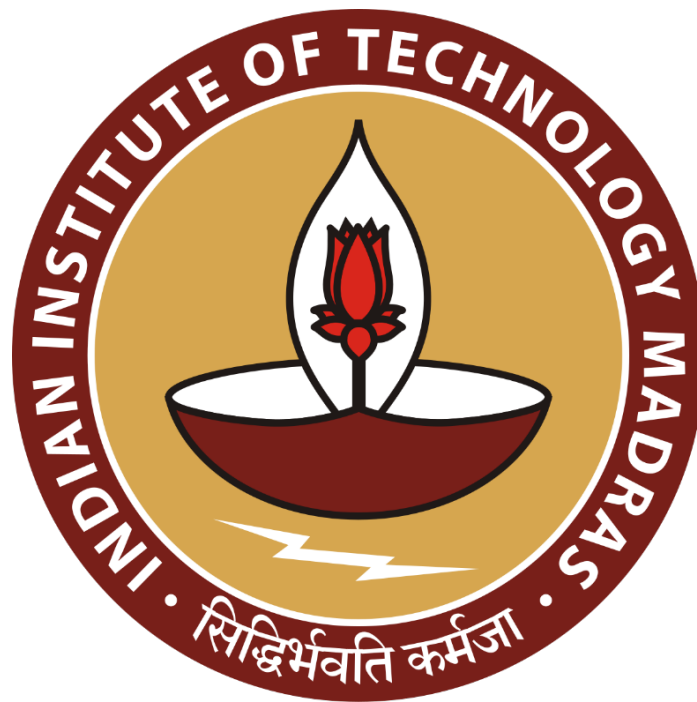# Cane Craft Capstone: Transforming Data into Business Growth Strategies

A Final report for the BDM capstone Project

Submitted by

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Declaration Statement

I am working on a Project Title **"Cane Craft Capstone: Transforming Data into Business Growth Strategies"**. I extend my appreciation to **"Welcome Cane Furniture & Mat"**, for providing the necessary resources that enabled me to conduct my project.

I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered through primary sources and carefully analyzed to assure its reliability.

Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the information of academic honesty and integrity, and I am receptive to any additional examination or validation of the data contained in this project report.

I understand that the execution of this project is intended for individual completion and is not to be undertaken collectively. I thus affirm that I am not engaged in any form of collaboration with other individuals, and that all the work undertaken has been solely conducted by me. If plagiarism is detected in the report at any stage of the project's completion, I am fully aware and prepared to accept disciplinary measures imposed by the relevant authority.

I agree that all the recommendations are business-specific and limited to this project exclusively and cannot be utilized for any other purpose with an IIT Madras tag. I understand that IIT Madras does not endorse this.

Signature of Candidate:

Name: Ragul.S

Date:18/08/2024

1 Executive Summary and Title

The "Welcome Cane Furniture & Mat" shop, specializing in cane-based furniture and crafts, has been a cornerstone of Thaikal, Kollidam, in the Mayiladuthurai district since 1994. Known for its high-quality products, including hanging chairs, sofas, and custom-designed tables, the shop has strong loyal customer base. However, recent trends in sales data have raised concerns about the shop's future viability, particularly affecting Shop 3, one of the three shop locations in the same area.

Over the last six months, the shop's sales showed an overall positive trend, with consistent growth across its various outlets. Shop 3, located on and outside the town's main road that served as a key connection between major cities, was initially the top performer among the three shops. Its strategic position attracted a high volume of travelers, contributing to significant spontaneous purchases. However, this upward trajectory experienced a sudden and alarming decline in the past two months, raising red flags about underlying issues.

Upon deeper analysis, it was discovered that the opening of a new highway bypass has dramatically impacted all three Shop's customer traffic. The bypass has diverted a significant portion of vehicular movement away from the old route, leading to a noticeable drop in passersby who would typically stop to make impulsive purchases. This geographic shift has had a profound effect on the shop's sales, highlighting the vulnerability of businesses dependent on location-based traffic.

This report also focuses on the root causes of the sudden decline in sales, analyzing data from six months of sales across all three shops. By examining both the sales data and geographic factors, this analysis aims to uncover the reasons behind the drop in customer traffic and provide actionable recommendations.

In addition to the geographic challenges, the analysis also explored other factors contributing to the decline. By understanding these factors, the report aims to provide actionable recommendations to help the shop navigate those challenges, regain its market position, and ensure long-term sustainability.

2   Detailed Explanation of Analysis Process and Methods

In conducting a thorough analysis of the "Welcome Cane Furniture & Mat" shop's sales data, a structured approach was employed. This involved a combination of data cleaning, descriptive statistics, and advanced analytical methods.

The shop operates with a handwritten billing system and shop owner agreed to provide available sales data, the process begins with data collection from 6 months handwritten records. Spreadsheet software like Excel will be used to input the handwritten bills into a digital format. Excel is chosen for its ease of use, data manipulation capabilities, and wide range of analytical tools.

Pre-processing:

The first step involves manually entering the handwritten bills into a digital format. This process includes recording details such as the date of sale, item descriptions, quantities sold, prices, and payment type. This digitization will make it easier to analyse and visualize the data. As the data we got in raw format the requirement for data cleaning process was null.

