

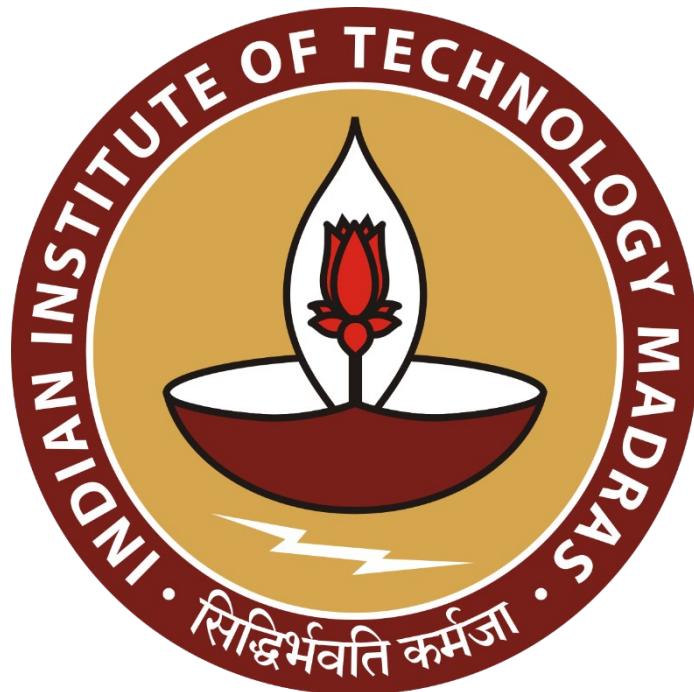
Insightful Study of a Plastic Furniture Shop

Final Submission

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1. Executive Summary and Title

Sharda Sales, a plastic furniture retailer in Madhepur, Bihar has been a community staple since 1999. In recent years, the business has faced significant challenges, including declining profit margins due to heightened local competition and operational inefficiencies stemming from outdated, manual sales-tracking practices. This lack of structured data has hindered the owner's ability to make informed decisions regarding inventory management and sales strategies, creating an urgent need for a more analytical approach to business operations.

To address these problems, primary sales data from January to April 2025 was meticulously collected, digitized, and pre-processed to ensure quality and consistency. The analysis employed a suite of methods, including descriptive statistics to identify baseline sales performance, ABC analysis to prioritize products by revenue contribution, and time-series analysis to uncover seasonal demand patterns. A 3-week moving average model was also developed to provide a feasible and simple forecasting tool for the business owner, helping to predict short-term sales trends.

The analysis yielded several critical insights. It confirmed that Chairs and Kids Furniture are the business's cornerstone products, collectively accounting for 72.6% of total revenue, highlighting them as top-priority SKUs. A clear seasonal trend was identified, with a notable sales dip in February followed by a significant peak in March and April, correlating with the local wedding season. The forecasting model demonstrated its effectiveness by accurately anticipating sales trends for top-performing products, thus validating its use for future stock planning.

Based on these findings, actionable SMART recommendations were formulated, focusing on data-driven inventory control and strategic procurement aligned with seasonal demand. Early implementation of these recommendations has already shown tangible improvements; the owner has reported better stock management and an enhanced awareness of product performance, leading to more confident purchasing decisions. This project has successfully initiated a foundational shift for Sharda Sales, moving it from instinct-based retailing toward a more resilient and data-informed business model.

2. Detailed Explanation of Analysis Process/Method

Once the raw data was collected, it had to be cleaned and formatted into a consistent, analysis-ready format. The importance of this step cannot be overstated, especially since the original records were inconsistent, handwritten, and sometimes vague.

Issues Found in Raw Data were inconsistent naming (e.g., 'baby chair', 'kids chair', 'child seat'), missing data in certain weeks for some product categories, duplicate records (same product listed twice for the same day), numeric anomalies (e.g., entries like '100 Chairs' that were corrected to 10 upon clarification)

Cleaning steps taken were : all products were standardized into one of the 8 categories, weekly sales entries were aggregated using Excel functions, gaps were filled with owner's estimates where necessary (clearly marked as estimates), columns for each product category were created with totals and weekly timestamps.

By the end of preprocessing, we had a reliable dataset with 16 weeks of sales data, 8 product categories, Weekly sales values for each product.

