

# **Harnessing Data-Driven Inventory Management to Boost Profits in Pipes and Sanitary Ware Store**

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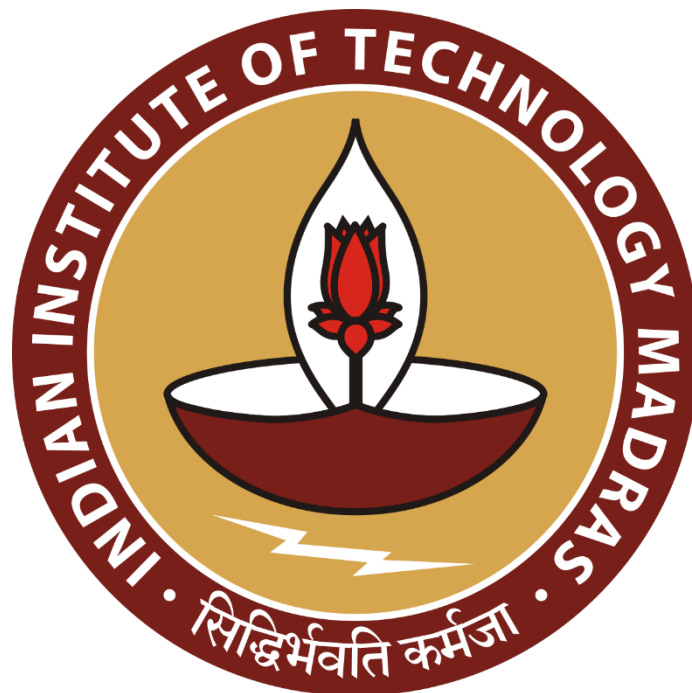
*A Mid-Term report for the BDM capstone Project*

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Submitted by

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## 1. Executive Summary

This project focuses on addressing the inefficiencies in inventory management at Chaudhary Pipes and Sanitary Ware, a business dealing in both retail and wholesale of pipes and sanitary products. By analyzing six months of sales and purchase data, the goal is to optimize inventory levels, improve profitability, and enhance customer satisfaction.

The project began with obtaining consent and collecting sales and purchase data for six months from the business owner. This data was then processed, cleaned, and analyzed using various techniques, including ABC analysis, to categorize products based on their contribution to sales and revenue. The data analysis was conducted using tools like MS Excel and Python, aiming to extract meaningful insights and patterns.

Key findings revealed that a significant portion of the products (75%) fell into the Category C segment, which contributed the least to revenue and could be managed with minimal resources. Category A products, which are critical to revenue, require close monitoring for stock levels.

Key insights include monthly trend analysis, revealing peak sales in June and September, and a noticeable decline in sales between June and August. This trend indicates the need for strategic resource allocation, where high inventory levels are maintained during peak months and cost-saving measures are prioritized during low-sales periods.

## 2. Proof of originality of the Data

The following contents are provided as a proof of originality :

**Letter Head :** When the owner agreed to give the data for this BDM project, I demanded a consent letter from him as proof of originality of the data.

**Shop Images :** Due to working hour in the day, I visited the shop in the night before closure. So, some images of the shop clicked at that time can be seen here.

**Interaction Video :** A video of interaction with the owner of Chaudhary Pipes and Sanitary Ware is provided here. It contains the whole conversation of my second meeting with him.

[Watch here](#)

## **2.1. Summary of the Interaction Video :**

Interaction started by a formal hand shake with the owner (Somehow this part was not recorded) and a brief introduction about myself. Then, addressed my purpose of meeting him which was my BDM project. I clearly demonstrated the whole purpose of meeting him and doing this project which he understood. Then, I asked him about some business problems he might be facing. So, he started by introducing himself and his shop. He told me that he was running his shop for seven years and also he is both retailer and wholesaler of pipes and sanitary products. But, he was not sure about the type of problems I was asking for. So, I listed out some problems which might be happening there. He understood and asked me to explain how the data he had can be used to solve such problems. I explained in brief that the data contains some patterns which can be identified and used for solving a large number of business problems using the techniques which I have studied from IITM. Also, identifying the buying patterns of customer will help to predict what they might want in the future. After too much explanation, I arrived at the problem with inventory management. I told him that I'll give some insights from the project I am doing which will help him in knowing what unique items are in demand and what products need to be stocked more. Satisfied by all the explanations, he gave me the permission to use his data for this project on a condition to use it solely for this project and privacy of data must be maintained. He gave me the consent letter. He was only able to give me his sales and purchase data of six months.

