Optimize Cost and Inventory Management for an Interior Designing firm

Mid-Term Report for BDM Capstone Project

Submitted by

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1. Executive Summary and Title

Title:
Optimize Cost and Inventory Management for Design De Interiors, An Interior Design Firm.

Design De Interiors, is a leading interior designing firm which is based in Ranchi, Jharkhand which specializes in complete interior designing solutions for residential and retail spaces. Despite its strong market presence, the firm is currently facing few vital challenges. Among these fluctuating raw material prices, which disturbs project cost throughout the timeline and impact both client trust and profit margins, as well as ineffective inventory management leads to material overuse, waste, and increased expenses.

This midterm report uses business data management techniques to address these issues. By analysing procurement records and raw material cost trends, the project aims to gain important insights. The primary objectives are to stabilize project costs through better insights from raw material pricings, and then we can optimize inventory to reduce waste, and enhance overall efficiency of the firm. Special attention is given to identifying patterns in material consumption and cost fluctuations.

Furthermore, we will explore different opportunities to predictable pricing and better material procurement processes, hence increasing the profitability. Through data analysis and practical recommendations, this project is committed to help Design De Interiors with the tools needed to overcome its current challenges. The goal is to gain positive insights which will improve the profitability and will positively impact the firm's reputation as a trusted partner in the interior design industry.

2. Proof of Originality of Data

As the part of the proof of originality for the collected data, I am providing the required video survey with the owner, letter head with their permission and few photos of the office. These are attached via a Google Drive link for your reference and review:

Drive folder link :
https://drive.google.com/drive/folders/1_4LZpUzR0KMh6KcKDBBoa0w5LufJwL4c?usp=sharing

3. Metadata and Descriptive Statistics

Meta Data:

For this project, the raw data was collected from January 2024 to December 2024, which comprise of material procurement data of various vital materials at Design De Interiors, for their 25 projects. The dataset provides a detailed record of items purchased and procured of each material every time across multiple client project sites, each project site is identified by 1 to 25 serial number. This approach ensures both privacy of clients.

The data is structured into the following columns:

Date	Flat ID	Item	Unit	Quantity	Rate	Amount
Item: Ceramic Tiles		Count: 55		Sum: 14712	Avg: 48.2	Sum: 713536.43
01 February 2024	10	Ceramic Tiles	Sqft	209	43.36	9062.24
01 February 2024	23	Ceramic Tiles	Sqft	110	43.36	4769.6
01 March 2024	20	Ceramic Tiles	Sqft	128	44.07	5640.96
01 March 2024	23	Ceramic Tiles	Sqft	383	44.07	16878.81
01 March 2024	23	Ceramic Tiles	Sqft	219	44.07	9651.33
01 April 2024	5	Ceramic Tiles	Sqft	316	45.21	14286.36
01 April 2024	13	Ceramic Tiles	Sqft	372	45.21	16818.12
01 April 2024	13	Ceramic Tiles	Sqft	289	45.21	13065.69
01 April 2024	23	Ceramic Tiles	Sqft	174	45.21	7866.54

1. **Date**: The date of each transaction is mentioned and is formatted as DD-'month_name'-YYYY, which helps us for having chronological insights.
2. **Flat ID**: A serial number (1 to 25) represents different project sites, it is used in place of personal names for privacy of the cliets.
3. **Item**: The specific material procured/used (e.g., Wood, Paint Primer, Ceramic Tiles, Shower Cubicle) for a project site.
4. **Unit**: The measurement unit for each item (e.g., Cft, Litre, Sqft, Nos, Mtr), it helps in having consistent ordering of goods.
5. **Quantity**: The number of units of each item procured in each transaction.
6. **Rate**: The unit price for each material at the time of transaction, it is a very important figure that we need analyse ahead.
7. **Amount**: The total cost for each transaction, it is calculated as Quantity × Rate.

After collecting the raw data, the data was transferred into a google sheet for better analysis. Analytical tools such as spreadsheet formulas, pivot tables and other analysis methods were employed to identify consumption patterns, materials cost trends, and other important markers. Through this dataset we can get numerous types of insights regarding different materials used, their seasonal pricing and other various important factors that affects the firm and its functioning.

Link for the data:
https://docs.google.com/spreadsheets/d/1n0aF3h2XZbUWLkGDsHKeRUAx5al7z08M0HFNiyaiVmw/edit?usp=sharing

Descriptive Statistics:

This analysis provides a statistical summary of the dataset that we have collected from January 2024 to December 2024. By calculating these measures such as measures of central tendencies (Mean, Median, Mode) along with measure of standard deviation of Quantity and Amount of the items, we try to get important insights from these figures across different project sites.