Data Description:

The dataset comprises 2,048 entries and includes a total of 8 columns. Below is an overview of the data columns, providing insight into the structure and characteristics of the dataset:

1. **Date:** The specific date on which each sales was made.
2. **Product ID:** A unique identifier assigned to each product sold.
3. **Product Name:** The name of the product along with its dimensions.
4. **Price:** The price per unit of the product.
5. **Quantity:** The number of units of the product sold.
6. **Total:** The total cost for the product, calculated as Price x Quantity.
7. **Payment Method:** The mode of payment used for the transaction, such as cash, card, or digital payment.
8. **Shop No.:** The specific shop location where the sale was made.

The data types include both numerical values (e.g., Price, Quantity, Total) and categorical values (e.g., Product ID, Product Name, Payment Method, Shop No.).

Link to Primary Data and other files : <u>google drive folder</u>

Descriptive Statistics:

Descriptive statistics were then applied to gain an initial understanding of the data. Key metrics such as mean, median, standard deviation, and percentiles were calculated for variables like price, quantity sold, and total sales.

Sales Trends Over Time:

Conducted a comprehensive analysis of sales quantities, price, and totals across the six months to discern trends or patterns.

Sales Trend over time in each shop:

An analysis of sales revenue across all six month of three shops where conducted

Product Performance:

Investigated sales quantity, price, and gross total for specific products to identifying top-selling products and assessing their contribution to overall revenue.

Top Performing Products:

Identified the top-performing products based on a combination of quantity sold and total revenue. Evaluated the performance of each product over months

Payment Type:
Explored the distribution of payment modes used by customers, identifying common payment modes and their impact on sales.

Geographic Analysis

Given the impact of geographic factors on Shop 3's performance, a geographic analysis was integrated into the study. This involved using Google map data to assess traffic patterns after opening of the new highway bypass. By mapping traffic routes, it was possible to quantify the loss in passersby traffic and its direct impact on sales. This analysis provided crucial insights into the extent to which external infrastructure changes can influence retail performance.

The combination of these methods provided a detailed understanding of the dynamic sales at "Welcome Cane Furniture & Mat." The use of Python's libraries facilitated a robust analysis. By incorporating both descriptive and predictive analytics, the analysis not only identified current issues but also provided actionable insights for future decision-making.

3 Results and Findings

Descriptive Statistics

```
              Price      Quantity         Total
count   2046.000000   2046.000000   2046.000000
mean    1931.859734      1.545455   2584.941362
std     1864.393254      0.766433   2490.559865
min       95.000000      1.000000     95.000000
25%      250.000000      1.000000    446.666667
50%     1150.000000      1.000000   1900.000000
75%     3400.000000      2.000000   4000.000000
max     7000.000000      4.000000  19500.000000
```

Figure 1 Descriptive Statistics of sales data.

This step revealed important patterns, such as the distribution of sales across different products and price variability. For instance, a high standard deviation in prices suggested a diverse product range catering to different market segments. Such variability could impact customer behavior, with higher-priced items potentially demanding to a place market while lower-priced items drive volume sales.

Correlation Analysis

To get deeper into the relationships between different variables, a correlation analysis was conducted. This involved calculating correlation coefficients to understand the relationships between sales figures and time-related variables, such as the day of the week or the month. For example, a positive correlation between sales and specific days of the month could indicate payday effects, where customers are more likely to make purchases after receiving their salaries. Similarly, analyzing the correlation between sales and seasonal trends could uncover periods of peak demand.
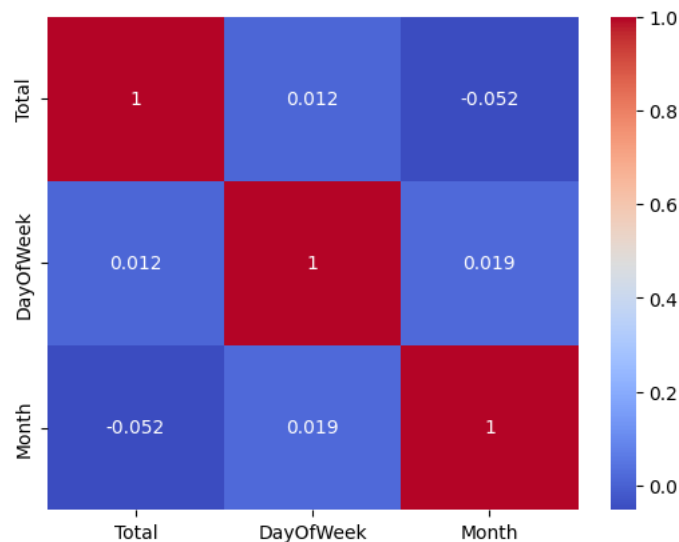
Figure 2 correlation_matrix for Dayofweek/holiday/month

The results of the Pearson correlation analysis between total sales and the Holiday Weekend values are very close to 0, indicating a negligible or no linear relationship between sales and whether a day is a holiday or weekend or month is seasonal. In other words, there is no significant pattern showing that sales increase or decrease on holidays or weekends compared to regular days. The slight correlation observed is likely due to random chance rather than a true relationship between Total sales and holidays/weekends/ months. This might imply that other factors are more influential in driving sales during this period, or it could indicate that customer behavior in relation to holidays and weekends is not distinct enough to affect sales noticeably.

