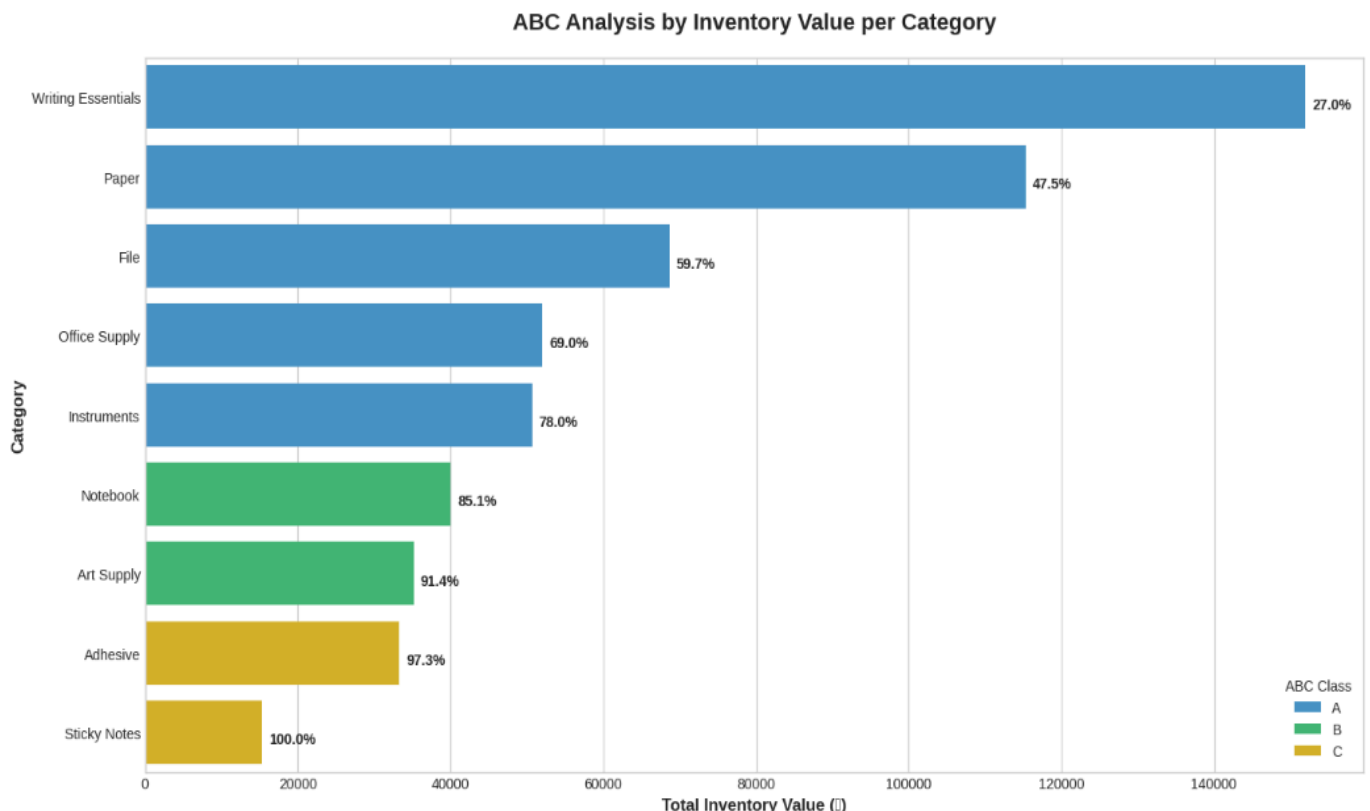

Graph 3: ABC Analysis

In contrast, the company's most profitable categories, Notebook and Art Supply, are in Class B and require less capital investment. This indicates a misalignment between capital allocation and profitability. Meanwhile, Class C categories like Adhesive and Sticky Notes represent a small share of inventory value but deliver consistent sales. Their low capital footprint and fast turnover suggest they can be managed with streamlined policies, allowing more attention to be focused on optimizing high-risk, high-investment Class A segments.