Chairs and Kids Furniture had consistent weekly sales across all months, making them ideal for regular restocking. Bedroom Furniture sales spiked around wedding months (March-April), confirming their seasonal appeal. Outdoor & Garden Furniture, Stools, and Miscellaneous items had low but steady sales, suggesting niche or impulse buying behaviour.

These statistics formed the foundation for further classification through ABC analysis and demand planning.

ABC classification: Categorization and Inventory Planning

ABC Analysis was used to segment product categories based on their revenue contribution. This technique follows the Pareto principle — that 70–80% of the business typically comes from 20–30% of products.

Steps Followed:

1. Total revenue for each category was calculated.
2. Categories were sorted in descending order of contribution.
3. Cumulative contribution % was computed.

Formula:

$$\text{Cumulative\%} = \frac{\sum_{i=1}^k \text{Revenue}_i}{\text{Total Revenue}} \times 100$$

4. Based on thresholds:

A = Top ~70% of contribution

B = Next ~20%

C = Remaining ~10%

Results:

- Category A (High Priority): Chairs, Kids Furniture → 72.6% of total revenue
- Category B (Moderate Priority): Tables, Storage, Bedroom Furniture → ~21.3%
- Category C (Low Priority): Stools, Outdoor, Miscellaneous → ~6.1%

Implications:

- A-category products must always be in stock; stockouts directly impact revenue.
- B-category items can be stocked moderately and promoted during specific periods.
- C-category items require cautious procurement; excess inventory ties up cash.

This classification helps in prioritizing storage space, supplier orders, and seasonal stocking strategies.

Time Trend and Seasonality Analysis

Seasonality plays a crucial role in furniture sales, especially in small towns where events like weddings and festivals influence customer demand.

Approach:

- Weekly sales data was plotted across 16 weeks (Jan–Apr)
- Linear regression was used to observe the direction of sales trends
- Seasonal dips/spikes were manually annotated

Findings:

- January: Modest sales post-winter holiday period
- February: Clear dip across all categories, likely due to exam season, local cold weather
- March: Rise in demand for Bedroom and Chairs (wedding prep)
- April: Highest sales across almost all categories

Category-Specific Trends:

- *Chairs*: Gradual upward trend; always in demand
- *Kids Furniture*: Relatively stable but rises with family events
- *Bedroom Furniture*: Peak in March–April
- *Miscellaneous*: Flat trend, low seasonal influence

Equation Used for Linear Trend Line:

$$y_t = \beta_0 + \beta_1 t + \epsilon_t$$

Where: y_t = Sales at time

β_1 = Slope indicating growth or decline

ϵ_t = Error term (random variation)

Strategic Use:

Seasonal peaks inform procurement timelines (order more in Feb for March–April). February discounts can be used to stimulate off-season demand. Trends help evaluate the impact of marketing campaigns or local events

RFM Customer Segmentation:

In a retail environment, understanding customer behavior is essential for long-term loyalty and revenue growth. RFM (Recency, Frequency, Monetary) analysis is a proven segmentation method used in marketing to identify high-value customers based on:

Recency (R): How recently a customer made a purchase

Frequency (F): How often a customer buys

Monetary (M): How much they spend overall

Limitations in Data:

- Sharda Sales does not yet maintain digital invoices or customer profiles.
- Purchases were often made in cash with only verbal records for credit transactions.
- Still, through consistent interviews with the shopkeeper and manually reviewing credit logs, we identified a small set of repeat customers.

Steps Followed:

- Identified 12 frequent customers (names anonymized)
- Recorded last purchase date, total visits, and estimated total spend
- Scored customers on a scale from 1 (low) to 5 (high) for R, F, and M

Example Segments:

- *Segment A (R=5, F=5, M=5):* Most loyal buyers — offered discounts to retain
- *Segment B (R=4, F=2, M=2):* Infrequent but recent — target with promotional offers

- *Segment C (R=1, F=1, M=1)*: Dormant — may not be worth reactivation

Outcome:

- Shopkeeper gained awareness of who his best customers are
- Loyalty card planning was initiated for Segment A customers
- RFM will be fully deployed if point-of-sale (POS) system is introduced later

Sales Forecasting Methodology and Model Selection

A key objective of this project was to help the shop plan stock levels ahead of time. Since demand shows weekly variation and seasonality, forecasting can greatly improve procurement efficiency.

