Optimizing Plywood Business Operations Using Data Analytics

A Mid-Term report for the BDM capstone Project

Submitted by

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Contents

Declaration Statement

I am working on a Project titled "**Optimizing Plywood Business Operations Using Data Analytics**". I extend my appreciation to **AARAMBH TRADERS**, 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 from 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 analytical procedures.

I am dedicated to adhering to the principles 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. In the event that 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 understand that all recommendations made in this project report are within the context of the academic project taken up towards course fulfillment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Signature of Candidate:

Name: Punit Kumar

Date: 03/02/2025

1 Executive Summary and Title

Aarambh Traders is a well-established distributor in the plywood industry, facing challenges related to **inventory management, profitability tracking, and credit monitoring**. Inefficient stock handling, lack of demand forecasting, and credit risks have impacted business operations. To address these challenges, this project aims to analyze inventory patterns, assess financial performance, and improve credit management using structured data-driven methods.

In the **proposal stage**, the focus was on identifying key business problems affecting operational efficiency. After discussions with the business owner, it was observed that inventory mismanagement, untracked profitability, and credit risks were major concerns. The absence of proper inventory tracking led to overstocking or understocking, affecting cash flow. Profitability analysis was limited due to unstructured financial records, and outstanding credit payments created financial uncertainty. These findings helped shape the project objectives and define the areas requiring improvement.

In the **mid-term stage**, the project moved to data collection and preliminary analysis. Data was gathered directly from Aarambh Traders through business records, transaction logs, and an interaction video with the owner to ensure the originality and accuracy of insights. The collected data was structured into spreadsheets, including SKU Price List, Sales Data, Purchase Data, and Credit Data, covering essential business operations. Using Excel tools such as pivot tables, conditional formatting, and financial formulas, a basic analysis was conducted to understand sales trends, stock movement, and outstanding payments. This provided initial insights into inefficiencies, helping to establish a clearer understanding of business patterns and financial performance. However, this stage was focused only on data organization and surface-level observations rather than in-depth analytics.

In the **final report**, a deeper analysis will be conducted based on the collected data. Advanced techniques will be applied to gain more meaningful insights into inventory flow, profitability trends, and credit risks. The final phase will also focus on developing recommendations for improving inventory tracking, optimizing pricing strategies, and reducing financial risks. The objective is to create a data-driven framework that will assist Aarambh Traders in making informed business decisions and improving overall operational efficiency.

2 Proof of originality of the Data

Company Name : **AARAMBH TRADERS**

GST No. : 10AKQPK0590B1ZM

Owner Name : Manish Kumar

Location : Nuaon, Kaimur, Bihar

Industry : Plywood Distribution and Trading

Letter from Company : Click here

Video Interaction with Owner : Video Link

Figure 1 - Shop Image with Owner

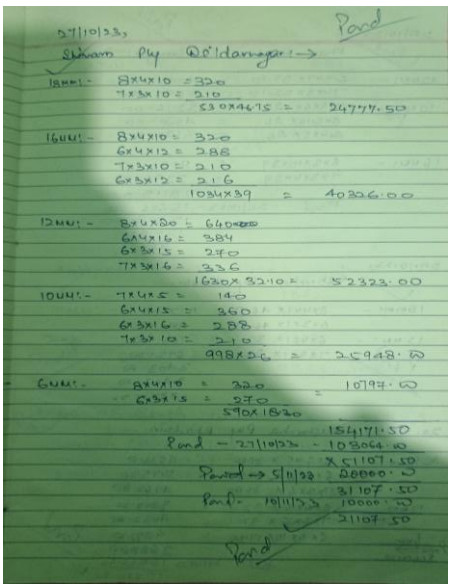


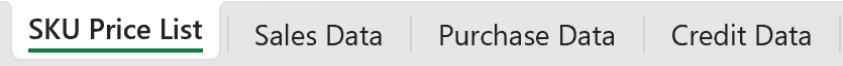
Figure 2 – Sample Register Recordl

Figure 3 - Inventory Image

3 Metadata

Collected Data from Firm – View Excel

In the workbook, there are mainly four spreadsheets, namely:



- **SKU Price List -** The SKU Price List spreadsheet contains the purchase and sale price of each SKU, helping track cost variations and pricing strategies.
- **Sales Data –** The Sales Data spreadsheet maintains a record of all sales transactions, helping track customer purchases, product demand, and revenue generation.
- **Purchase Data –** The Purchase Data spreadsheet tracks procurement transactions, helping monitor stock additions, supplier costs, and inventory replenishment.
- **Credit Data -** The Credit Data spreadsheet manages customer credit transactions, ensuring effective tracking of outstanding payments and cash flow management.