The positive correlation between price and total revenue is quite strong, indicating that as prices increase, total revenue also tends to increase significantly. This suggests that despite a reduction in the quantity sold when prices rise, the overall revenue still benefits from higher pricing. This is likely because the revenue gained from higher prices outweighs the revenue lost from selling fewer units.

The strong positive correlation highlights that for this business, focusing on higher-priced items could be more beneficial in terms of maximizing total revenue, even if it means selling fewer units.

Figure 3 correlation scatter plot for price vs Total sales

Sales Trends Over Time

The analysis of sales trends over a six-month period revealed several important patterns. Initially, the shop experienced steady growth in sales, with the total quantity of products sold and revenue increasing month over month.
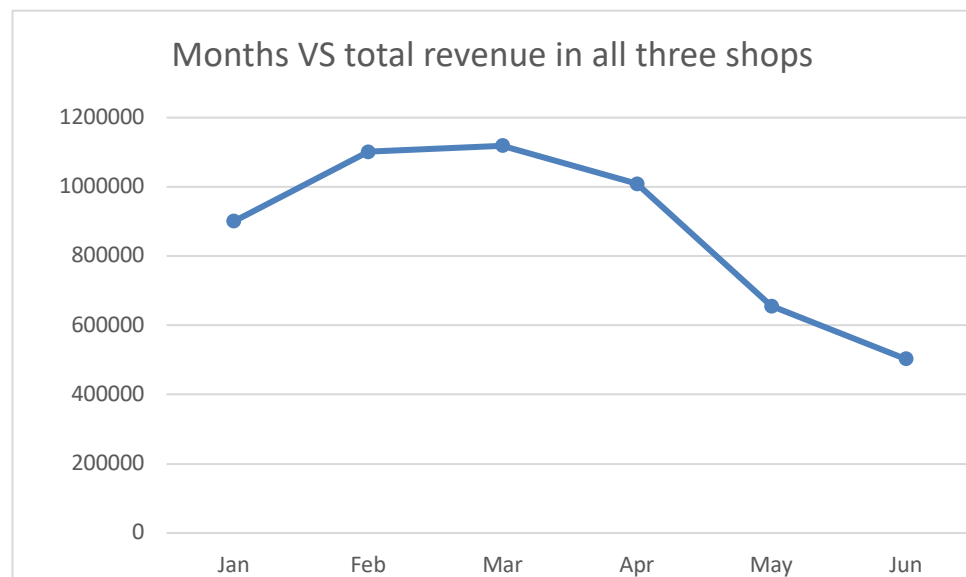

Figure 4 line chart for sale trend over 6 month

This growth, however, was interrupted by a sharp decline in the last two months of the analyzed period.

Additionally, the trend analysis showed that certain months consistently performed better. For instance, months corresponding to pre summer seasons saw higher sales volumes, suggesting that targeted marketing during these periods could further boost sales. The analysis also identified fluctuations in average selling prices, which appeared to correlate with the introduction of higher-priced products.
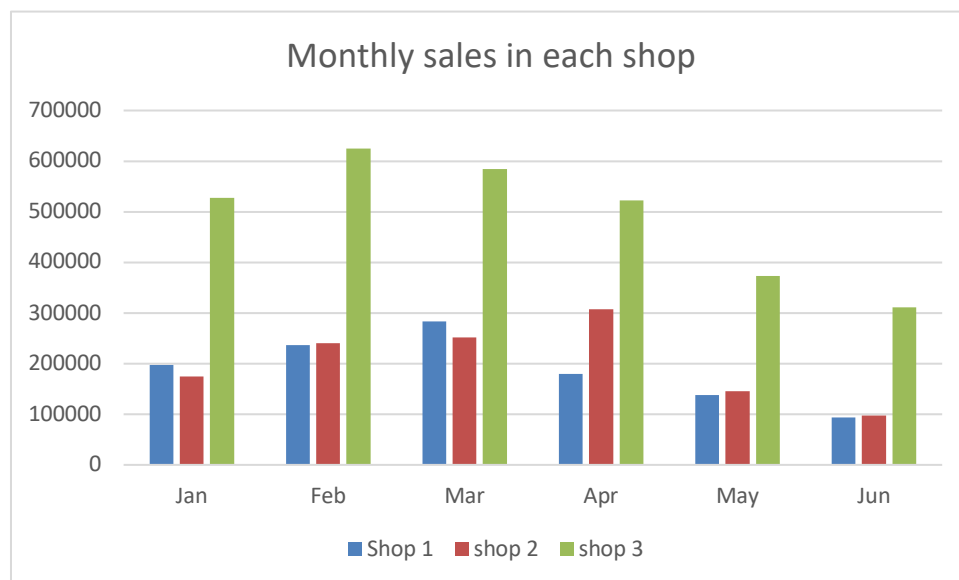
Figure 5 shop performance and trend in term of revenue

The sales trend in the above histogram on all three shops shows that Shop 3 is performing outstandingly compared to the other two shops. This implies that a maximum number of products were sold in Shop 3. Even though all three shops are located in the same general area, Shop 3 stands out due to its unique location. Unlike the other two shops, which are situated within the main bazaar, Shop 3 is positioned just outside the main commercial area, along a busy road. This location allows for easy access to passer-by who might stop and purchase items on their way to or from other destinations. The convenience of its location for travellers and commuters significantly contributes to its higher sales figures.