This chart contrasts sales volume with final inventory, revealing key operational insights. Writing Essentials is the clear leader in units sold but also holds the largest closing stock. In a notable contrast, Art Supply is the only category where the final inventory exceeds total sales, indicating significant overstocking or poor performance for the period.

Key Insights

The *Category-wise Sales vs. Final Inventory* chart provides a direct comparison of sales performance against end-of-period stock levels, revealing significant imbalances in inventory efficiency across the product portfolio. A primary insight is the clear divide between high-velocity categories and a broad segment of overstocked products. Writing Essentials and Adhesive stand out as the sales leaders, with sales volumes far exceeding their final stock, indicating healthy turnover.
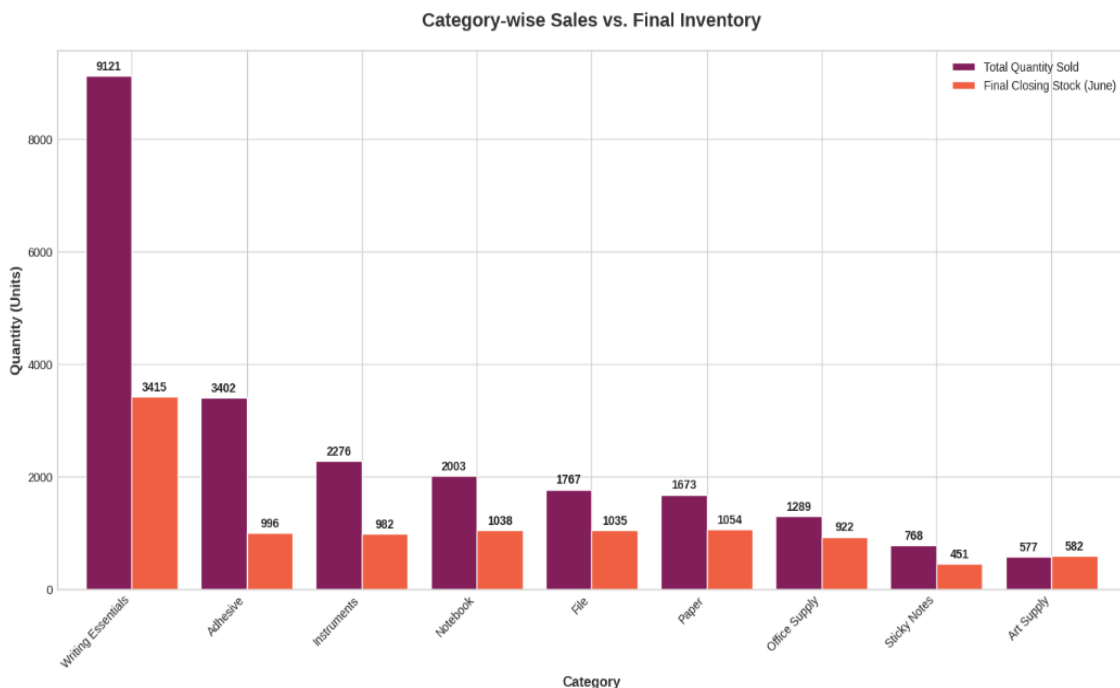
Graph 4 : Category-wise Sales vs. Final Inventory

Adhesive is particularly efficient, with its closing stock representing less than 30% of its total units sold for the period, setting a benchmark for effective inventory management.

The analysis highlights a systemic issue of overstocking in the majority of other categories. The most critical case is Art Supply, where the closing inventory of 582 units surpasses the total sales of 577 units, indicating a near-zero turn rate and a significant misallocation of capital.

This problem of holding excessive stock extends to other key categories, including Notebook, File, Paper, and Office Supply, all of which have final inventory levels equivalent to more than 50% of their total sales. This crucial insight demonstrates that a large portion of the

company's physical assets is tied up in slow-moving products, which presents a considerable risk to cash flow and profitability.

3.3 Refining Product Assortment for Profitability:

This horizontal bar chart ranks the top 10 products by revenue, revealing a clear market dominance by paper items. Bilt A4 Printing Paper (500 sheets) stands out as the highest earner by a significant margin, with various paper products collectively accounting for six of the top ten revenue-generating spots.