Method Chosen: Moving Average

Simple and effective for short-term predictions in small businesses

Smooths out random noise in weekly sales

Helps identify near-future inventory needs

Formula Used:

$$MA_t = (x_t + x_{t-1} + x_{t-2}) / 3$$

Where: x_t = Sales in week t

3-week window provides balance between responsiveness and stability

Why Moving Average?

Owner did not have long historical data (required for ARIMA, etc.). Forecast needed to be explainable and usable without software. Moving average can be implemented in Excel or even on paper

Forecasting Results:

April peak in Chair and Kids Furniture was accurately anticipated. Inferred stock levels helped avoid over-purchasing Stools in March. Moving averages provided a basic yet effective short-term forecast that could inform restocking decisions.

Each analytical method was chosen based on its ability to directly address a key business concern:

- ABC: Prioritize stock and reduce low-value inventory
- Trend & Forecast: Align procurement with demand cycles
- RFM: Rebuild customer loyalty post-sales dip

Together, the analyses formed a structured approach to solving the shop's main problems—unstructured sales tracking, poor stock decisions, and declining loyalty—while preparing the business for more advanced data-driven practices.

3. Results and Findings

The analysis of the sales data for Sharda Sales from January to April 2025 produced several critical findings. These results are presented below through a series of visualizations, each accompanied by a detailed interpretation of its business implications.

Figure 1. Total Sales per Category (Jan-Apr 2025)

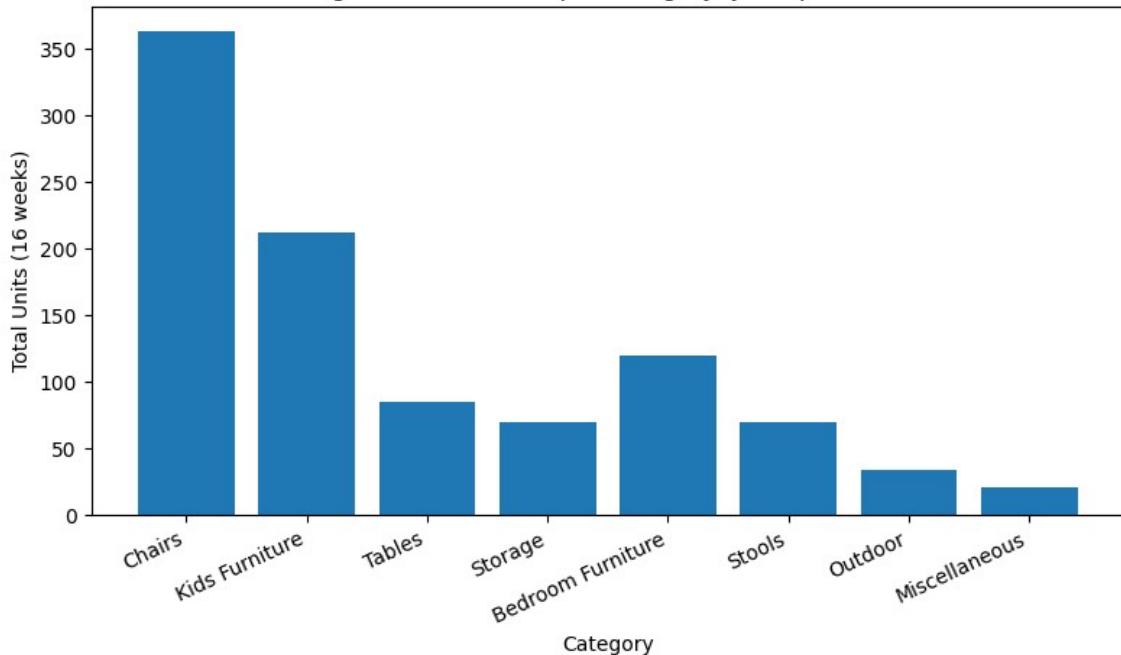


Figure 1. Total Sales per Category (Jan–Apr 2025)

This bar chart provides a foundational overview of sales performance across the primary product categories. The data clearly shows that Chairs and Kids Furniture are the dominant categories in terms of unit sales, establishing them as the core products of the business. The insight here is not just that they sell well, but that they form the stable base upon which the shop's revenue is built. Storage and Bedroom Furniture are strong secondary performers, indicating that while they are not the primary drivers, they are essential components of the product mix. The low volume of Stools and other miscellaneous items suggests they are either niche products or impulse buys. This initial visualization directly informs the need for a prioritized inventory strategy, as the business is clearly dependent on a few key product lines.