However, with the recent changes in traffic patterns due to the new bypass, the shop's advantage may be diminishing, making it crucial to conduct a detailed geographic analysis. This Histogram clearly shows location plays important role in sale trend and for customer attraction.

Geographic Analysis

Data from the google map shows that shop 1 and shop 2 are situated in the main bazaar area of Thaikal. This central location places it within a commercial zone, surrounded by other businesses, local markets, and residential areas.

Figure 6 google map image of shops location.

Due to its position in the main market, Shop 1&2 are easily accessible to local residents who frequent to the bazaar for their daily needs. This shows shop benefits from consistent foot traffic, particularly from local shoppers. Whereas Shop 3 is located outside the main bazaar, along what was once a busy highway connecting two major cities. This highway served as a critical route for travellers, making Shop 3 a convenient stop for passersby.

Shop 3's location made it particularly attractive to non-local customers—travellers and commuters who would stop by during their journey. The shop's positioning outside the congested bazaar area allowed for easy parking and quick purchases, which contributed to its higher sales volume.

The geographic analysis of sales performance, particularly focusing on Shop 3, revealed a clear link between the new bypass and the decline in sales. This shop, previously benefiting from its location on a busy highway, saw a drastic reduction in customer traffic once the new highway

diverted vehicles away from the area. This finding was corroborated by traffic data, which showed a significant drop in the number of vehicles passing by the shop post-bypass.

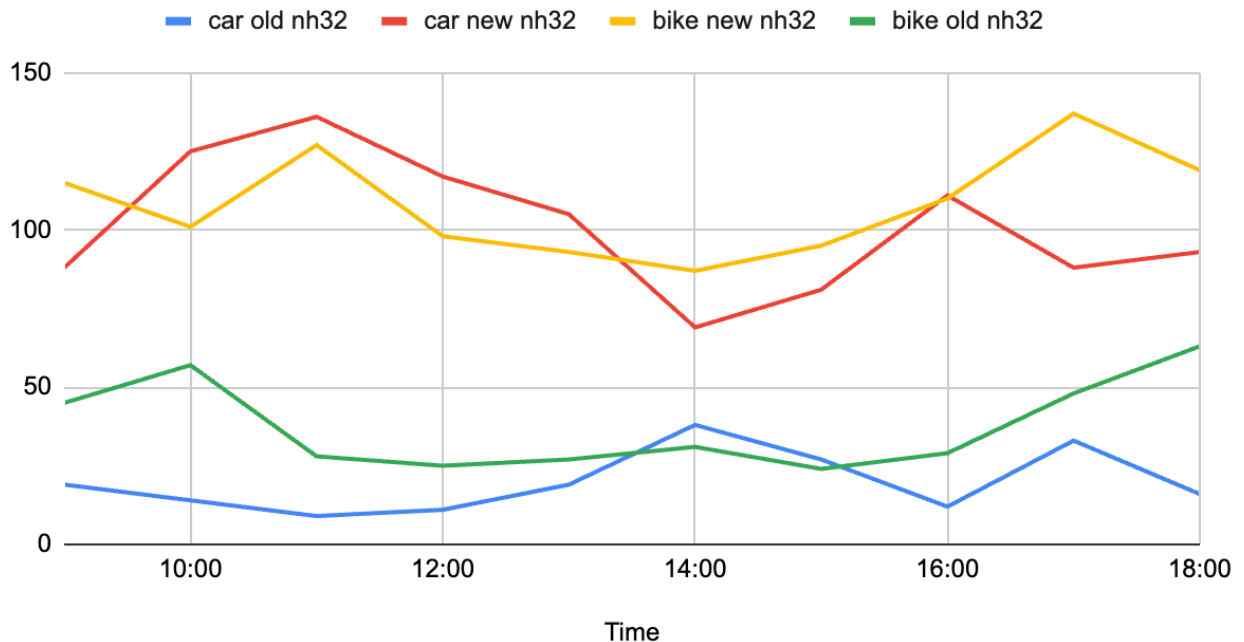## Traffic on Cars ands Bikes on a particular day

Figure 7 traffic trend over a day on NH32 and main road

The line chart shows traffic patterns on the new and old highways reveals a clear preference among drivers for the new route. This trend is largely attributed to several key factors: the superior road conditions, the ease of driving, and the significantly reduced traffic congestion on the new highway. The wider lanes and smoother surface make the new highway a more attractive option for both car and bike drivers, leading to a noticeable decline in the usage of the old highway.

Interestingly, the data shows a slight peak in the number of cars on the new highway around 2 PM. This midday surge could likely be due to taking breaks to refuel their vehicles or stopping for lunch at nearby establishments. The timing aligns with a typical lunch hour, suggesting that the convenience and facilities along the new highway are also drawing more travellers during this period.