Item	Transactions	Qty Mean	Qty Median	Qty Std	Qty Min	Qty Max	Amount Mean	Amount Median	Amount Std	Amount Min	Amount Max
Ceramic Tiles	55	267.49	280	90.65	110	400	12,973.39	13,483.08	4,667.04	4,769.60	21,157.80
Duco Finish Bed Paneling	18	19.5	20.5	6.71	8	32	17,247.60	18,049.36	6,039.42	7,034.96	29,045.12
Gypsum False Ceiling	21	19.1	19	9.38	1	32	1,120.29	1,113.50	559.03	54	1,920.00
Havells Panel Light 10W	18	20.44	21	7.58	8	32	35,925.87	37,302.30	13,529.29	14,015.44	59,861.44
Laminate Wardrobe	22	21.86	23.5	7.15	8	30	45,930.16	49,178.76	15,382.22	16,987.36	66,525.90
PVC Pipes	39	41.49	42	10.64	21	60	5,476.09	5,378.49	1,408.38	2,548.14	7,857.84
Paint Primer	47	34.85	34	9.49	20	50	6,647.32	6,792.18	1,787.34	3,764.40	9,788.73
Profile Light with Wiring	19	18.53	20	8.27	5	30	21,917.92	22,719.40	9,556.91	5,755.55	35,563.20
Rope Light DTH	22	19.95	19	6	8	30	31,555.08	31,302.22	8,954.34	12,842.56	49,869.90
Safety Main Door	23	1.7	2	0.7	1	3	1,30,159.11	1,44,730.36	53,285.82	72,365.18	2,41,387.53
Sand	54	109.43	117.5	28.69	58	147	8,431.04	8,778.00	2,586.66	3,423.16	12,860.05
Shower Cubicle	22	2.39	2	0.57	2	4	1,37,637.14	1,17,626.64	35,790.65	1,01,920.40	2,29,961.48
Spot Light 2W	23	17.96	15	9.79	4	34	7,094.39	5,863.52	4,054.62	1,637.08	14,729.48
TV Unit Laminate	22	20.68	21	6.75	8	32	34,896.74	35,408.31	11,456.25	13,642.64	55,992.00
Window Paneling	22	19.82	19	8.29	7	33	15,815.33	15,565.75	6,571.51	5,543.37	26,916.16
Wood	62	28.08	27	7.59	15	40	68,921.99	69,562.32	20,887.21	34,301.92	1,06,998.06

Key Insights:

- **Wood** and **Ceramic Tiles** are among the most frequently transacted items, with high average and maximum amounts, reflecting their central role in interior projects.
- **Sand** and **Paint Primer** are also having high transaction count, which indicates these are regularly used.
- **Shower Cubicle** and **Safety Main Door** have the highest mean amount, which signifies they have very high unit cost.
- **TV Unit Laminate** and **Laminate Wardrobe** shows consistent transaction patterns, with moderate quantities in most of the projects.

Following is the Descriptive Statistics of **Rates** of different articles -

- **Ceramic Tiles**:
  - Mean rate: ₹48.20
  - Median rate: ₹49.81
  - Standard deviation: ₹4.34
  - Minimum rate: ₹40.47
  - Maximum rate: ₹53.70
- **Duco Finish Bed Paneling**:
  - Mean rate: ₹883.79
  - Median rate: ₹879.37
  - Standard deviation: ₹24.64
  - Minimum rate: ₹839.92
  - Maximum rate: ₹923.02
- **Gypsum False Ceiling**:
  - Mean rate: ₹58.43
  - Median rate: ₹56.00
  - Standard deviation: ₹4.06
  - Minimum rate: ₹54.00
  - Maximum rate: ₹65.50
- **Havells Panel Light 10W**:
  - Mean rate: ₹1,757.03
  - Median rate: ₹1,762.16
  - Standard deviation: ₹72.27
  - Minimum rate: ₹1,631.27
  - Maximum rate: ₹1,870.67
- **Laminate Wardrobe**:
  - Mean rate: ₹2,100.50
  - Median rate: ₹2,094.54
  - Standard deviation: ₹81.47
  - Minimum rate: ₹1,994.54
  - Maximum rate: ₹2,238.17
- **PVC Pipes**:
  - Mean rate: ₹132.16
  - Median rate: ₹135.48
  - Standard deviation: ₹10.48
  - Minimum rate: ₹111.05
  - Maximum rate: ₹145.44