3.1. SKU Price List Spreadsheet:

SKU	Purchase Per Sqft	Purchase Price	Sell Per Sqft	Sell Price

The metadata of the above mentioned column headers are as follows :

- **SKU – Product Name**: The name or identification of the plywood product.
- **Purchase Price Per Sqft**: The cost per square foot at which the owner purchases the plywood.
- **Purchase Price**: The overall price of the SKU, including any additional costs.
- **Sell Per Sqft**: The selling price per square foot at which the owner sells the plywood.
- **Sell Price**: The final selling price of the plywood, determined by the owner's pricing strategy.

3.2. Sales Data :

Date	Customer Name	SKU	Qty	Price	Value

The metadata of the above mentioned column headers are explained as follows :

- **Date –** The date on which the sale transaction occurred.
- **Customer Name –** The name of the customer who made the purchase.
- **SKU –** The specific product sold in the transaction.
- **Qty –** The quantity of the product sold.
- **Price –** The per-unit selling price of the product.
- **Value -** The total sales amount calculated as Qty × Price**.**

3.3. Purchase Data :

Date	SKU	Qty	Price	Value

The metadata of the above mentioned column headers are explained as follows :

- **Data –** The date on which purchase transaction occurred.
- **SKU –** The specific product purchased in this transaction.
- **Qty –** The quantity of the product purchased.
- **Price –** The per-unit purchase price of the product.
- **Value –** The total purchase amount calculated as Qty × Price.

3.4. Credit Data :

Date	Customer Name	Credit Amount	Payment Received	Oustanding Amount	Mode of Payment

The metadata of the above mentioned column headers are explained as follows :

- **Date –** The date on which the credit transaction occurred.
- **Customer Name –** The name of the customer associated with the transaction.
- **Credit Amount –** The amount of credit extended to the customer.
- **Payment Received –** The amount received from the customer against the credit.
- **Outstanding Amount –** The remaining balance after adjusting payments received.
- **Mode of Payment -** The method used for payment, such as cash, cheque, or UPI.

4 Descriptive Statistics

Descriptive statistics summarize key business data, including sales, purchases, inventory, and credit transactions. Metrics like mean, median, minimum, maximum, and standard deviation help analyze sales trends, pricing variations, stock movement, and outstanding payments. This analysis provides insights into business performance, financial health, and operational efficiency.

4.1. Descriptive Statistics for SKU Price List Data:

The SKU Price List Data includes purchase, cost, and selling prices. Key metrics like mean, median, minimum, maximum, and standard deviation help analyze price distribution, detect outliers, and maintain cost consistency.

Descriptive Statistics for Price before 01 April 2024

	Purchase Per Sqft	Cost Price	Sell Per Sqft	Sell Price
count	25.000000	25.000000	25.000000	25.000000
mean	30.340000	746.364000	31.857000	783.682200
std	9.739011	288.724865	10.225961	303.161108
min	16.500000	297.000000	17.325000	311.850000
25%	24.400000	528.000000	25.620000	554.400000
50%	30.000000	720.000000	31.500000	756.000000
75%	36.800000	924.000000	38.640000	970.200000
max	44.000000	1408.000000	46.200000	1478.400000

Figure 4 - Descriptive Statistics for SKU Price List

Descriptive Statistics for Price after 01 April 2024

	Purchase Per Sqft	Purchase Price	Sell Per Sqft	Sell Price
count	25.00000	25.000000	25.000000	25.000000
mean	31.26000	768.996000	32.840000	807.864000
std	10.04129	297.627801	10.553801	312.776992
min	17.00000	306.000000	17.850000	321.300000
25%	25.10000	544.000000	26.350000	571.200000
50%	30.90000	741.600000	32.500000	780.000000
75%	38.00000	951.300000	39.900000	999.600000
max	45.30000	1449.600000	47.600000	1523.200000

Figure 5 - Descriptive Statistics for SKU Price List

4.2. Descriptive Statistics for Sales Data

The Sales Data records transaction details, including quantity, price, and order value. Metrics like total sales, average price, minimum, maximum, and standard deviation help analyze sales trends, demand patterns, and revenue fluctuations.