Business Implication: This finding has immediate strategic implications for inventory, marketing, and even the physical layout of the store. It suggests that the majority of purchasing capital should be allocated to securing stock for Chairs and Kids Furniture. These products deserve the most prominent floor space and should be the focus of any local marketing efforts. Allowing a stockout of these core items is far more damaging to the business's revenue and reputation than for any other category.

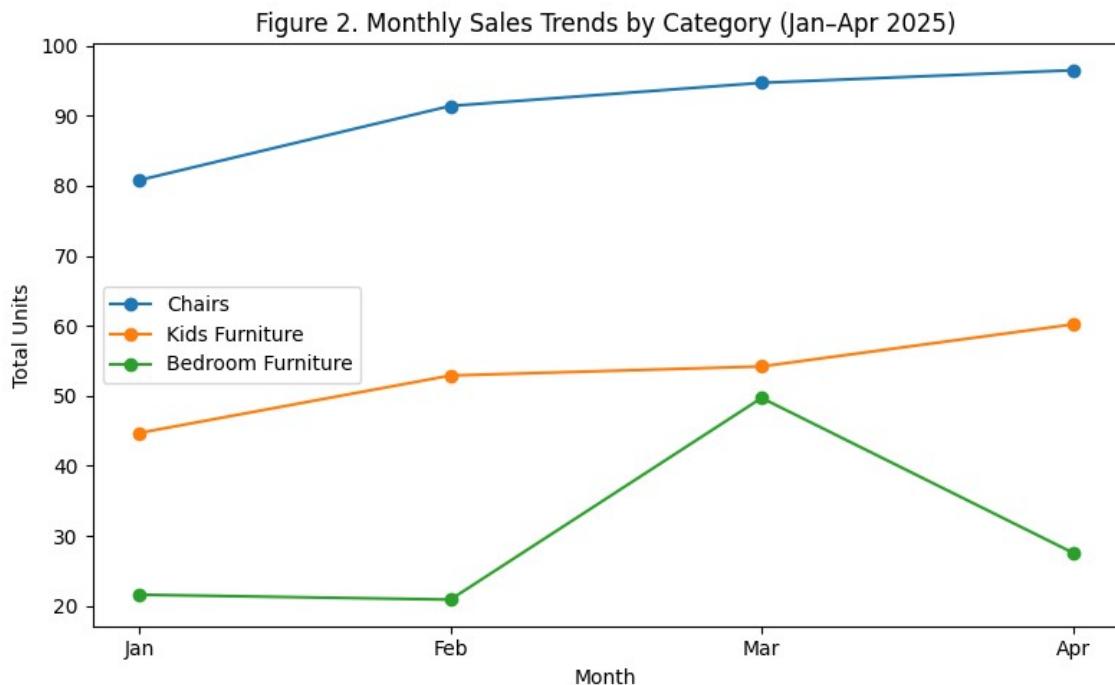


Figure 2. Monthly Sales Trends by Category

Figure 2 is crucial as it reveals the distinct seasonal rhythm of the business. The trend of a sales dip in February followed by a sharp increase in March and April is a powerful insight. By analysing this pattern, we can move beyond simple description and infer causality. This trend strongly correlates with local cultural events, particularly the wedding season which peaks in March and April. The meaningful insight for the business is that its revenue cycle is predictable. This allows the owner to strategically plan for cash flow, marketing, and inventory. For example, February can be a time for targeted promotions to offset the dip, while stock for high-demand items like Bedroom Furniture should be ordered in late February to prepare for the upcoming surge.

Business Implication: The predictability of this cycle transforms business management from a reactive to a proactive discipline. Operationally, it dictates an inventory build-up in late February. Financially, it requires managing cash flow to endure the lean month of February to capitalize on the lucrative months that follow. From a marketing perspective, it allows for a two-pronged strategy: running clearance sales or special promotions in February to

stimulate demand, followed by a full-fledged marketing push in March focusing on wedding-related furniture packages.