- **Paint Primer**:
  - Mean rate: ₹191.33
  - Median rate: ₹191.23
  - Standard deviation: ₹9.44
  - Minimum rate: ₹167.53
  - Maximum rate: ₹205.12
- **Profile Light with Wiring**:
  - Mean rate: ₹1,190.26
  - Median rate: ₹1,185.44
  - Standard deviation: ₹49.03
  - Minimum rate: ₹1,123.74
  - Maximum rate: ₹1,285.52
- **Rope Light DTH**:
  - Mean rate: ₹1,590.72
  - Median rate: ₹1,605.32
  - Standard deviation: ₹84.25
  - Minimum rate: ₹1,445.11
  - Maximum rate: ₹1,721.03
- **Safety Main Door**:
  - Mean rate: ₹77,080.72
  - Median rate: ₹77,532.62
  - Standard deviation: ₹2,931.19
  - Minimum rate: ₹70,575.68
  - Maximum rate: ₹81,399.88
- **Sand**:
  - Mean rate: ₹76.81
  - Median rate: ₹83.65
  - Standard deviation: ₹10.41
  - Minimum rate: ₹55.42
  - Maximum rate: ₹88.69
- **Shower Cubicle**:
  - Mean rate: ₹53,417.49
  - Median rate: ₹52,728.37
  - Standard deviation: ₹2,379.69
  - Minimum rate: ₹50,960.20
  - Maximum rate: ₹59,216.08
- **Spot Light 2W**:
  - Mean rate: ₹391.72
  - Median rate: ₹392.31
  - Standard deviation: ₹24.17
  - Minimum rate: ₹361.06
  - Maximum rate: ₹433.22
- **TV Unit Laminate**:
  - Mean rate: ₹1,687.26
  - Median rate: ₹1,706.62
  - Standard deviation: ₹69.27
  - Minimum rate: ₹1,558.29
  - Maximum rate: ₹1,759.28
- **Window Paneling**:
  - Mean rate: ₹799.51
  - Median rate: ₹794.68
  - Standard deviation: ₹31.09
  - Minimum rate: ₹751.10
  - Maximum rate: ₹879.33
- **Wood**:
  - Mean rate: ₹2,446.94
  - Median rate: ₹2,528.80
  - Standard deviation: ₹278.30
  - Minimum rate: ₹1,923.72
  - Maximum rate: ₹2,743.54

4. Detailed Explanation of Analysis Process/Method

For this project, the analysis focuses on procurement data from an interior design firm, covering all months of 2024 of various items across 25 different projects. The primary goal is to get actionable insights to optimize inventory management and get proper insights of the prices of different materials, with this better understanding the firm can function efficiently with a better profit margin.

1. Data Preparation

- The process begins with the systematic collection and cleaning of procurement data that we received from the firm.
- The dataset is structured in a tabular format for better use case, along with that it is being grouped with items.

- A lot of data cleaning is being done, such as missing values, inconsistent data, sorting/filtering of required data and other similar actions. Data is also converted to visualizations as required, also in a form of dashboard.

2. Linear Regression & Trend Visualization

- We will be using Linear Regression & Trend Visualizations as it will us to identify and forecast trends in material procurement over time, identifying seasonality in material prices, and other cost fluctuations.
- Linear regression helps to predict future procurement needs and enabling better budgeting. Trend visualization (using line charts) makes it easier to gain insights with these patterns. Hence, we can have decisions backed by these insights.

3. ABC-XYZ analysis process

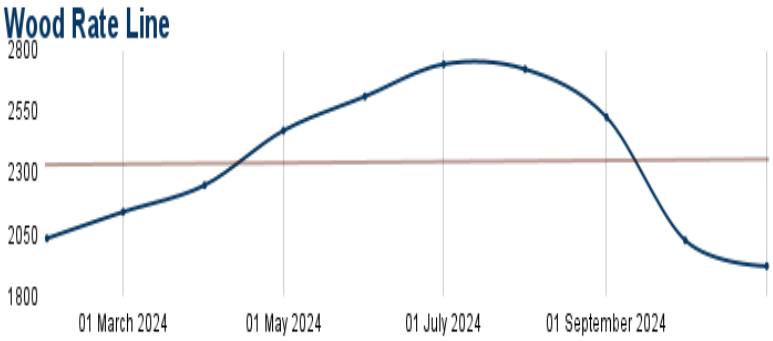
- We will be using ABC-XYZ analysis process to categorize materials based on their consumption value (ABC) and usage consistency (XYZ).
- ABC analysis identifies high-value items that require tight control, while XYZ analysis sorts materials with unpredictable demand. So with these data we can have information that can help us to take informed decision while procuring items and in better inventory management.