Key Insights

The bar chart, *Top 10 Products by Revenue* offers clear and direct insights for refining the product assortment to enhance profitability. It is immediately evident that A4 printing paper is the primary engine of revenue, with four different brands, led decisively by Bilt A4 Printing Paper, dominating the top half of the list.
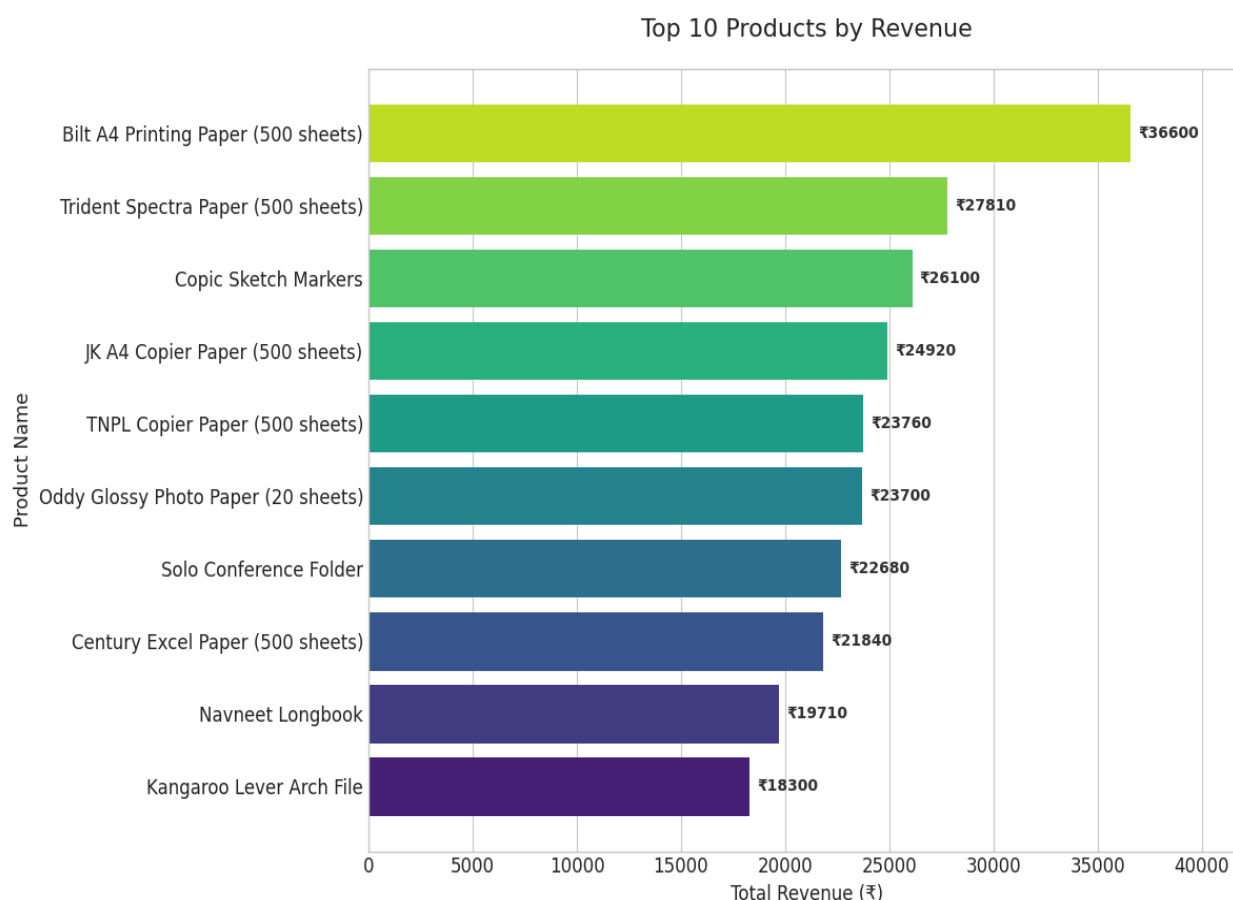
Graph 5 : Top 10 Products by Revenue

This underscores the critical importance of this single sub-category. Alongside these high-volume commodity items, the strong performance of a high-value niche product like Copic Sketch Markers, which stands as the third-highest revenue generator, highlights a separate and potentially more profitable market segment.