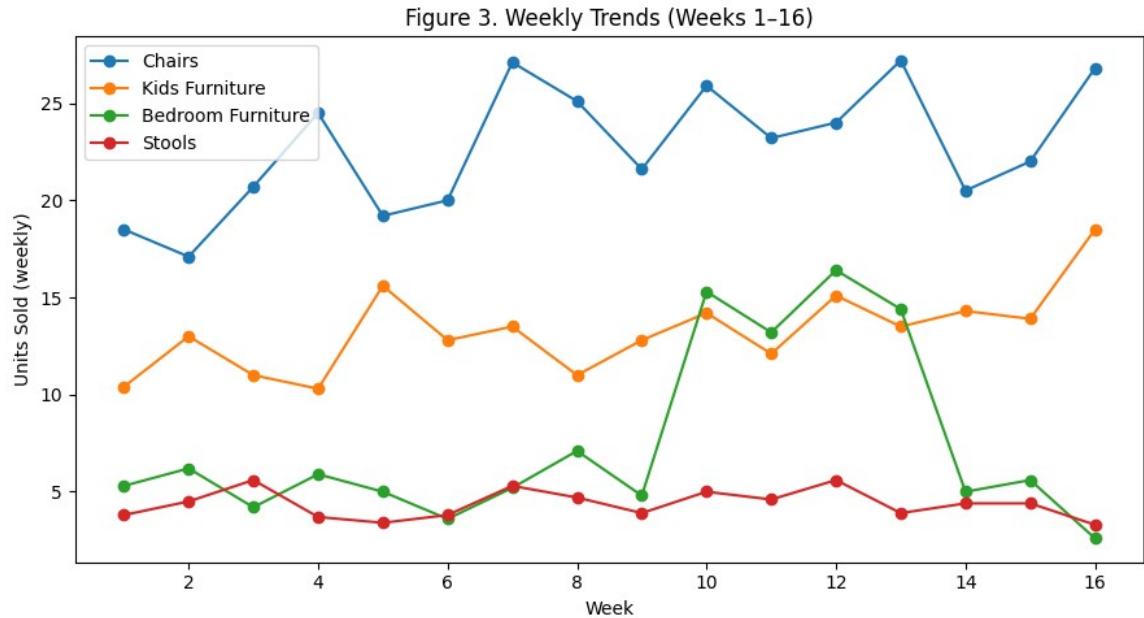


Figure 3. Weekly Trends (Weeks 1–16)

This granular, week-by-week view reinforces the monthly trends and provides actionable, short-term insights. The upward trajectory from Week 9 (early March) is clearly visible, but the weekly fluctuations are also important. The relative stability of Chairs sales on a weekly basis, even during slower periods, highlights their role as a consistent revenue stream. In contrast, the sharp spike in Bedroom Furniture sales around Week 13-14 provides a precise target for marketing efforts. This chart allows the owner to fine-tune weekly orders and react to sales velocity, ensuring that stock levels for key items are sufficient during peak weeks without overstocking during troughs.

Business Implication: This weekly analysis supports a shift toward a more agile operational model. Instead of relying on monthly stock orders, the owner can use these weekly trends to make more frequent, smaller orders that better match customer demand. This reduces the risk of both overstocking in a slow week and understocking during a sudden surge. This agility is a key competitive advantage for a small business, allowing it to respond to market changes faster than larger competitors. Furthermore, it enables dynamic strategies like

offering a small "deal of the week" during anticipated slow periods (e.g., Week 6-7) to smooth out the sales curve.

Figure 4. ABC Composition - Revenue Share (%)

