# BUSINESS DATA MANAGEMENT CAPSTONE PROJECT FINAL SUBMISSION

# "Optimizing Retail Performance: An Analysis of a Fashion Shop"

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# 1. Executive Summary:

The Business Data Management Capstone Project is a project a part of the Diploma course of BS in Data Science and Applications offered by the IIT Madras. This capstone project explores the use of business data management and data science techniques to analyze the performance of a retail fashion shop. The project aims to identify the business problems and develop a solution or recommendations that address the business problem.

The project focuses on three key areas: customer behaviour analysis, inventory management, and sales data analysis. Using the various data from the shop, I conduct a detailed analysis of customer buying patterns, inventory rates, and sales trends over three months period.

I began the project with data collection and cleaning, including removing duplicate entries and incomplete entries. The data contains sales, revenue, inventory data, etc. over a period of three months i.e. Oct 2022 to Dec 2022. Most of the required data is collected in an unstructured format. Also, they provided some averaged numbers or data on the rates of the items. I have to put the data in an MS Excel sheet in a structured way for further analysis. Then the cleaned data is used to create visualizations to understand the graphs, trends, and product performance.

In this case study, a complete analysis has been done on the data received from the shop owner. Recommendations and detailed inferences based on the data analysis can be found in this report's Results and Findings section.

Overall, this project helps to identify areas for improvement in the shop's operations. By using data to gain insights into various trends, owners can make changes that aim to increase sales and profitability.

# 1.1. Organisation Background:

The 'Flying Colours of Fashion' is a retail shop or B2C type of business located in Ranchi, Jharkhand. It sells readymade fashion-related products mainly for Men such as shirts, jeans, trousers, shoes, etc. This shop was started in Oct 2020, three years ago. The shop is run mainly by the owner of the shop, but one or two additional staff works mainly in the season as required.

During the pandemic, sale is almost zero because as we know that there is very low economic activity. After the pandemic, their business started to grow at an expected pace. The shop's sales and revenue have been normal or strong over the few past years, with the highest sales during the holiday season.

# 2. Detailed Explanation of Analysis Process/Method:

# 2.1. Collection and Originality of Data

After a successful talk with the shop's owner, I collected the required data over three months from Oct 2022 to Dec 2022. All the data is provided by the owner of the shop. Please find below some photos and a letter to validate the authenticity of the data.





Figures 1 & 2: Photos of the Shop Owner and the Customers



Figure 3: Photo of the shop with a stock of jeans

## FLYING COLORS OF FASHION

## CERTIFICATE OF AUTHENTICITY

## TO WHOMSOEVER IT MAY CONCERN

This is to certify that I, Mr. Change Kumar owner of the shop 'Flying Colors of Fashion' has provided the Business data for a few months to Mr. Vivek Kumar for academics purpose for the capstone project in BS in Data Science and Applications. The data provided by me is real up to my knowledge. This student promises us that he will use this data solely for academics and the use of this data outside of academics does not own any credibility.

So, I am certifying that I issue some of my business data to Mr. Vivek Kumar who is claiming himself as a student of the Indian Institute of Technology, Madras.

Place: Ranchi, Jharkhand

Figure 4: Authenticity Letter

I have recorded or collected sales data in an unstructured format in the excel sheet named 'Stored Daily Sales'. I have put the date in the rows and different SKUs or items in different columns. The average prices of each item are directly given by the shop's owner and I have stored them in an excel sheet named 'Items List'. Also, there is one more excel sheet namely 'Stock Inventory' that contains SKUs or items with their monthly opening stock, closing stock, purchases, sales, and the names of their items.