	Qty	Price	Value
count	3220.000000	3220.000000	3220.000000
mean	10.254969	787.829789	8046.760565
std	11.317465	292.504879	9859.427714
min	1.000000	311.850000	311.850000
25%	4.000000	567.000000	2856.000000
50%	8.000000	756.000000	5059.200000
75%	10.000000	957.600000	9486.000000
max	160.000000	1523.200000	156000.000000

Figure 6 - Descriptive Statistics for Sales Data

4.3. Descriptive Statistics for Purchase Data

The Purchase Data records details of acquired stock, including quantity, price, and total value. Descriptive statistics such as total purchases, average cost, minimum, maximum, and standard deviation help analyze procurement trends, supplier pricing variations, and inventory replenishment patterns for efficient stock management.

	Qty	Price	Value
count	402.000000	402.000000	402.000000
mean	81.833333	749.029104	61544.678109
std	46.227720	277.241899	43759.613745
min	10.000000	297.000000	6930.000000
25%	40.000000	540.000000	26055.750000
50%	80.000000	720.000000	47104.000000
75%	120.000000	921.000000	91440.000000
max	200.000000	1449.600000	217440.000000

Figure 7 - Descriptive Statistics for Purchase Data

4.4. Descriptive Statistics for Credit Data

The Credit Data tracks customer transactions, including credit amount, payments received, and outstanding balances. Descriptive statistics such as total credit issued, average outstanding, minimum, maximum, and standard deviation help assess customer payment behavior, credit risk, and financial stability.

	Credit Amount	Payment Received	Oustanding Amount
count	849.000000	849.000000	849.000000
mean	30518.926996	30267.680813	22393.098339
std	39579.438959	32951.819789	36868.092310
min	0.000000	0.000000	-211305.010000
25%	5221.440000	10000.000000	3711.305000
50%	17598.000000	20000.000000	9085.930000
75%	38640.000000	38000.000000	23488.455000
max	266597.700000	270000.000000	272311.960000

Figure 8 - Descriptive Statistics for Credit Data

5 Detailed Explanation of Analysis Process/Methods

The analysis of the collected data is conducted using **time-series analysis techniques**, as the dataset spans from **October 2023 to September 2024**. Given that the data includes daily transactions, purchases, and credit records, time-series analysis is the most appropriate method because it allows for tracking trends over time, understanding seasonal variations, and identifying patterns in sales, purchases, and outstanding payments.

Approach to Data Analysis

There are four major types of data analysis, and the following structured approach is adopted:

1. **Descriptive Analysis** – This is the first step in the analysis, where we summarize and interpret historical data to identify trends in sales, inventory movement, and credit transactions. Basic descriptive statistics such as mean, median, standard deviation, and distribution are used to provide insights into price variations, demand fluctuations, and outstanding payments. This helps in understanding the current state of the business.

2. **Diagnostic Analysis** – This stage focuses on determining why certain trends occur. For example, if a particular SKU shows a decline in sales, the analysis looks at factors such as seasonal demand changes, price fluctuations, or supply chain issues. Similarly, fluctuations in

outstanding payments are analyzed by reviewing credit transactions and customer payment behaviors.

3. **Predictive Analysis (To Be Included in the Final Report)** – This will involve using past trends in sales, purchases, and credit data to forecast future performance. By examining historical patterns, it will be possible to predict future demand, potential inventory shortages, and credit risks. This will help the business in making informed decisions regarding stock replenishment and credit policies.

4. **Prescriptive Analysis (To Be Included in the Final Report)** – After identifying past trends and predicting future ones, prescriptive analysis will focus on recommending data-driven solutions. This may include optimizing inventory management to prevent overstocking or shortages, setting better credit policies to minimize outstanding payments, and suggesting pricing strategies for improving profitability.

Justification for Using This Method

- **Time-Series Analysis** is the best fit because the business data spans an entire year, allowing for seasonal trends and periodic fluctuations to be observed.

- **Descriptive and Diagnostic Analysis** provide a solid foundation by identifying what has happened and why before moving into **Predictive and Prescriptive Analysis** for future decision-making.

- **Excel-Based Analysis** ensures ease of data manipulation, visualization, and basic trend identification without requiring complex machine learning techniques at this stage.

- This structured approach ensures that the findings are **practical, actionable, and tailored to the business's needs**, enabling data-driven decision-making.

At this **mid-term stage**, the focus has been on **descriptive and diagnostic analysis**, providing initial insights into sales trends, inventory movement, and credit transactions. The final report will build upon this foundation with deeper analysis and actionable recommendations.

