

**Enhancing Operational Efficiency and Profitability
Through Pricing Strategy Optimization and Seasonal Sales
Analysis for A Paper Trading Firm**

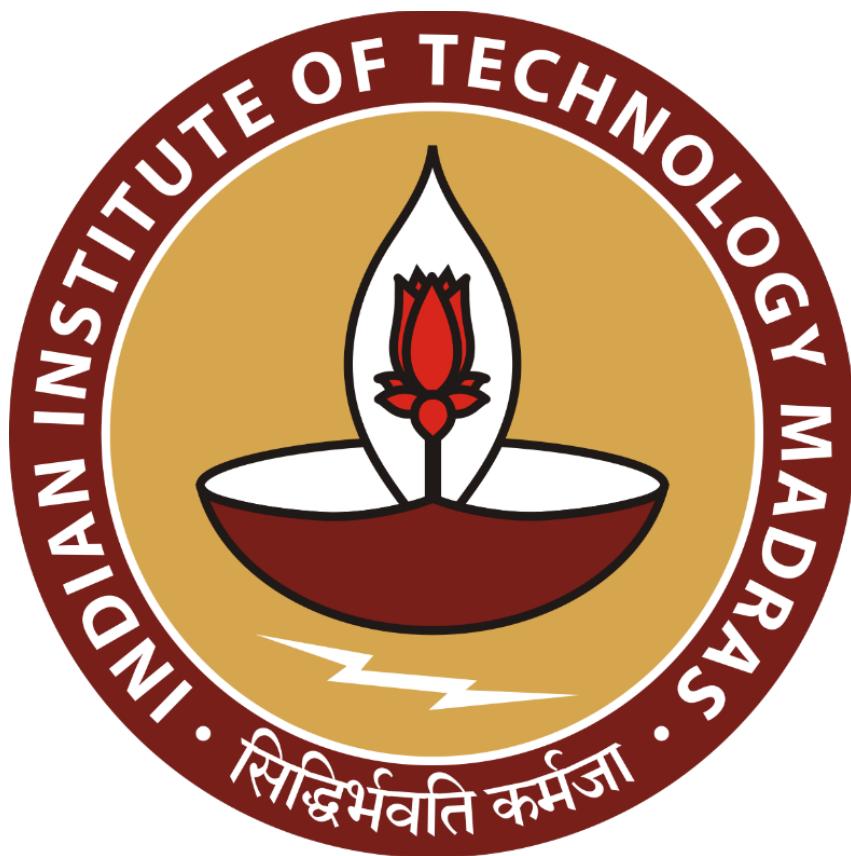
BUSINESS DATA MANAGEMENT CAPSTONE PROJECT

MIDTERM REPORT

SUBMITTED BY

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Declaration Statement

I am working on a Project Title “**Enhancing Operational Efficiency and Profitability Through Pricing Strategy Optimization and Seasonal Sales Analysis for A Paper Trading Firm**”. I extend my appreciation to **Indra Impex Corporation** 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 analysed 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. 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 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: Akshita Mittal

Date: 10-10-23



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1. Executive Summary

Indra Impex Corporation, a small B2B paper trading company of 10 employees, aims to enhance its operational efficiency and overcome stock shortages. To ensure customer satisfaction and maximise profits, a strategic pricing plan is imperative. The dataset used for this report consist of – Sales Data, and Stock data. Stock Data Analysis was completed and aimed to understand the firm's procurement landscape, and types of products dealt with. The analysis commenced with the categorization of the stock data by GSM (grams per square meter). A comprehensive monthly sales overview was constructed to identify demand trends for paper products, crucial for effective inventory management. Lastly, customers were segmented into High, Medium, and low value categories based on purchasing behaviour, enabling tailored strategies for different segments.