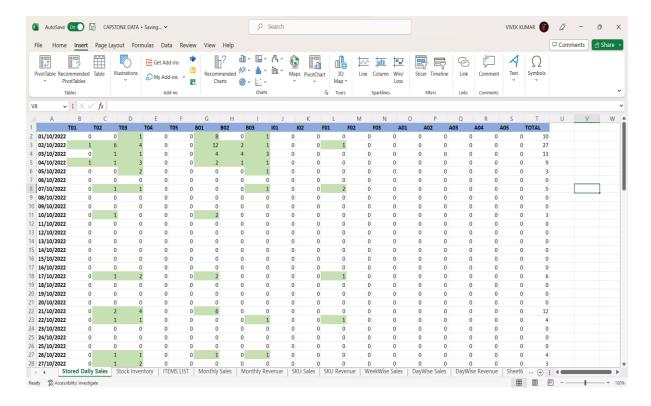


Figure 5: Stored Daily Sales

	Α	В	С	D	Е	F
1	CATEGORY	SKU	ITEMS	MRP	AVG SP	AVG CP
2	Topwear	T01	T-Shirts	₹1,399.00	₹549.00	₹ 365.00
3	Topwear	T02	Casual Shirts	₹2,199.00	₹ 699.00	₹ 550.00
4	Topwear	T03	Formal Shirts	₹2,299.00	₹739.00	₹ 620.00
5	Topwear	T04	Sweatshirts	₹ 2,499.00	₹899.00	₹714.00
6	Topwear	T05	Jackets	₹4,999.00	₹ 1,379.00	₹890.00
7	Bottomwear	B01	Denim / Jeans	₹3,499.00	₹ 849.00	₹530.00
8	Bottomwear	B02	Casual Trousers	₹ 2,999.00	₹1,000.00	₹ 768.00
9	Bottomwear	B03	Formal Trousers	₹ 2,099.00	₹ 680.00	₹ 570.00
10	Innerwear	101	Vests	₹ 250.00	₹ 199.00	₹ 140.00
11	Innerwear	102	Briefs	₹ 399.00	₹ 219.00	₹ 132.00
12	Footwear	F01	Shoes	₹4,199.00	₹ 1,469.00	₹ 1,184.00
13	Footwear	F02	Socks	₹ 150.00	₹ 89.00	₹ 59.00
14	Footwear	F03	Slippers	₹ 475.00	₹ 310.00	₹ 206.00
15	Accessories	A01	Wallets	₹899.00	₹ 540.00	₹ 397.00
16	Accessories	A02	Belts	₹ 799.00	₹ 360.00	₹ 248.00
17	Accessories	A03	Ties	₹ 499.00	₹ 250.00	₹ 190.00
18	Accessories	A04	Masks (Pack)	₹ 249.00	₹ 120.00	₹ 85.00
19	Accessories	A05	Hanky (Pack)	₹ 199.00	₹ 80.00	₹ 55.00
20						

Figure 6: Items List

# 2.2. Data Cleaning and Detailed Analysis:

After entering the raw data into excel, basic pre-processing has been done like imputing, sorting, filtering, etc. The main tool used for the analysis is MS Excel. It provides different excel features that are used for creating graphs, pivot tables, and different trends to draw insights and conclusions.

• The pre-processed sales data have mainly three columns (Date, SKUs, and Sales). There are a total of 1657 data points or rows. Also, this excel sheet namely 'Daily Sales' has other columns such as Day, Week no., Average Selling Price, Average Cost Price, Revenue, Total Cost Price, and Profit that has been taken from other stored data and derived columns from using different formulas.

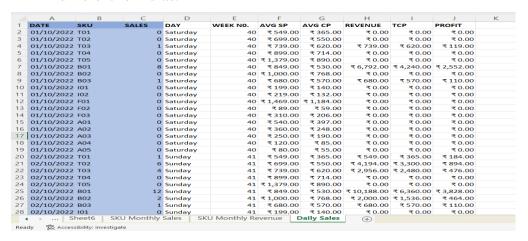


Figure 7: Daily Sales

• The major objective is to perform an analysis of stock inventory data to find the average inventory days. The opening stock details of Oct 2022 along with purchases for the three months were given by the shop's owner. The monthly stock report has been made with help of sales data and given data using different formulas of excel (Figure: Stock Inventory).

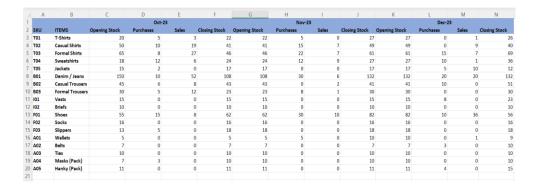


Figure 8: Stock Inventory

- Further, creating different pivot tables from daily sales data according to different parameters using filtering, sorting, etc.
- After creating different tables according to different parameters using the pivot table method, various graphs and different trends are created to analyze the data for better visualization and understanding.