Product Performance

The performance analysis of individual products provided valuable insights into which items were driving revenue and which were underperforming. By examining the sales quantities and gross

totals for each product, the analysis identified a few key items that consistently generated high sales volumes and revenue. These top-performing products were mostly higher-priced, products offerings like custom-designed chairs and hanging chairs, which suggests a strong demand for unique, high-quality furniture pieces.
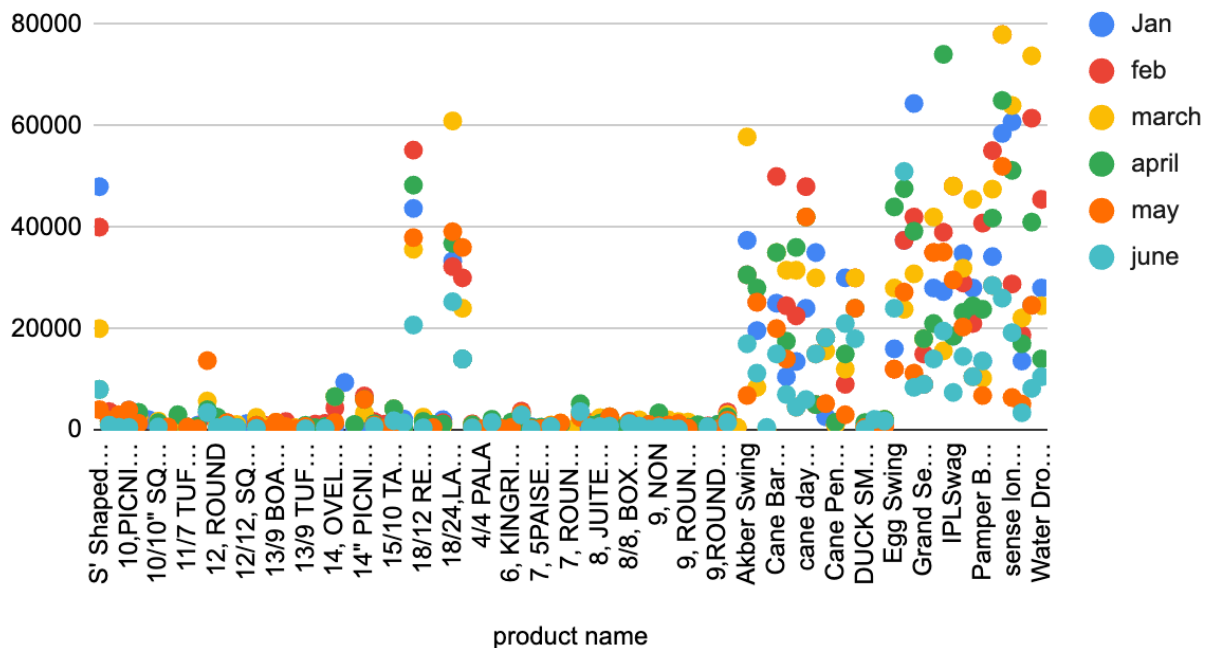

Figure 8 scatter plot for various products vs sales over months

Conversely, certain lower-priced items, while sold in large quantities, contributed less to overall revenue. As we can see from scatter plot for product vs total revenue, products in right side of the plot like Akber swing, Egg swing, IPL swage chair, etc., where more scattered on high revenue area and the products with average price are contributes less revenue area. Even some products with high price like S'shaped chair are sold in less quantity falls in less revenue area.

This finding indicates a potential area for improvement, as these products could be bundled with higher-margin items or promoted differently to increase their contribution to the shop's profitability