6 Results and Finding

The Results and Findings section presents key insights derived from the collected data across sales, purchases, inventory, and credit transactions. Using descriptive statistics and visual analysis, we examined sales trends, product-wise performance, stock movement, and outstanding payments. The analysis highlights patterns in customer demand, inventory fluctuations, and financial health, offering a foundational understanding of the business's operational efficiency. These findings serve as a baseline for further in-depth analysis in the final report.

6.1. Sales trend Over Time(Monthly):

This graph helps visualize how sales fluctuate over time, identifying seasonal patterns, peak sales periods, and downward trends. It is typically represented using a line chart to show trends clearly.

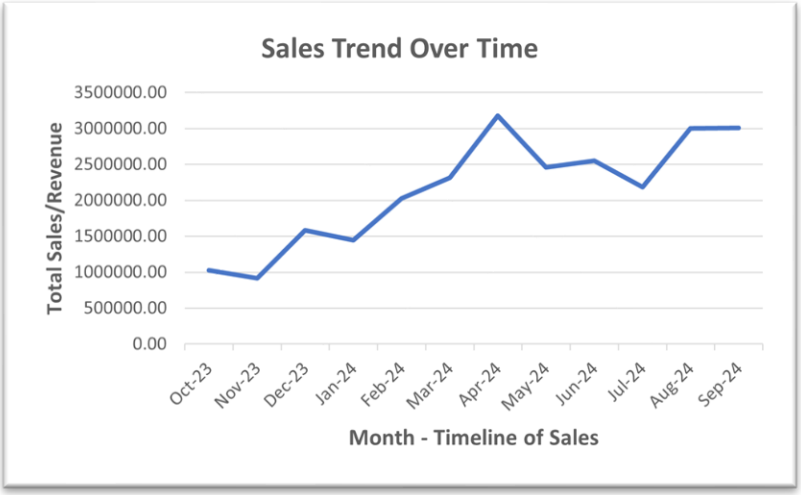


Figure 9 - Sales Trend Over Time

In the above graph, sales peaked in April 2024 due to seasonal demand, driven by the upcoming wedding season in May and June. Increased home renovations and furniture purchases led to higher plywood sales. Identifying such trends helps in effective inventory planning, ensuring optimal stock levels to meet demand without overstocking.

6.2. Purchase Trend Over Time (Monthly)

The purchase trend over time analyzes buying patterns across specific periods, revealing seasonal demand, peak sales periods, and fluctuations. A line chart typically visualizes this, with time on the X-axis and purchase count or revenue on the Y-axis. Identifying trends helps businesses optimize inventory, pricing, and marketing strategies effectively.

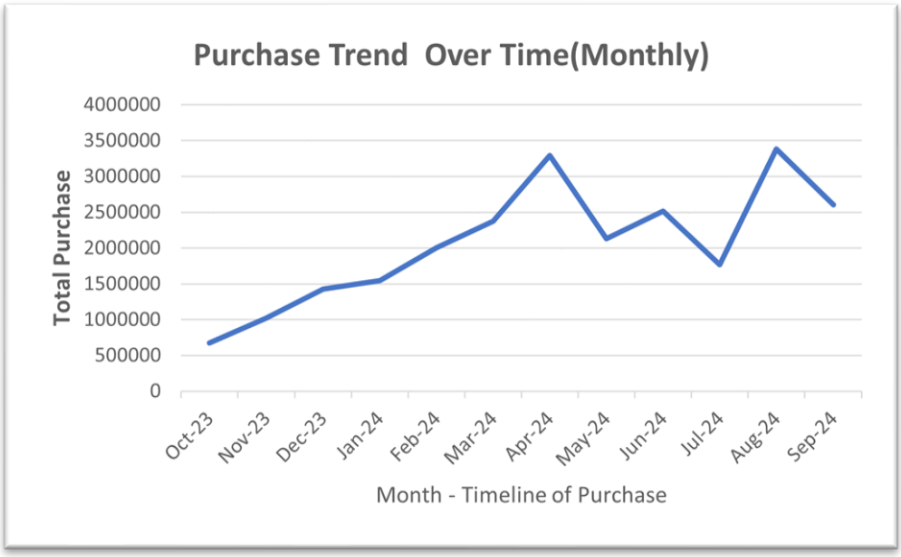


Figure 10 - Purchase Trend Over Time

6.3. SKU-Wise Sales Distribution

The SKU-wise sales distribution analysis highlights the sales performance of different products. It helps identify top-selling SKUs and underperforming items, aiding in inventory management and pricing strategies. Understanding which products drive revenue allows for better demand forecasting, stock optimization, and strategic decision-making to improve overall business profitability.