Based on this revenue hierarchy, a two-pronged strategy is recommended for refining the product assortment. First, the business must secure its core revenue stream by ensuring the top-performing A4 paper brands are always in stock, competitively priced, and prominently featured. Second, to drive higher profitability, there should be a strategic focus on expanding the assortment of high-margin, specialty products. The success of Copic Sketch Markers provides a strong validation for exploring other premium art supplies or similar niche items. This balanced approach will maintain the stability of high-revenue sales while systematically growing product lines that offer greater profitability.

This bar chart ranks product categories by profitability, identifying Notebook as the most lucrative with a 31.0% profit margin. On the other end of the spectrum, Instruments is the least profitable category at 20.0%, highlighting a significant 11-point spread in margin performance across the portfolio.

Key Insights

The *Profit Margin by Category* chart provides crucial data for refining the product assortment, shifting the focus from pure revenue to actual profitability. It reveals that Notebook and Art Supply are the most profitable categories, delivering impressive margins of 31.0% and 28.6% respectively.

This insight is particularly significant when contrasted with the earlier revenue analysis, which showed paper products as the top revenue drivers. This disparity suggests that the highest-volume products may not be the most financially rewarding, highlighting the importance of categories like Art Supply and Notebook as key to improving overall profitability.

Therefore, a profit-centric refinement of the product assortment should prioritize these high-margin categories. The strategic focus should be on expanding the range within Notebooks and Art Supplies, ensuring premium placement, and promoting them to drive sales. While high-revenue, lower-margin items are vital for attracting customers, profitability

can be significantly enhanced by encouraging customers to add these more lucrative products to their purchases.
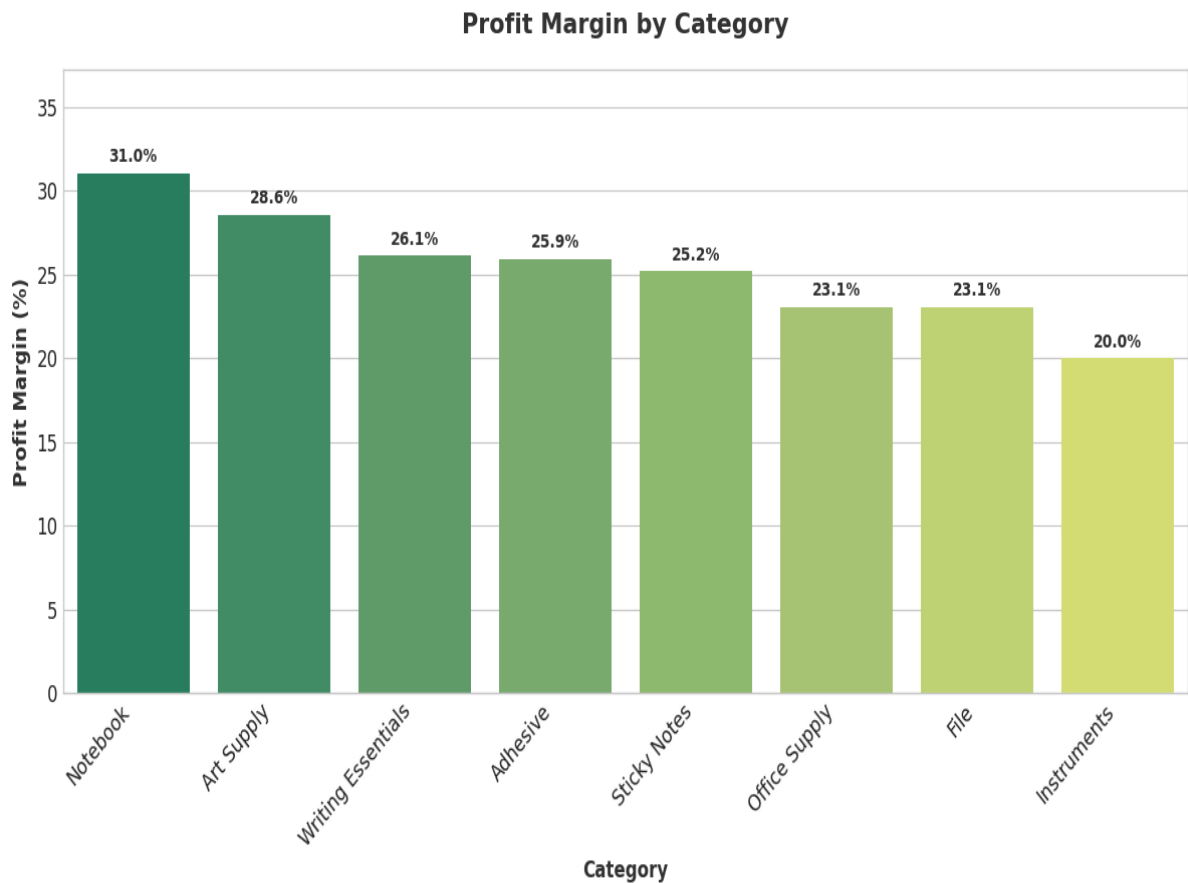
Graph 6 : Profit Margin by Category