Top Performing Products

In identifying the top-performing products, the analysis considered both the quantity sold and the total revenue generated. Products that consistently ranked high in both categories were recognized as the shop's best-sellers.
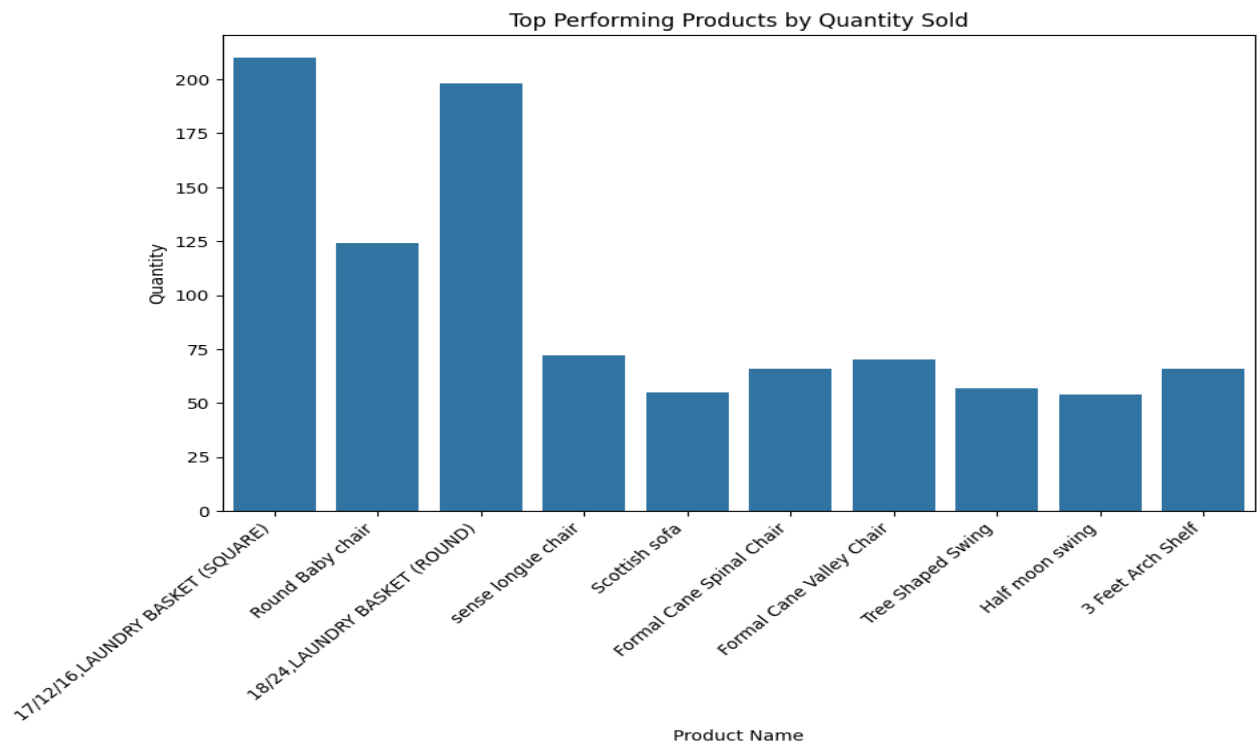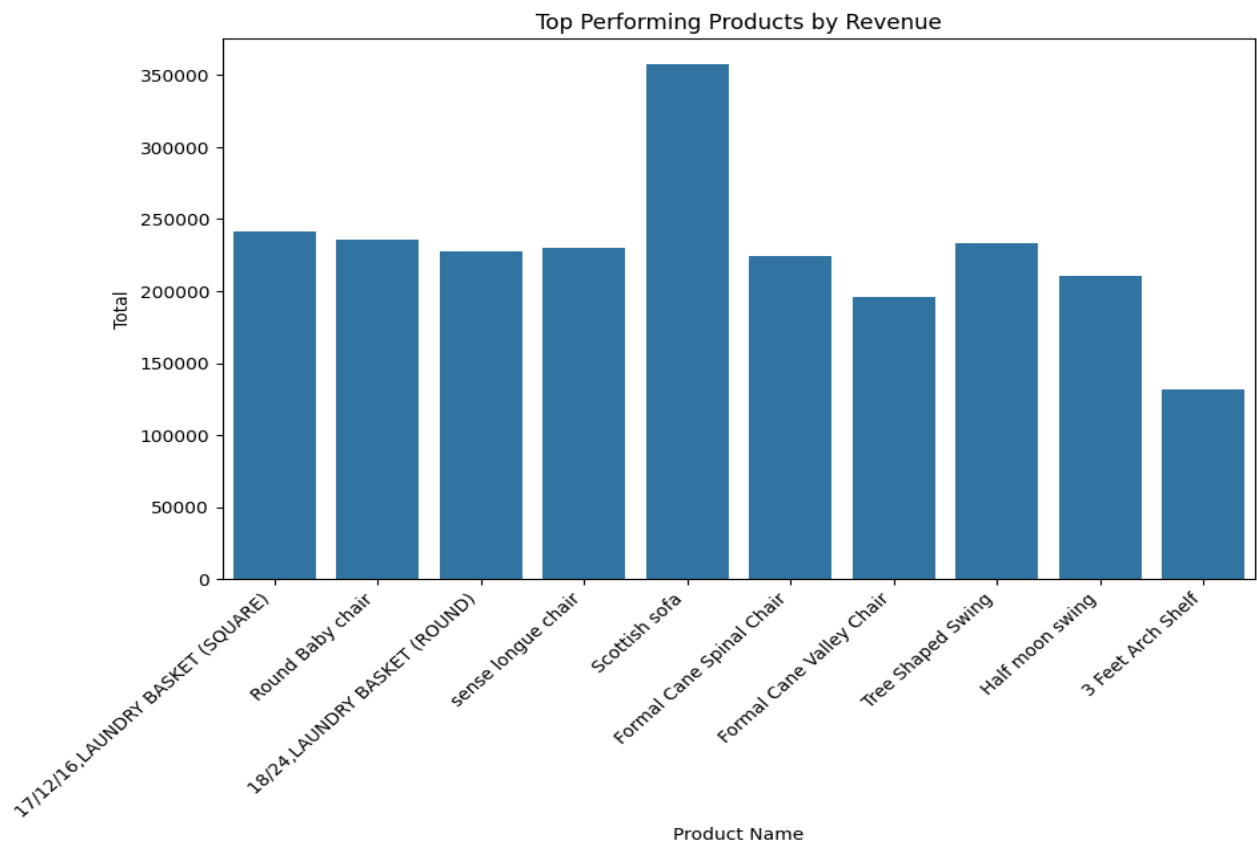

Figure 9a top performing product vs quantity

Figure 9b top performing product vs revenue

For instance, the custom-designed Chairs, laundry basket, Scottish sofa and hanging chairs not only sold in large quantities but also commanded higher prices, making them significant contributors to the shop's overall revenue. These products, therefore, represent key offerings that should be prioritized in marketing campaigns and inventory.