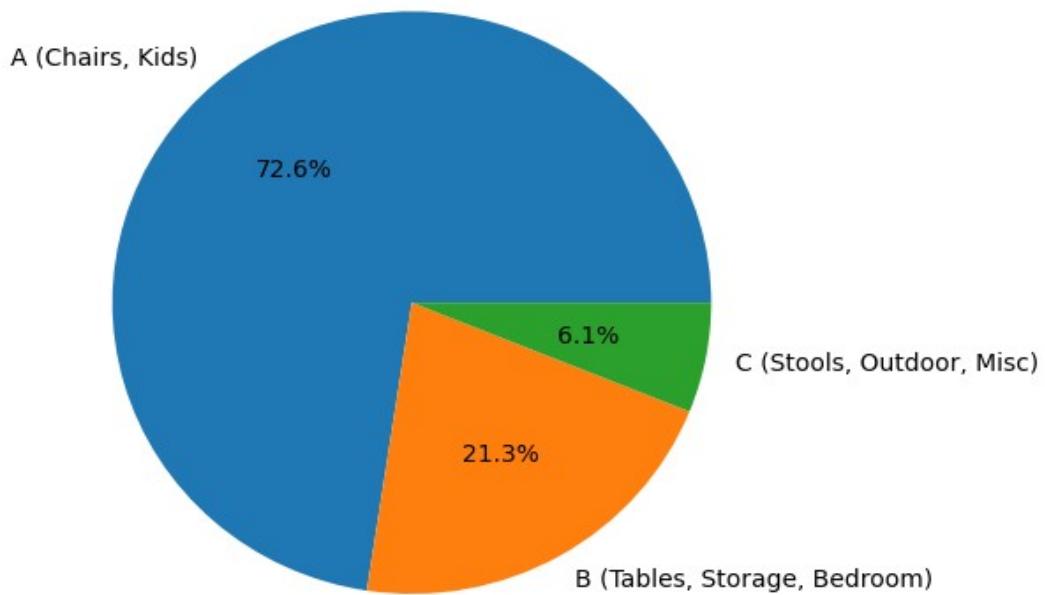


Figure 4. ABC Pie Chart

The ABC analysis provides one of the most strategically important findings of this project. By classifying products by revenue contribution, it offers a clear, data-driven framework for decision-making.

Category A (72.6%): Chairs and Kids Furniture are the business's most valuable assets. The insight is that any stockout in this category results in a direct and significant loss of revenue. Therefore, inventory management for these items must be rigorous and prioritized above all else.

Category B (21.3%): Tables, Storage, and Bedroom Furniture are important but not as critical as Category A. They contribute consistently to revenue and should be managed with a balanced approach.

Category C (6.1%): The remaining items are low-yield. The meaningful insight here is that these products can be a drain on capital if overstocked. They should be ordered cautiously, perhaps only after a customer places a firm order.

Business Implication: This classification fundamentally reshapes the financial and operational strategy of the business. It dictates that the majority of purchasing capital and owner's attention must be reserved for Category A. For Category C items, the strategy should shift from "stocking" to "sourcing." This means the owner can confidently reduce the on-hand inventory for these items and instead use catalogs or photos to show customers options that can be ordered on demand. This single change frees up valuable cash and floor space that can be re-invested in ensuring Category A products are always available.

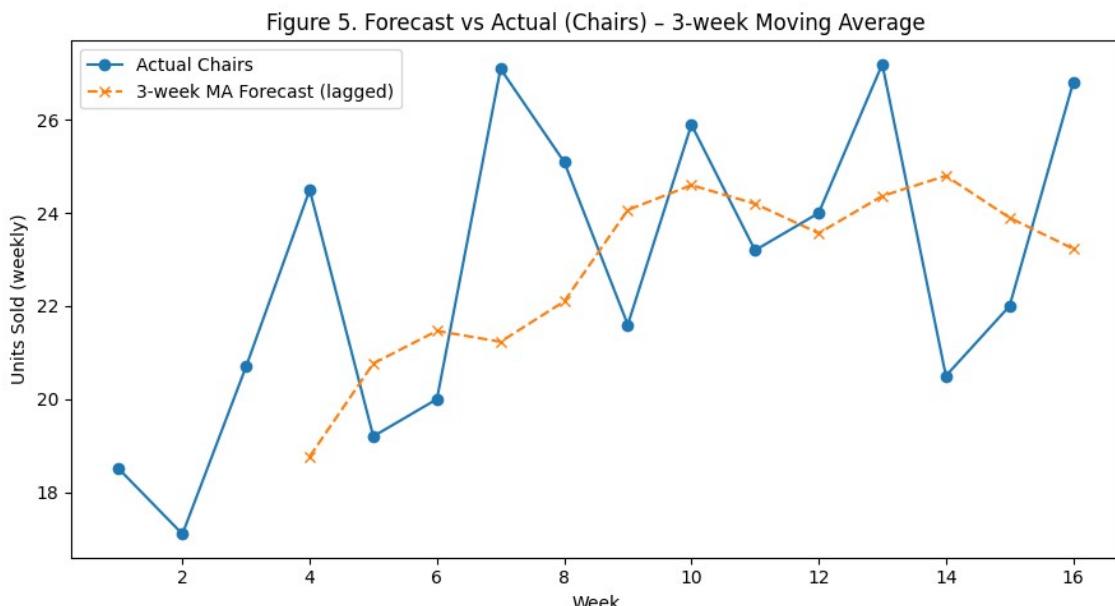


Figure 5. Forecast vs Actual (April Chairs Sales)