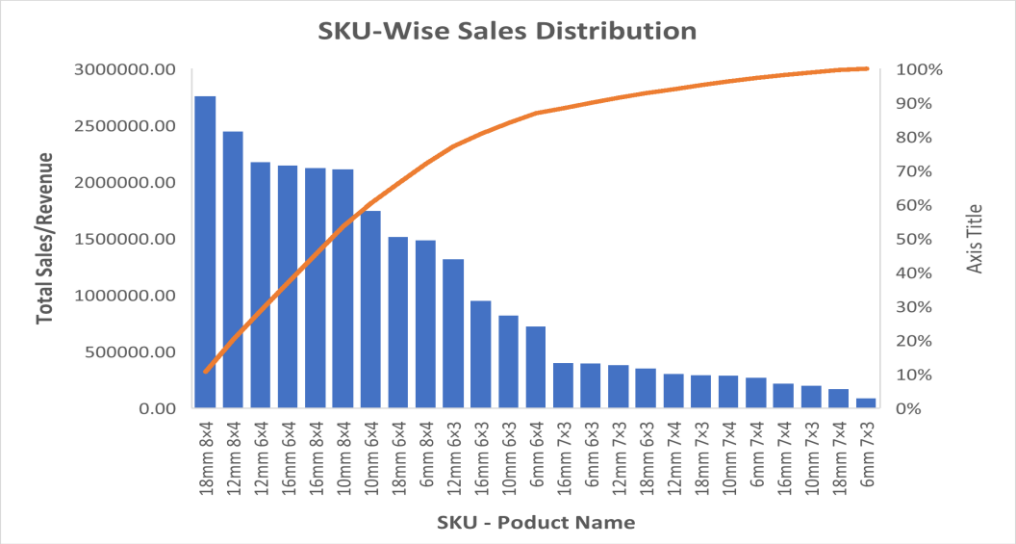


Figure 11 - SKU Wise Sales Distribution

The SKU-wise sales distribution graph highlights variations in product demand. Certain SKUs, particularly 12mm, 16mm, and 18mm thicknesses, exhibit higher sales, indicating customer preference. Lower-selling SKUs suggest possible overstock or lesser demand.

6.4. Credit vs Payment Received (Monthly) :

The Credit vs. Payment Received (Monthly) analysis compares the total credit extended to customers against payments received each month. This helps identify trends in outstanding balances, potential cash flow issues, and delays in collections. A consistent gap between credit and payments indicates the need for improved credit policies and collection strategies.

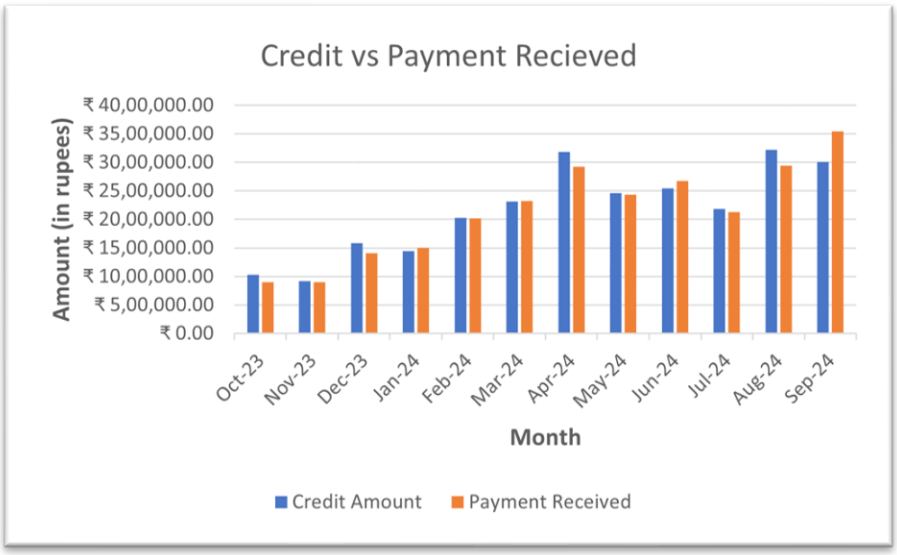


Figure 12 - Credit vs Payment Recieved (Monthly)

The graph shows a rising trend in both credit and payments. April 2024 sees a peak in credit due to seasonal demand. Some months show balanced transactions, while others, like August and September 2024, have higher credit, indicating the need for better credit management and payment collection strategies.