The full transcript of the video : [Transcript](#)

## **3. Metadata**

The raw data which I got from Chaudhary Pipes and Sanitary ware for my capstone project are,

- Sales Data
- Purchase Data

### **3.1. Sales Data :**

This is an excel file containing the information of items sold between 1<sup>st</sup> April 2024 to 7<sup>th</sup> October 2024. It has 12737 Rows and 10 Columns containing :

- Date :- When the product is sold. The format is DD/MM/YYYY.
- Vch/Bill No :- A unique number corresponding to each sale.
- Particulars :- This basically contains the names of the customers. The names starting with M/S are of wholesale customers.
- TIN/GSTIN No. :- The GST No. of a particular wholesale customer.
- Item Details :- Name of the product sold.
- Material Centre :- This contains only one entry in all cells which is “Main Store”.
- Qty. :- The quantity of the product sold.
- Unit :- Unit of measurement of the product (like Pcs., Fit, Kgs. Etc)
- Price :- This contains per unit price of the product sold.
- Amount :- The billing amount.

### **3.2. Purchase Data :**

This is an excel file containing the information of items purchased between 1<sup>st</sup> April 2024 to 7<sup>th</sup> October 2024. It has 1750 Rows and 8 Columns containing :

- Date :- The date of purchase of a particular product in DD/MM/YYYY format.
- Name :- The name of Supplier.
- Item Details :- Name of product which is purchased.
- Material Centre :- Contains only one entry in all cells “Main Store”.
- Quantity :- The Quantity of product purchased.
- Unit :- The unit of measurement of a particular product.
- Price :- Per unit price of the purchased product.
- Amount :- Total cost of purchasing a particular item.

### **3.3. Extracted Data :**

Since I had no information about the products purchased before 1<sup>st</sup> April 2024 and sold after 1<sup>st</sup> April 2024. I filtered out only those products which are purchased as well as sold after 1<sup>st</sup> April 2024. Also the data was raw, hence required a lot of data cleaning and modifications. I removed some unnecessary columns and filled all the empty cells with proper values. This gave me an informative and more useful dataset for analysis.

This dataset contains 11922 Rows and 7 Columns :

- Date :- The date of sale in DD/MM/YYYY format.
- Product :- The name of sold product.
- Category :- The category of products which it belongs to.
- Quantity :- The quantity of product sold.
- Unit :- The unit of measurement of product.
- Cost Price :- Extracted from Purchase Data gives the buying price of a particular product.
- Selling Price :- Extracted from Sales Data gives the information of price at which a product is sold.
- Amount :- The revenue generated per transaction.

## 4. Descriptive Statistics

There are 570 different items in the dataset. For analysis it is must to categorize them into different groups. So, after a lot of research and discussion with the shop owner I made a table by listing the items in each category. I determined 14 categories of products. And added a column “Category” into the 6 months sales data.

Table Link :- [Product Category](#)

I have four numerical columns in the dataset where descriptive statistics can be done. These are “Quantity”, “Cost Price”, “Selling Price”, and “Amount”.

### 4.1. Mean :

The mean of the quantity of products is 7.35 Pcs., 52.77 Fits, 29.35 Metres, and 7.3 Kgs.

The mean of cost price is 286.21.

The mean of Selling Price is 330.59.

The mean of amount is 1036.99.

### 4.2. Median :

Quantity : 3
Cost Price :50.84

Selling price :51.91
Amount :205

#### 4.3. Mode :

Quantity	1
Cost Price	35
Selling Price	10
Amount	10

### 5. Analysis Process

For data-driven inventory management the first and foremost analysis which is crucial and very informative is “ABC analysis”. I used MS Excel for this analysis.

#### Extracting the details of each inventory from the sales data :

Since I have the sales data of six months, it is important to extract the unique inventory details and put it into another sheet.

- From the sales data I selected the whole table and inserted a pivot table in another sheet. Then, added “Product” as rows and “Quantity” and “Amount” column as sum of values. This created a pivot table.
- To do further analysis, I copied the pivot table and pasted it into another sheet. This created a table containing “Product”, “Total Quantity”, and “Total sales Amount” as columns.
- Then, I sorted the data by descending “Total Sales Amount”.

#### Using the table obtained after extraction for ABC classification :

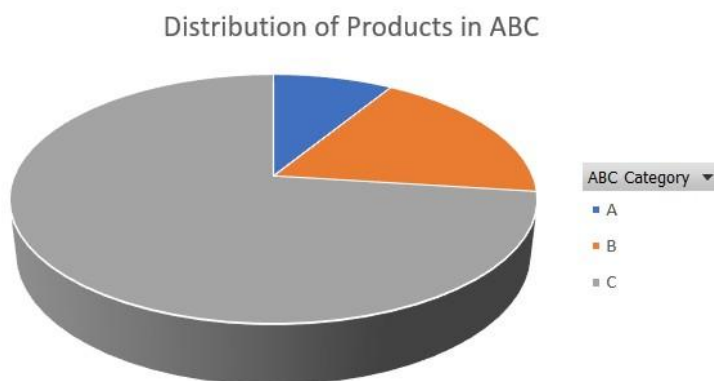
In order to categorize the inventories into A, B, and C classes, I proceed with the following steps.

- I added a column “Cumulative Sales” next to the “Total sales Amount”. Used the formula  $\text{Cumulative Sales} = \text{Total Sales Amount} + \text{Cumulative Sales in the cell above it}$ .
- After filling the column of “Cumulative Sales”, I added another column “Cumulative Percent” and filled it with the formula  $\text{Cumulative Percent} = (\text{Cumulative Sales} / \text{Sum of total sales amount}) * 100$ .
- This gave me the percentage of cumulative sales for each product.