The data collected and cleaned included stock data and sales data collected over the duration of April 2022 to March 2023. Data Cleaning of the Stock data involved the categorization of papers by GSM, addressing data formatting issues, and scaling procurement values for ease of analysis. Descriptive statistics provided insights, revealing maximum and minimum procurement values, average rates, and frequency distribution of the yearly procurement values of papers of different GSMS. For Sales Data, an extra column of month was added manually, and all the sales values were scaled by 1 Lakh for ease of understanding. Descriptive Statistics provide insights into the range and distribution of data. Two types of visualizations were created to analyse procurement and sales data for GSM paper from April 2022 to March 2023. A line chart depicted monthly procurement values for each GSM paper, while a stacked bar chart illustrated the annual procurement trends. Additionally, monthly sales data was presented in a table format, showcasing the yearly sales trend and enabling a comparison between procurement and sales patterns for the papers. These visualizations provide a comprehensive overview of paper procurement and sales performance over the specified period.

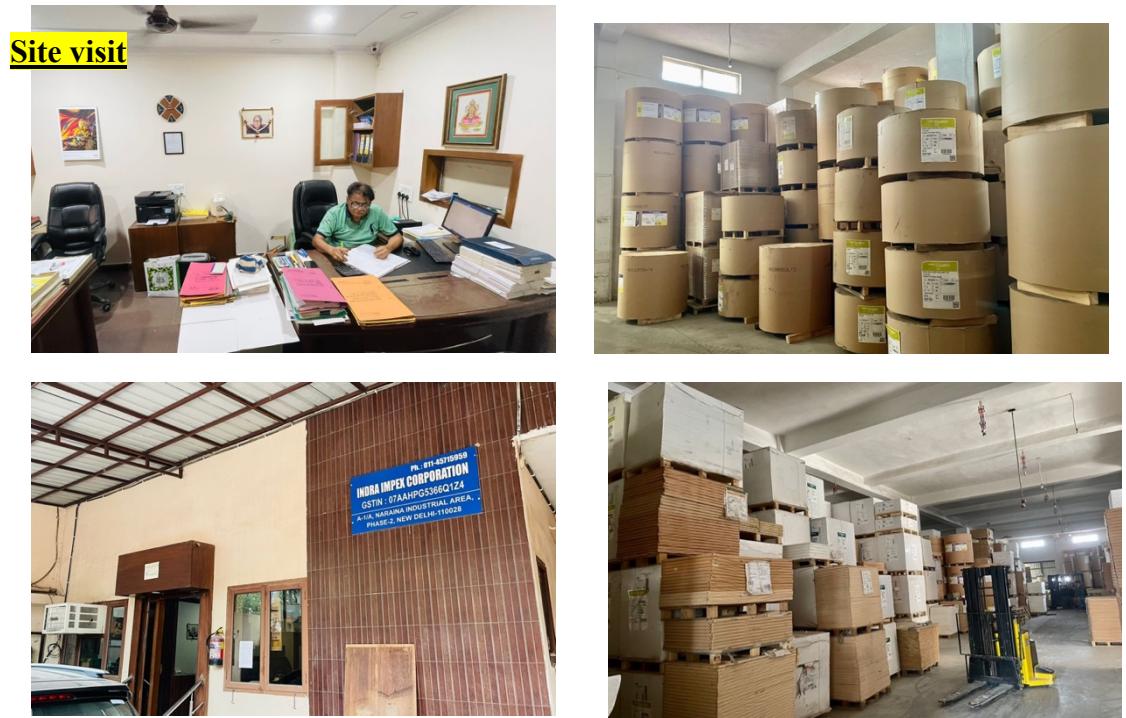
From the trend analysis depicting stock trends over months, higher volumes were observed from August to December, indicative of increased sales during this period. Further exploration using sales data is needed to understand sharp drops.

Future steps include identifying optimal price levels, valuable customers, and offering strategic recommendations for inventory management, aiming to improve operational efficiency and inventory practices. A stacked bar chart will depict high, medium, and low-value customers based on recent purchases, enabling precise inventory planning. These

insights will empower Indra Impex to streamline operations, make informed decisions, and drive business growth.

2. Proof of Originality

Indra Impex Corporation is a small B2B paper trading firm with head office located in **Naraina Industrial Area, Phase -2, New Delhi**. The Sales and Inventory data is stored in a computer software. The data for the project was provided by the owner, Mr. Abhishek Gupta, which required transferring the data from the software to excel format.