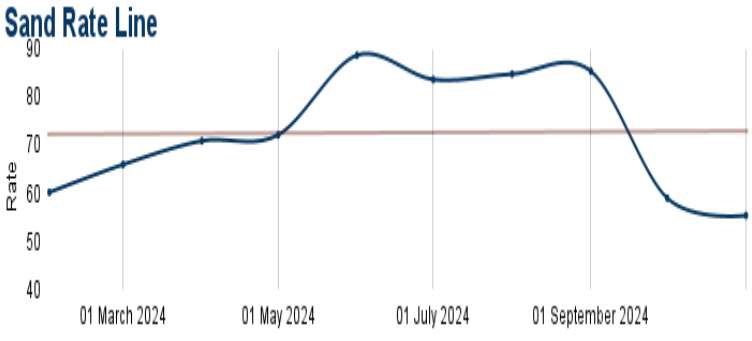
4. Visualization and Reporting

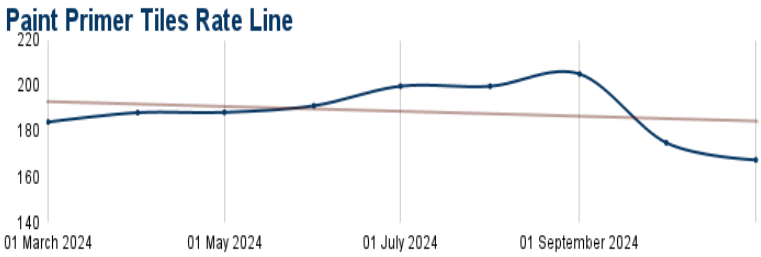
- We will be using various visualizations to present findings in a clear, actionable format.
- Visual tools and charts enhance the understanding of trends in the data, which makes it easier for decision-making to act on insights.
- Interactive dashboards and reports are created using Google Sheets or similar tools, employing pivot tables and other insightful charts for better understanding.

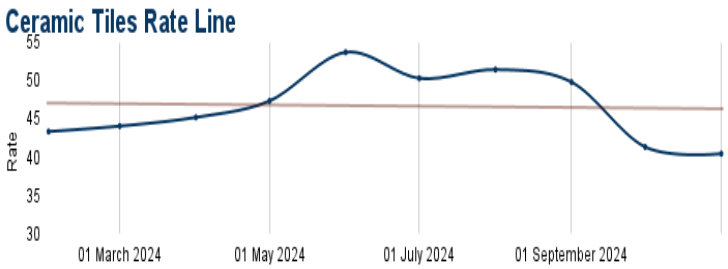
5. Results and Findings

We have got following insights till this point of our project. It is based on the price, rate, quantity, and amount of the various items procured as per the data we have.









We can make following understanding about the rates based on the line charts-

- **Wood:** Upward line till July, sharp downward after.
- **Sand:** Upward till September, sudden drop after.
- **Ceramic Tiles:** Upward till June, then downward.
- **Paint Primer:** Upward till September, then downward.

We can observe that there is a general trend of price hike during mid months, it can be due to more development activities in that timeframe, which results in high demand or due to monsoon season prices go up.

On performing **ABC-XYZ Classification**, we classified the items as per the following –

Item	Total Value	ABC Class	XYZ Class	ABC-XYZ
Safety Main Door	3,53,60,084.85	A	Z	AZ
Shower Cubicle	1,87,35,506.13	B	Z	BZ
Wood	42,73,163.16	B	Z	BZ
Laminate Wardrobe	10,10,463.43	B	Z	BZ
TV Unit Laminate	7,67,728.23	B	Z	BZ
Ceramic Tiles	7,13,536.43	B	Z	BZ
Rope Light DTH	6,94,211.73	C	Z	CZ
Profile Light with Wiring	6,59,824.09	C	Z	CZ
Havells Panel Light 10W	5,82,347.12	C	Z	CZ
Gypsum False Ceiling	5,01,236.45	C	Z	CZ
Duco Finish Bed Paneling	4,97,832.11	C	Z	CZ
Spot Light 2W	4,12,120.60	C	Z	CZ

Key Findings:

1. **High-Value Unpredictable (AZ):** Safety Main Door is the only A-class item but has highly variable demand (Z).
2. **Moderate-Value Unpredictable (BZ):** 5 items including Shower Cubicle and Wood account for 30% of total inventory value with unstable demand patterns.
3. **Low-Value Volatiles (CZ):** 6 items making up 5% of value but 40% of SKU count, showing extreme demand fluctuations.
4. **All items came under (Z) category** [As all items had CV(coefficient of variation) ≥ 0.25]. No items with stable (X) or moderately stable (Y) demand patterns were found.