According to the recommendations given in the feedback of the mid-term by the team, I am sharing a link to the excel sheet where all the data can be viewed. Please ignore some unwanted sheets, pivot tables, etc. Please find the <u>attached link</u> to the workbook Excel sheet below:

#### **CAPSTONE DATA.xlsx**

# 3. Results and Findings:

#### 1. SKUs Volume and Revenue Data Table:

In the below table (Figure 9), there are different 18 types of items that are stocked by the shop. But, out of 18 items, only 9 items are usually sold over the months. There is a net zero amount of sales and revenue other than these items given in the table.

SKU/Items	Total Sales	Sales Range	<b>Total Revenue</b>	Revenue
			(Rs)	Range
B01	78	0 – 13	66,222.00	0 – 11,037.00
F01	54	0-5	79,326.00	0 – 7,345.00
T03	41	0 – 4	30,299.00	0 - 2,956.00
T02	35	0-6	24,465.00	0 – 4,194.00
T04	16	0-6	14,384.00	0 – 5,394.00
B03	13	0-3	8,840.00	0 - 2,040.00
B02	10	0 - 4	10,000.00	0 - 4,000.00
T05	10	0 – 3	13,790.00	0-4,137.00
T01	4	0 – 1	2,196.00	0 - 549.00
A01	1	0 – 1	540.00	0 - 540.00

Figure 9: SKUs volume and revenue data table

#### 2. Monthly Sales and Revenue Analysis:

In the graph (Figure 10), we can see a trend of sales volume of first decreasing, then increasing back. The growth rate is linear. By analyzing the graph, we can say that there are maximum sales in the month of Oct 2023 due to the festive season. But, there is a drop in the volume of sales in Nov 2023 and a further increase in volume by Dec 2023. So, similar inferences can be seen in the revenue bar chart as it is obvious that the volume of sales sold is directly proportional to the revenue collected in that month.



Figure 10: Monthly sales and revenue trend

#### 3. Items-wise Revenue Contribution Analysis:

From the below revenue contribution graph (Figure 11), we can conclude that the most revenue is contributed by F01 followed by B01. Also, T03's revenue contribution growing very fast. The focus is more on these four items or SKUs that generate more of the total revenue.

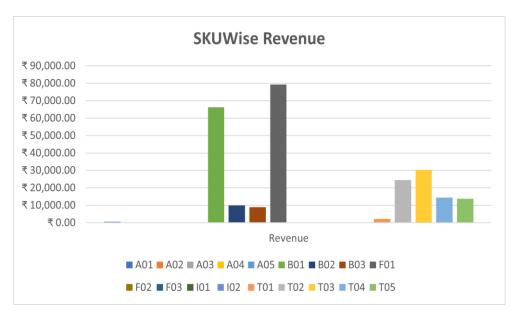


Figure 11: Items' revenue contribution column chart

#### 4. Monthly SKU-wise Sales Analysis:

In the SKU-wise sales graph (Figure 12), We can see that the sales of F01 are growing every month, especially in December 2022. But in the case of B01, T02, and T03, the peak has been already reached on October 2022 and is comparatively low in the other two months. Also, still B01 is the highest-selling product followed by the F01.

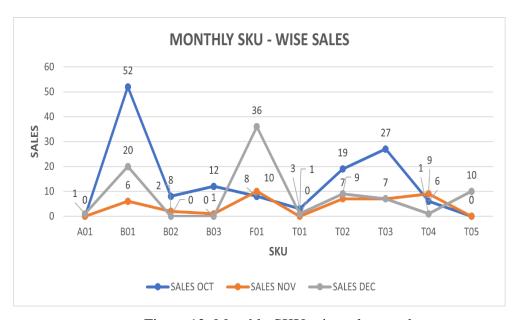


Figure 12: Monthly SKU-wise sales trend

#### 5. Day-wise Volume Analysis:

In this graph (Figure 13) of day-wise volume analysis, we can see that the maximum volume of sales is happening on the day of Saturday followed by Monday and Sunday. The lowest volume of sales of items is on Thursday.