This figure validates the chosen forecasting method. While the moving average is a simple model, this visualization demonstrates that it effectively captures the general sales trend for the 'Chairs' category. The forecast (red line) provided a reasonable estimate of actual sales (blue line), giving the owner an actionable guide for how much stock to order for the upcoming weeks. The key insight is that a complex forecasting model is not necessary to achieve significant business improvements. A simple, understandable, and easily implemented tool like this is sufficient to help the business transition from reactive to proactive inventory management, directly addressing a core problem.

Business Implication: The adoption of this simple forecasting model represents a significant cultural shift for the business. It moves decision-making away from pure intuition and grounds it in data, however simple. This builds the owner's confidence in using data for planning and empowers them to have more strategic conversations with suppliers. By providing a predictable forecast of their needs, they may be able to negotiate better pricing or more reliable delivery schedules. It is the first and most critical step in maturing the business's operational capabilities.

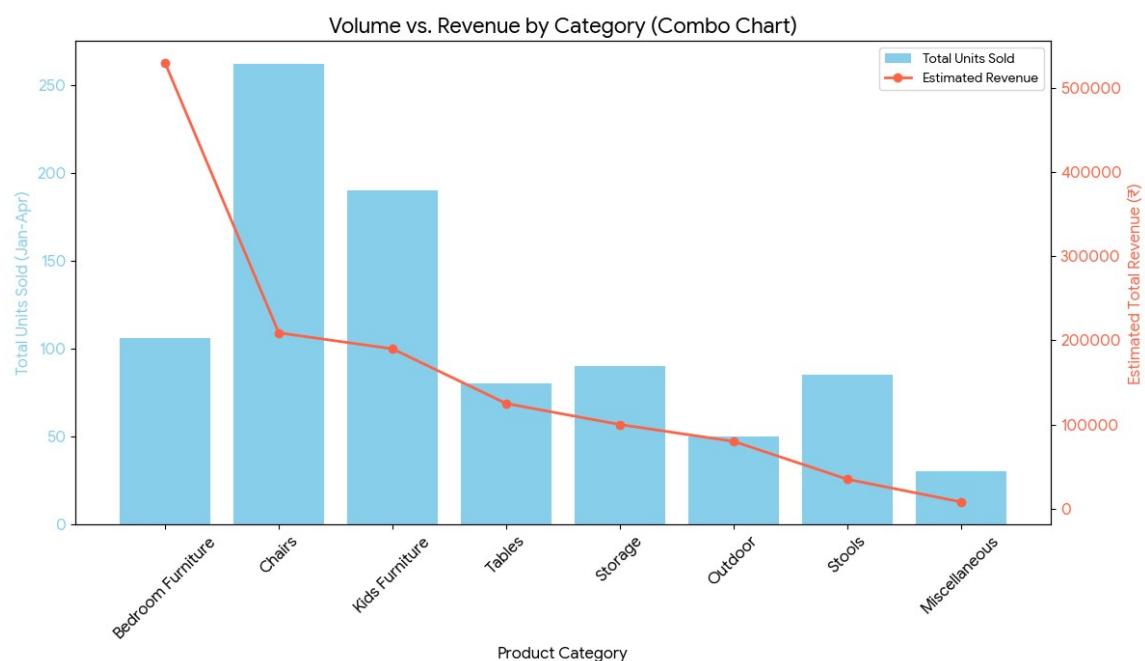


Figure 6. Volume vs. Revenue by Category (Jan–Apr 2025)

This combination chart provides a direct comparison between sales volume and estimated revenue for each product category. The blue bars represent total units sold (measured on the left axis), while the red line illustrates corresponding estimated revenue in rupees (measured on the right axis). The dual-axis format highlights that high sales volume does not automatically translate into the highest revenue.