The analysis also highlighted the importance of product diversity. While products drove substantial revenue, the shop also benefited from offering a range of lower-priced items.

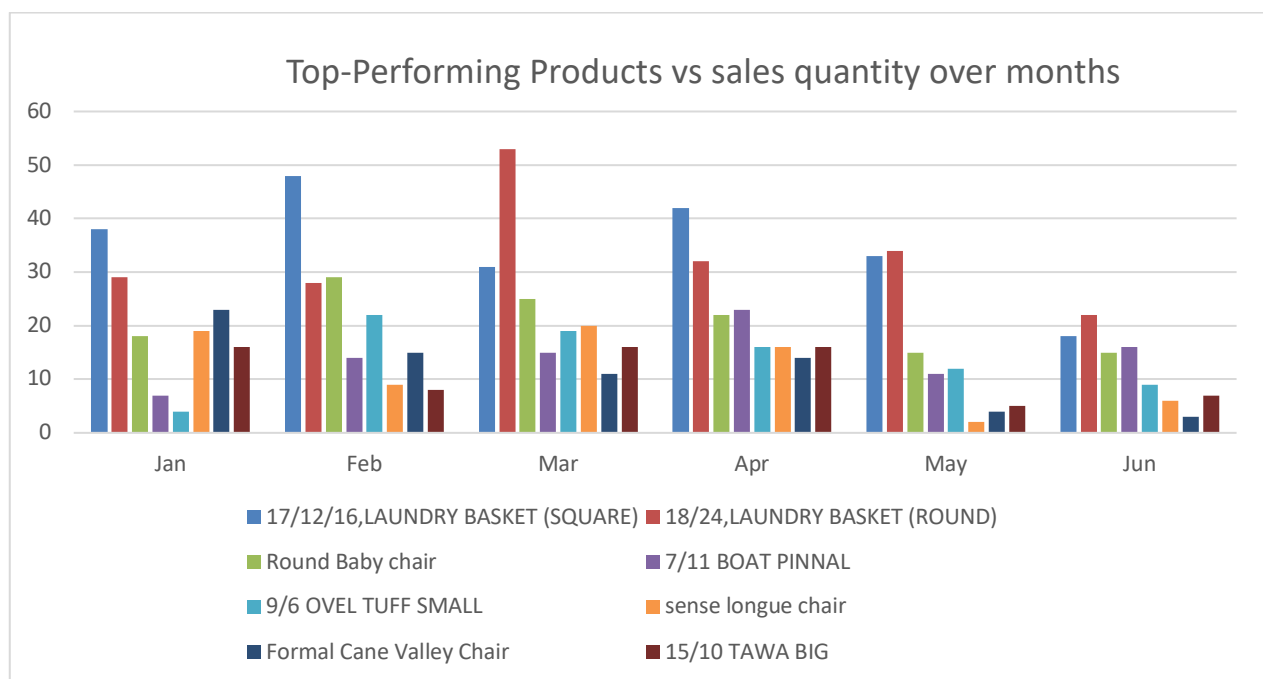**Top preforming product and their sales quantity over months**

Figure 10 Top performing products sales trend over months

Product name	Total revenue	total sale
Scottish sofa	357500	55
17/12/16,LAUNDRY BASKET (SQUARE)	241500	210
Round Baby chair	235600	124
Tree Shaped Swing	233700	57
sense longue chair	230400	82
18/24,LAUNDRY BASKET (ROUND)	227700	198
Formal Cane Spinal Chair	224400	66
Half moon swing	210600	66
cane day bed	204000	34
Formal Cane Valley Chair	196000	70

The table shown above are top 10 products contributes the 45% of total revenue and item sold.

Payment Type

The exploration of payment modes used by customers revealed that digital payments and cash were equally popular, accounting for a majority of transactions
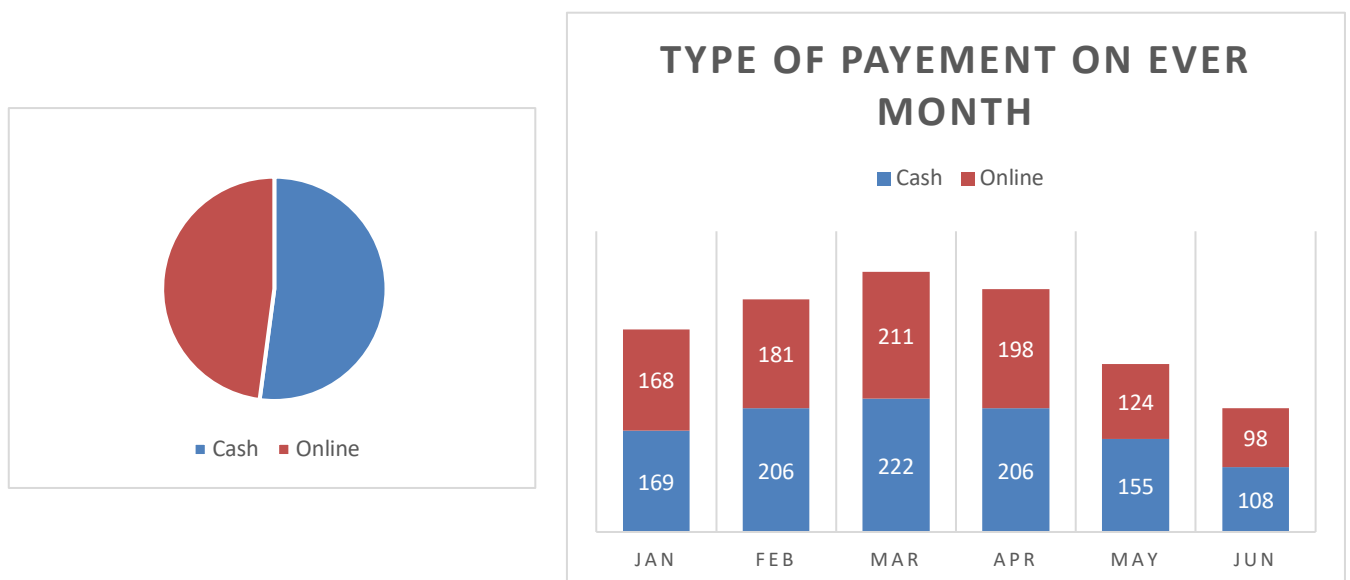