(From top left clockwise: The Head Office, Sheets of paper, rolls of paper (called Reams), Entrance to the Office of Indra Impex Corporation)

Table 1: Documents for the proof of originality

Name	Type	Link
A Letter bearing the company's letterhead permitting the use of the data	PDF	Link
Pictures of the site visit of the company	Images	Link
Excel sheet of the Stock Data	Excel sheet	Link
Excel sheet of the Sales Data	Excel sheet	Link
Entire BDM Folder link of Google Drive	Google Drive	Link

3. Metadata and Descriptive Statistics

There are two datasets being analysed in this report – Stock data, and Sales Data.

4.1. STOCK DATA

The data collected was for the duration of **April 2022 – March 2023** (One fiscal year).

The data was in the form of an excel sheet in a condensed format.

Indra Impex Corporation											
487, EPIP, Sector 53, HSIIDC, Phase 3, Kundli Industrial Estate, Distt Sonipat, Haryana - 131028 Udyam Regn No: UDYAM-DL-10-0004798 FSC Certificate Code: RR-COC-000710 Contact : 9810225567											
Stock Group Summary											
Particulars			Indra Impex Corporation (KUNDLI) - (from 1- 1-Apr-22 to 30-Apr-22)			Indra Impex Corporation (KUNDLI) - (from 1- 1-May-22 to 31-May-22)			Indra Impex Corporation (KUNDLI) - (from 1- 1-Jun-22 to 30-Jun-22)		
			Closing Balance			Closing Balance			Closing Balance		
			Quantity	Rate	Value	Quantity	Rate	Value	Quantity	Rate	Value
100 Gsm / 101.6 cm Silk Q	2935.000 Kgs	60.93	178829.55			2935.000 Kgs	60.93	178829.55	2935.000 Kgs	60.93	178829.55
100 Gsm / 123 cm Gloss											
100 Gsm / 129 cm Gloss											
100 Gsm / 131 cm Gloss											
100 Gsm / 135 cm Silk											
100 Gsm / 145 cm Gloss											
100 Gsm / 58.4 cm Silk Q	3260.000 Kgs	68.40	222984.00			3260.000 Kgs	68.40	222984.00	3260.000 Kgs	68.40	222984.00
100 Gsm / 58.5 cm BILT Gloss	5486.000 Kgs	87.85	481945.10			5486.000 Kgs	87.85	481945.10	3489.000 Kgs	87.85	306508.65
100 Gsm / 83 cm Matt	2029.000 Kgs	56.00	113624.00			2029.000 Kgs	56.00	113624.00	2029.000 Kgs	56.00	113624.00
100 Gsm / 89 cm Gloss											
100 Gsm / 91.2 cm Gloss											
100 Gsm / 91.5 cm Gloss											
100 Gsm / 91 cm BILT Gloss	5408.000 Kgs	87.85	475092.80			3088.000 Kgs	87.85	271280.80	3088.000 Kgs	87.85	271280.80
108 x 79 cm / 400 Gsm 0.5 S	14.20 Pkt	928.47	13184.28			14.20 Pkt	928.47	13184.28			
108 x 79 cm / 400 Gsm S	18.00 Pkt	1953.16	35156.93			18.00 Pkt	1953.16	35156.93	18.00 Pkt	1953.16	35156.93
115 Gsm / 128 cm Gloss	4766.000 Kgs	84.40	402250.40			4766.000 Kgs	84.40	402250.40	4766.000 Kgs	84.40	402250.40

Metadata:

Collected : Indra Impex Co., compiled and transferred on 10th August 2023.

Shape of the dataset : 489 Rows x 38 Columns

- The columns are sets of 3 merged columns for each month from April 22 – March 23.
- The rows - Each row contains a separate type of a paper in terms of its dimensionality, GSM, and type.