Furthermore, categories with the lowest margins, such as Instruments at 20.0%, should be carefully evaluated to determine if their sales volume and strategic importance justify their place in the assortment or if they could be replaced by more profitable alternatives.

4. INTERPRETATIONS OF RESULTS AND RECOMMENDATIONS

4.1 Managing Seasonal Demand Fluctuations

4.1.1 Interpretation

The combined analysis of aggregate sales performance and category-specific revenue trends reveals that the business's seasonality is not uniform but layered across multiple product

cycles. The overall revenue peak in May is largely driven by strong performance in Writing Essentials, while the sustained revenue in June despite a drop in total sales volume is attributed to different peak periods across other categories. This indicates that what appears to be a single seasonal trend is, in fact, a blend of non-aligned category-level cycles.

The *Category Revenue Over Time* chart confirms this divergence. While Writing Essentials slows after May, categories like Office Supply and Paper achieve their highest revenue in June. Earlier peaks in File and Adhesive during April further reinforce this pattern. The increase in average revenue per unit in June reflects a shift toward higher-value product categories. This underscores that Top Shelf operates not as a single seasonal business but as a portfolio of overlapping demand cycles, each requiring targeted planning and inventory strategies for effective management.

4.1.2 Recommendations

Based on these insights, the business should shift away from a uniform marketing and inventory calendar and adopt a dynamic, multi-peak strategy for the 2026 planning cycle. This means building distinct operational plans for key categories aligned with their individual demand cycles, allowing the company to deploy marketing, inventory, and promotional resources at moments of maximum impact.

For the core revenue driver, Writing Essentials, inventory levels and marketing campaigns should be ramped up ahead of the April-May peak. File and Adhesive, as early-quarter performers, require a strategic push in April to fully capture their time-sensitive demand. In contrast, Office Supply and Paper should be managed with a late-quarter focus, with stock and promotional efforts targeted towards June. This approach will help smooth overall revenue across the quarter and reduce the financial dip typically seen in the final month.

The company should also capitalize on the insight that revenue can remain strong even during lower sales volume periods when the product mix shifts towards higher-value items. It is recommended to analyze the specific June 2025 sales mix and pricing strategy to identify what contributed to the higher average revenue per item. These findings should inform future upselling tactics, product bundles, and premium promotions across other months, allowing the business to drive profitability through smarter positioning rather than just higher volume.

4.2 Optimizing Inventory Through Sales Trend Analysis

4.2.1 Interpretation

The combined analysis of the *ABC Analysis by Inventory Value* and the *Category-wise Sales vs. Final Inventory* charts reveal a systemic misalignment between where capital is invested and how inventory performs in the market. The data shows that significant portions of working capital are tied up in categories that are underperforming or moving too slowly. This disconnect between inventory value and sales velocity remains a major barrier to efficient stock management and healthy cash flow.