### **Categorizing the inventories on the basis of their cumulative percentage :**

I added another column “ABC Category” next to “Cumulative Percent” and used the following rule to fill the categories of each inventory.

- Categorized into “A” if the product’s contribution to total sales is less than or equal to 70%.
- Categorized into “B” for contribution between 70% to 90%. And remaining into “C”.



## **6. Results and Findings**

### **6.1. Summary of the ABC classification :**

In figure 2, the percent wise contribution of each categories to the total quantity, total sales amount, and number products can be seen. This visualization highlights how much each category contributes to both inventory and revenue.



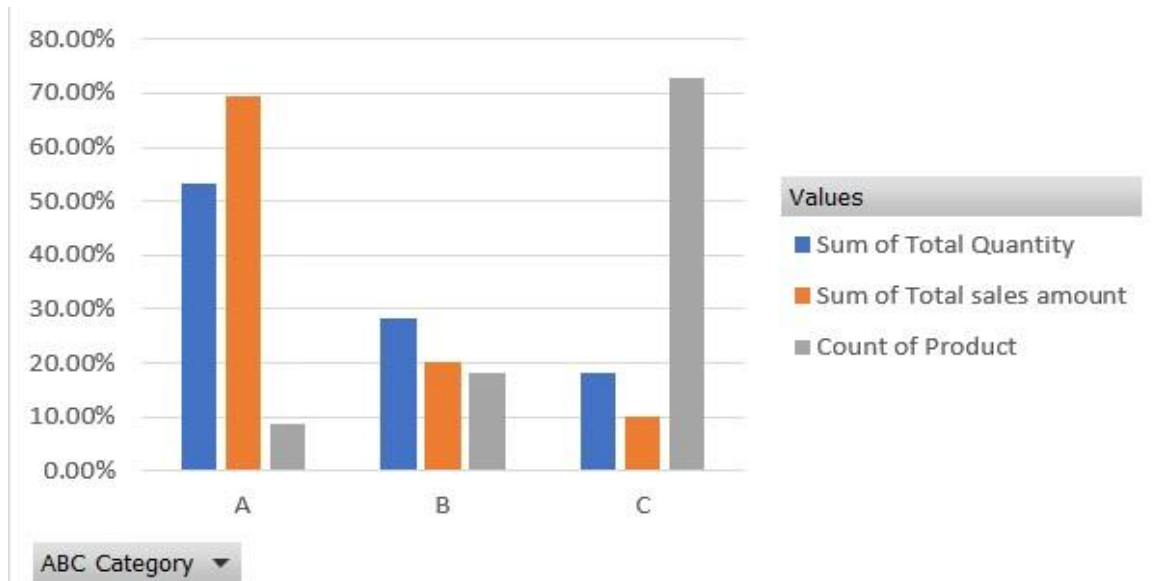


Figure 1

- Category A products are critical to revenue and require close monitoring for stock levels. These items must be prioritize for better inventory control.
- Category B contribute moderately to revenue. Indicates considering for stock check periodically.
- Category C contribute the least to revenue. The items under this category can be managed with minimal resources. However, from the visualization above, it shows almost 75% of the product comes under this category.

## 6.2. Summary of the analysis of sales data :

### Monthly Trend :

The basic check which is must in the business data analysis is monthly trend analysis. This is crucial for identifying the seasonal patterns. Identifying this enables a better strategic planning.



Figure 2

- The start of this financial year was the peak time of sales. As we can see from the almost uniform blue line showing it increased till the month of June.
- A drastic decline in the sales can be seen after June and it kept going on till August. Then, a sudden increase in sales in the September month.
- During this six month the trendline which is the straight thin blue line shows a downward slope.

The monthly revenue trend indicates an overall decline in revenue over time. However, the sales peaked in the month of June and September. This gives clues about when to optimise resources. Like, during month with high revenue, the business must increase inventory to meet demand and in months with lower revenue, the business must focus on cost-saving measures rather than allocating resources toward huge sales target.

### Profit Per Category :

The figure 3 below gives a deeper understanding of which type of product is giving the most of the profit in last 6 months.



Figure 3

- “Motors and pump system” and “Pipes” are the top profit-generating categories, each contributing to profits close to 3 lakhs in six months. So, a stable stock for these inventories is crucial for the overall profit.
- After these two the Toilet and sanitary products is also giving a better profit relative to the others. Since, these type products are very prone to be damaged. So, this should be stocked in a limited and space favourable quantity. Otherwise lead to loss instead of profit.
- Storage and water supply and traps and bends show moderate profit levels. However, these are much lower than the other three. These category product are also cheaper than the others but needed during a very small plumbing work. So, the stocks needs to be maintained for these products.

From the above visualization it is clear to focus mainly on the product which gives the most profit as the products in the top two categories are space friendly and doesn't require much safety while handling.