Table 2 : Column Details of the Stock Data

Column Name	Type	Unit	Remark
Particulars	Categorical	-	Contains the details of papers – dimension, GSM (gram per square metre), and Type (Silk, Gloss, Matt etc).
Quantity	Numeric (in string format)	Kgs, Pkt, Rm	Quantity is described in varied units. <i>Kgs</i> – Kilograms <i>Pkt</i> – Packet (1 <i>Pkt</i> = 100 Sheets of paper, 1.25 <i>Pkt</i> = 125 Sheets of paper) <i>Rm</i> – Ream (500 sheets)
Rate	Numeric	Rupees per unit	-
Value	Numeric	Same as Rate	Calculated as Quantity x Rate.

Descriptive Statistics:

GSM Vs Value:

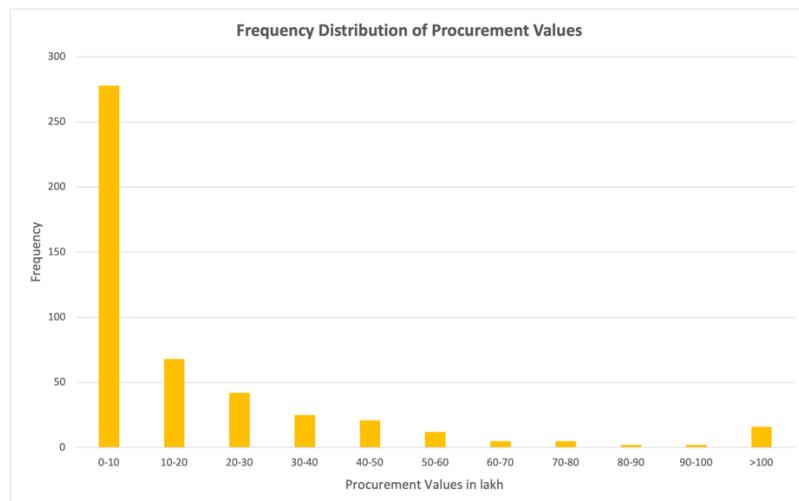
Maximum procurement value of a single type of paper = 764.04 L (170 Gsm / 92 cm Silk)

Minimum procurement value = 0.01L (1000 Rs) (66 x 105.5 cm / 310 Gsm S)

Mean procurement value by month = 845.35 Lakh Rs

Mean yearly procurement value by GSM = 676.279499 lakh Rs

Frequency Distribution of Yearly Procurement Values of different GSM papers:



GSM Vs Rate :

Maximum Average Rate of any paper = 6713 Rs / Rm (30" x 40" / 170 Gsm Silk)

Minimum Average Rate of any paper = 45.62 Rs / Ream (115 Gsm / 90.6 cm Silk)

Standard Deviation of Mean price for all papers over an entire year of procurement = 6.096

4.2. SALES DATA

Data collected for the same duration as of the Stock data, i.e., **April 2022 – March 2023** (One fiscal year).

Indra Impex Corporation										
487, EPIP, Sector 53, HSIIDC, Phase 3, Kundli Industrial Estate, Distt Sonepat, Haryana - 131028 Udyam Regn No: UDYAM-DL-10-0004798 FSC Certificate Code: RR-COC-000710 Contact : 9810225567										
Sales Register										
Date	Particulars	Voucher Type	Voucher No.	Delivery Note No. & Date	Despatch Doc. No	Despatch Through	Destination	Quantity	All. Units	
01-Apr-22	Paper Hub	SALES INVOICE	K/ T-0001/ 22-23					24.00 Pkt	588.000 Kgs	
01-Apr-22	Concept Advertising Agency	SALES INVOICE	K/ T-0002/ 22-23					13.50 Rm	617.625 Kgs	
01-Apr-22	Indra Impex Corporation (Delhi)	SALES INVOICE	K/ T-0003/ 22-23					17.00 Rm	806.630 Kgs	
01-Apr-22	Thomson Press (India) Ltd. (100% EOU)	SALES INVOICE	K/ T-0004/ 22-23					14100.000 Kgs		
04-Apr-22	Lustra Print Process Pvt. Ltd.	SALES INVOICE	K/ T-0005/ 22-23					5021.354 Kgs		
04-Apr-22	SRV Services	SALES INVOICE	K/ T-0006/ 22-23					12.00 Rm	284.400 Kgs	
04-Apr-22	Niyogi Offset Pvt. Ltd.	SALES INVOICE	K/ T-0007/ 22-23					18.00 Rm	817.380 Kgs	
04-Apr-22	Archana Advertising Pvt. Ltd.	SALES INVOICE	K/ T-0008/ 22-23					1156.575 Kgs		
05-Apr-22	Deeptee Paper Mart	SALES INVOICE	K/ T-0009/ 22-23					55.00 Rm	1303.500 Kgs	
05-Apr-22	Thomson Press (India) Ltd. (100% EOU)	SALES INVOICE	K/ T-0010/ 22-23					9100.000 Kgs		