This issue is especially evident within high-value Class A categories like Paper, File, and Instruments. While these account for a large share of inventory investment, they show weak sales performance. Paper is severely overstocked relative to sales, and similar patterns appear in File and Instruments, highlighting a failure to align procurement with real demand. Even in Class B, issues persist. Art Supply, despite its high margin potential, closed with more inventory than it sold. In contrast, Adhesive, a low-value Class C item, demonstrated excellent sales velocity and stock turnover proving that efficient inventory management is possible but not applied where it matters most.

4.2.2 Recommendations

Based on the findings, the existing uniform inventory policy should be replaced with a differentiated, data-driven approach for the 2026 planning cycle. Inventory rules, reorder points, and safety stock levels must be tailored to each category by combining its ABC classification with observed sales velocity. This targeted strategy will ensure capital and operational attention are directed where they deliver the most value.

For underperforming Class A categories such as Paper, File, and Instruments, immediate action is necessary. Excess stock must be reduced through clearance sales or promotional bundling. Future procurement should shift from a just-in-case approach to a leaner, demand-driven model, significantly lowering order quantities and freeing up working capital. The assumption that high investment equates to high value must be re-evaluated.

In the Class B segment, particularly Notebook and Art Supply, the goal is to enhance turnover while preserving margins. This can be achieved by right-sizing future orders and deploying targeted promotions to increase movement. These are high-potential categories that are currently underutilized.

For efficient Class C performers like Adhesive, simple automated reordering systems should be implemented to maintain availability without manual oversight. These fast-moving, low-investment items require minimal effort but contribute reliably to sales volume.

This tiered inventory strategy addresses inefficiencies at the top while strengthening overall portfolio performance.

4.3 Refining Product Assortment for Profitability

4.3.1 Interpretation

The analysis of top revenue-generating products and category-level profit margins reveals a key disconnect between sales volume and profitability. The current assortment leans heavily on high-volume, low-margin products, while high-margin categories remain under-leveraged. This suggests that a purely revenue-driven strategy may be capping overall profitability, requiring a more balanced, margin-aware approach.

The Paper category exemplifies this paradox. A4 paper products dominate revenue charts, acting as the primary traffic drivers. Yet, the category is absent from the top profit margin rankings indicating they are low-margin cash cows that support volume but not profit. This creates over-reliance on products with minimal impact on the bottom line.

In contrast, categories like Art Supply and Notebook offer strong profit potential. Products such as Copic Sketch Markers contribute notable revenue, while the Notebook category posts the highest margin at 31.0% despite limited presence on the revenue leaderboard. Meanwhile, Writing Essentials and Adhesive provide a healthy balance of volume and margin, highlighting the need to re-strategize assortment around both traffic and profitability drivers.

4.3.2 Recommendations

Based on the analysis, the business should transition from a revenue-centric approach to a portfolio-based product strategy. Each category must be managed according to its role whether as a high-volume traffic driver or a high-margin profit center to build a more balanced and sustainable business model in 2026 and beyond.

To unlock profitability, strategic investment should be directed toward Art Supply and Notebook categories. This includes expanding the range with other premium items, enhancing in-store and online visibility, and running targeted campaigns aimed at customers seeking high-quality, high-margin goods. The goal is to deliberately increase their share in the sales mix.

Paper products, though low in margin, should be repositioned as tools for driving store traffic and cross-selling. Promotions can bundle them with profitable items such as notebooks or folders to lift total transaction value.

Categories like File and Instruments (20% margin) should undergo a performance and pricing review. Underperforming SKUs may be delisted to free up space and capital for higher-yield alternatives.

Conclusion

This report provided a comprehensive analysis of Top Shelf's sales and inventory performance, highlighting critical inefficiencies in managing seasonal demand, capital allocation, and product assortment. The findings demonstrate that the business operates across overlapping demand cycles, requiring a shift from a uniform strategy to a dynamic, category-specific approach. By implementing differentiated inventory policies, aligning promotions with category peaks, and optimizing the product mix toward high-margin items, Top Shelf can significantly improve operational efficiency, reduce stock-related losses, and increase overall profitability. These strategic adjustments will position the business to respond more effectively to demand fluctuations and sustain long-term growth.