Figure 13: Day-wise volume trend

#### 6. Day-wise Revenue Analysis:

In figure 14, we can see similar inferences or trends as we saw in figure 13. The max revenue earned on the day of Saturday is followed by Monday and Friday. And the worst-performing day is Thursday which is followed by Tuesday & Wednesday.



Figure 14: Day-wise revenue trend

#### 7. Week-wise Sales Analysis:

In Figure 15, I have drawn a bar chart of the volume of sales weekly over the three months. As we can see, the maximum sales happen during the first week of Oct 2022 due to the festive season of Dussehra and decreased further (Week no. 40 & 41) and further dipped down. Further, the volume of sales increased due to Diwali and Christmas (Week no. 43 – 44 & 51). The average number of sales regardless of the festive season is about 15 according to three months of data. According to the data of Figure 15, the average volume of sales in Oct & Dec 2022 is about 22 but interestingly that average comes down to about 11 only (just half) in Nov or general weeks.

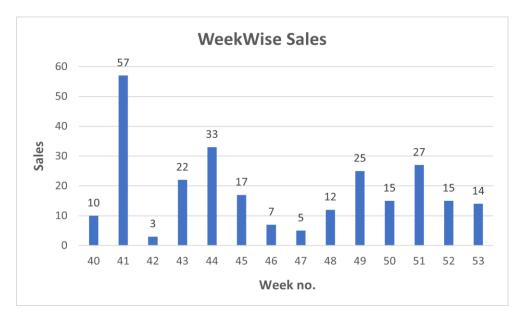


Figure 15: Week-wise sales column chart

#### 8. Week-wise Revenue Analysis:

In the below trend (Figure 16), We can see a similar trend as we saw in Figure 15. Interestingly, the average revenue earned in festive weeks is double that of simple weeks. According to the data of Figure 15, the average revenue earned in Oct & Dec 2022 is about 22 thousand but interestingly that average comes down to about 11 thousand only (just half) in Nov or general weeks.

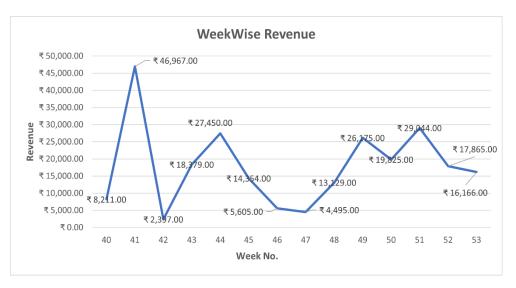


Figure 16: Week-wise revenue trend

# 9. Inventory Analysis:

From the below table (Figure 17), it is evident that the inventory handling of A01, T01, and B02 is not efficient. The inventory stock of SKUs like B01, B03, and all the Ts are well managed by the shop with the normal average days of inventory. Also, the shop owner has to take care of F01 regarding the stock due to its lowest days of inventory with just 3.69.

In the table, we can see the empty average days of inventory shown with a 'dash', those SKUs are worst performing regarding both sales and inventory. There are zero sales over three months, and their stock is kept over.

SKUs	Average Days of Inventory
A01	20.20
A02	-
A03	-
A04	-
A05	-
B01	5.00
B02	12.91
B03	6.39
F01	3.69
F02	-

F03	-
I01	-
I02	-
T01	17.29
T02	4.00
T03	4.19
T04	4.32
T05	4.90

Figure 17: Average days of the inventory data table

#### 10. Profit Analysis:

In the below pie chart (Figure 18), interestingly we can see that 65% of the total profit just comes from only two items, the first one is B01 followed by F01. Both B01 & F01 collect a profit of about 40 thousand. Other than these two items, out of 18 items, those items generally contribute about 5% or 8% of the total profit.



Figure 18: Profit Doughnut chart

#### 11. Scatter Plot Analysis:

In the below scatter plot (Figure 19), there are five categories of items and the plot is divided into four parts namely A, B, C, and D. Also, the items on the left part of the vertical line have fewer sales, while the items on the right side of the line have frequent sales. Similarly, the items above the horizontal line are more expensive

compared to the bottom of the item to the horizontal line. From this plot, we can analyse which products can be kept in the shop to increase the visibility of the product. As we can see two parts are empty. So, in part B, items such as F01 and B01 are expensive as well as popular items that can be kept on the visibility of its customers to attract the customers. Similarly, items in part D are normal performing and mid-range items that can be kept beside those items or in other spaces of the shop.