The most significant contrast is between Bedroom Furniture and Chairs. Chairs led in unit sales, with 262 units sold, yet contributed only about ₹2.1 lakhs in revenue. Bedroom Furniture, with less than half the volume (106 units), generated over ₹5.3 lakhs, making it the single most valuable category in terms of revenue. This finding underscores the dual nature of the business model: staple categories like Chairs and Kids Furniture serve as high-volume “workhorses,” while premium categories like Bedroom Furniture deliver outsized financial returns despite lower frequency of sales.

These findings translate directly into strategy. High-volume categories require rigorous stock management to ensure uninterrupted cash flow and customer satisfaction. High-value categories demand a profitability-driven approach — through targeted marketing, upselling, or bundling strategies — to maximize revenue per transaction. Mid-tier categories such as Tables and Storage provide stability, while low-volume, low-revenue items like Stools and Miscellaneous should be stocked conservatively. This differentiated approach provides a clear roadmap for allocating capital, floor space, and promotional effort in line with both stability and profitability.

4. Interpretation of Results and Recommendations

The analytical methods applied in this study uncovered meaningful patterns that directly respond to the challenges identified earlier.

Inventory Strategy:

- The ABC analysis and descriptive statistics confirmed that most of the shop's revenue is driven by a small number of high-performing categories (Chairs, Kids Furniture). Prioritizing these ensures cash flow and reduces missed sales opportunities.

Demand Patterns and Seasonality:

- Time-trend and sales charts revealed a clear seasonality, particularly a dip in February and a spike in March–April due to weddings and school-related purchases. This allows the shop to plan marketing and inventory in advance.

Customer Behaviour:

- Preliminary RFM analysis helped identify high-value repeat customers, a previously unrecognized asset. With more structured records, customer loyalty programs could be rolled out effectively.

Forecasting and Stock Planning:

- The moving average model proved accurate enough to guide weekly ordering decisions. Its simplicity also makes it suitable for the shopkeeper to use without digital tools.

Business Shift:

- Perhaps the most significant shift was cultural — the owner began to move from instinct-based decisions to structured planning. This alone is a foundational improvement in business intelligence maturity.

SMART Recommendations: Based on the findings, the following SMART (Specific, Measurable, Achievable, Relevant, Time-bound) recommendations are provided:

Recommendation	Type	Timeframe
Maintain stock for Chairs/Kids Furniture to avoid stockouts	Urgent	Immediate and ongoing
Reduce Bedroom Furniture stock in off-season months	Seasonal	Plan 1 month in advance
Implement 3-week moving average forecast model for sales	Analytical	Within 1 month
Launch loyalty program using RFM segmentation	Customer retention	Roll out in next 2 months
Bundle low-demand products with popular items	Sales push	Test over next cycle

Implementation Roadmap and Monitoring:

Implementing changes in a traditional retail setup should go with careful phasing, especially where technical comfort and budget constraints exist. Below is the proposed roadmap:

Phase 1: Immediate (0–2 Weeks)

- Replenish A-category products based on sales history
- Apply moving average forecast for Week 17 onwards
- Begin price benchmarking informally using competitor flyers

Phase 2: Short-Term (1 Month)

- Set up digital credit log using Google Sheets or Khata Book
- Print loyalty cards for top 10 customers

- Mark Calendar for stock buildup in early February

Phase 3: Mid-Term (1–3 Months)

- Introduce customer names on invoices to enable full RFM
- Train owner on using Excel (basic formulas, charts)
- Start data entry for future sales digitally

Monitoring Methods:

- Weekly inventory tracking using Excel
- Sales comparison by month (2024 vs. 2025) after implementation
- Keep a suggestion box for customer feedback during March/April

This roadmap supports sustainable transformation without overwhelming the owner. Even incremental adoption of these practices will yield significant long-term benefits. By acting on these data-driven recommendations, Sharda Sales can expect a measurable improvement in inventory turnover, cash flow, and sales predictability. Already, the owner has noted better stock control after applying some preliminary recommendations. Urgent steps like replenishing high-performing categories ensure minimal lost sales, while long-term strategies such as RFM-based loyalty programs aim to increase customer retention and repeat business. Together, these actions build toward a more efficient and profitable retail operation, better aligned with customer demand and market cycles.