Figure 11 over all payment type over 6 month and types of payment distribution in every month

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Understanding the distribution of payment modes for optimizing the customer experience. The preference for digital payments suggests that the shop should continue to enhance its digital payment infrastructure, potentially speeding up transactions and improving customer satisfaction.

4 Interpretation of Results and Recommendations for Business Owner

Based on the comprehensive analysis of sales trends, product performance, geographic factors, and payment modes, several key insights and recommendations emerge that can guide the business owner.

Sales Trends Over Time

The analysis indicates that Shop 3 has historically been the top performer among the three locations, largely due to its strategic position on a once-busy highway. However, the recent decline in sales, especially in the last two months, suggests that external factors, such as the opening of a new bypass, have significantly impacted customer traffic. This decline in sales at Shop 3 is concerning and warrants immediate action.

Recommendation:

To counter the negative impact of the new bypass, consider launching targeted marketing campaigns aimed at attracting local customers. Additionally, introducing special promotions for repeated customers could help draw more traffic to the shop.

Geographic Analysis

The geographic analysis revealed that while Shop 1 and Shop 2 benefit from consistent foot traffic due to their central location in the main bazaar, Shop 3's advantage of attracting passersby has diminished with the opening of the new highway. It diverted significant traffic away from the area, leading to a reduction in spontaneous purchases.

Recommendation:

To address this issue, consider enhancing the visibility of Shop 3 through improved signage or advertising along the new highway. Additionally, exploring options to open a new shop or pop-up shop closer to the new highway could capture some of the lost traffic. The shop owner could also consider offering delivery services or online ordering options to customers who no longer pass by the shop.

Product Performance

The analysis identified several top-performing products, such as the Scottish sofa, custom-designed chairs, laundry baskets, and hanging chairs, which consistently generated high revenue. These products are high-value items that resonate well with customers, contributing significantly to the shop's overall profitability.

Recommendation:

Focus on maintaining a well-stocked inventory of these top-performing products and consider expanding the range of similar high-margin items. Additionally, promoting these products through targeted advertising and special offers could further boost sales. Introducing customized versions of these popular items could also attract more customers and justify pricing.

Top-Performing Products and Sales Quantity

The top-performing products, such as the Scottish sofa and laundry baskets, not only drive revenue but also indicate strong customer preferences for quality and design. The shop's ability to offer these products in sufficient quantities while maintaining quality will be crucial for sustaining high sales volumes.

Recommendation:

Given the significant contribution of these products to total revenue, the shop owner should prioritize their marketing and inventory management. Ensuring that these products are prominently displayed in the shop and featured in promotional materials will help maintain strong sales performance. Additionally, tracking customer feedback on these items can provide insights into potential areas for product improvement or innovation.

Payment Type

The equal popularity of digital payments and cash transactions suggests that customers value flexibility in payment options. The preference for digital payments aligns with broader trends in consumer behavior, indicating a shift towards cashless transactions.

Recommendation:

The shop should continue to invest in and expand its digital payment infrastructure. Additionally, training staff to handle digital payments efficiently will ensure smooth operations and customer satisfaction and speeding up transactions enhances the overall shopping experience.

Digitalization of the Billing System

Transitioning from a handwritten billing system to a digital one can greatly enhance the efficiency and accuracy of sales processes.

Workforce shortage :

Offering competitive wages, performance-based bonuses, flexible working hours and providing a supportive work environment and recognizing the efforts of employees can also go a long way in boosting morale and reducing burnout to wrokers. Hiring temporary or part-time workers during peak seasons could help to reduce the strain on full-time worker. This approach allows the shop to scale its workforce according to demand without committing to long-term works.

Conclusion

In conclusion, the analysis provides a clear idea for the shop to address the current challenges and capitalize on opportunities. By focusing on improving customer traffic at Shop 3, leveraging the strong performance of top-selling products, and optimizing payment processes the shop can reverse the recent sales decline and continue to thrive in a competitive market. Implementing these recommendations will help the shop to strengthen its market presence, enhance customer satisfaction, and ensure long-term sustainability.