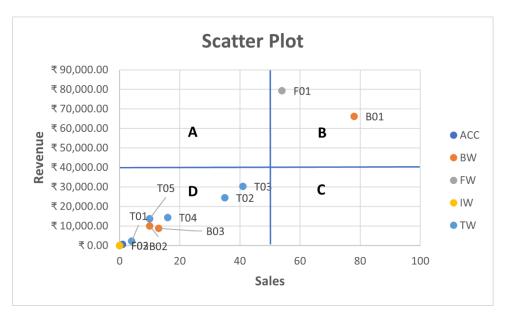


Figure 19: Scatter plot

# 4. Interpretation of Results and Recommendations:

#### 4.1. Interpretation:

Based on the analysis of three-month data of October, November, & December 2022 for the retail fashion shop, I have identified several trends and patterns. Overall, the shop has seen a change in the volume of sales over three months, with the highest sales in the month of October followed by December due to festive seasons like Dussehra, Diwali, & Christmas. The sales declined on normal days. But, the shop has regained its customers to some extent after the festive season. I also found that certain products, such as Jeans (B01), and Shoes (F01), are more popular as well as expensive than others. Also, expensive products contribute a large share of earning revenue.

However, I also observed some areas where the shop could improve. These are as follows:

- There is a significant drop in the volume of sales during mid-week days such as Tuesday, Wednesday, and Thursday.
- The daily average purchase amount is relatively low about two thousand only over three months, indicating that the shop may need to focus on increasing the average order value.
- According to the analysis, out of 18 items or products, 8 products that are
  accessories or complementary have zero sales over the period. Their inventory
  stock is pilled up or kept over a long period.
- Also, there is a significant drop in the volume of sales and revenue during the mid-weeks of every month from October 2022 to December 2022.
- Out of 10 selling products, only 2 products or items (B01 & F01) are
  performing outstanding and other than these are performing low. Only these
  two products contribute 65 per cent of the total profit. While others contribute
  only about 8 per cent each.
- According to scatter plot analysis, the outliers (B01 & F01) are expensive as well as popular products among customers.

### 4.2. Recommendations:

Based on the above interpretations or insights of the data, some recommendations are as follows:

- Implement weekday promotions: To increase the volume of sales during the
  mid-weekdays, the shop could consider implementing promotions that are
  specifically targeted at weekday customers. For example, offering a discount
  for customers who shop on Tuesdays, Wednesdays, or Thursdays could
  encourage more people to visit the store during those days.
- 2. Cross-sell and Upsell: To increase the average order value, the shop could its staff to cross-sell and upsell the products. For example, when a customer is buying a dress, the staff could suggest a matching accessory or complementary items go with the dress. This could help boost the overall value of each sale as well as increase the sales of accessories or complementary items.

- 3. Offers and discounts: To increase the sales of mid-performing items, they can provide freebies, attractive discounts, and offers to attract customers. It also helps in increasing the sales of expensive items.
- 4. Optimize inventory management: To improve overall efficiency and reduce costs, the shop could optimize its inventory management system. The shop could reduce the stock of those items which have a net zero amount of sales and minimize the stockouts of some products.
- 5. Increase product visibility: The shop could focus on increasing the space and the visibility of its products to attract more customers. For example, placing popular products (such as jeans(B01) and shoes (F01) in this case) in prominent locations within the store or using eye-catching displays could draw customers' attention to these items.
- 6. Expand items or product offerings: In my view, the shop has fewer products or items to some extent. The shop is selling only products related to men's clothing. To attract more customers and increase revenue, the shop could consider expanding its product offerings. This could include introducing new products, women's clothing, or child products.

Overall, by implementing these recommendations, the retail fashion or garment shop can increase its sales and revenue, and improve customer satisfaction. However, the shop needs to take or purchase some billing software (if possible) to monitor or analyse the data to be effective in the long term.

That's all conclusion and recommendations from my side.

#### Thank You!