Metadata:

Shape of the data: The data consists of 566 Rows and 23 Columns out of which only five were deemed useful for analysis.

Table 3: Column Details of Sales Data

Column Name	Type	Unit	Remark
Date	Datetime	Datetime	Gives the date of purchase
Month	Categorical	-	Manually created column to aid analysis.
Particulars	Categorical	-	Contains Customer Name
Quantity	Numeric (in string format)	Kgs, Pkt, Rm	Quantity of product purchased
Gross Total	Numeric	Dr	Total Debit (Dr stands for Debit)

Descriptive Statistics:

Sales Percentile	Value (in Lakhs)
0.25	0.53
0.5	1.1
0.75	2.04
0.9	4.16

Max Sale = 21.30 (in Lakh)

Total Sale in the year 22-23 = 1020.302 Lakh

4. Detailed Explanation of the Analysis Process / Methods

5.1. STOCK DATA

Data Cleaning

- A. Categorisation of the data: For the data analysis that was required to be done (Such as analysing the procurement pattern of various papers over the year), it was not a viable option to plot 498 categories of data, as it would have led to complicated and messy graphs. Thus, *the papers had to be categorised in some way*.

After talking to Mr. Abhishek Gupta regarding this, it was advised to categorise them on the basis of GSM. This had to be done manually by creating a separate column for GSM.

- B. Formatting : Many of the entries had the wrong formatting (String instead of numeric) which had to be corrected.

- C. Unmerging of Columns: Moreover, for ease of analysis, the merged columns were unmerged and made into three separate sheets (GSM Vs Quantity, Rate, and Value).

D. Scaling of Values: Since huge numbers were being dealt with, **entries were scaled by 1**

Lakh for Value.

Cleaned Data (Depicted here is the sheet for GSM vs Value):

A	B	C	D	E	F	G	H	I
Particulars	GSM	April	May	Jun	July	Aug	Sep	Oct
65 Gsm / 111 cm Silk		70	2.06	2.06	2.06	2.11	2.11	2.11
65 Gsm / 92 cm Bulky		70	0.79	0.79	0.79	0.79	0.79	0.79
70 Gsm / 101.6 cm Silk		70	9.41	9.41	9.41	9.41	9.41	9.41
70 Gsm / 58.4 cm Silk		70	1.87	1.87	1.87	1.87	1.87	1.87
70 x 100 cm / 070 Gsm Matt		70	10.33	10.33	10.33	10.33	6.16	5.61
58.5 x 87 cm / 80 Gsm Matt		80	0.24	0.24	0.24	0.24	0.24	0.24
58.5 x 88.9 cm / 80 Gsm Silk K		80	18.72	0.00	0.00	0.00	0.00	14.50
58.5 x 91.5 cm / 80 Gsm		80	0.01	0.01	0.01	0.01	0.01	0.01

Cleaned Data (Depicted here is the sheet for GSM vs Rate):

B	C	D	E	F	G	H	I	J
GSM	April	May	Jun	July	Aug	Sep	Oct	Nov
65	49.83	49.83	49.83	50.45	50.45	50.45	50.45	50.45
65	62.09	62.09	62.09	62.09	62.09	62.09	62.09	62.09
70	62.29	62.29	62.29	62.29	62.29	62.29	62.29	62.29
70	63.46	63.46	63.46	63.46	63.46	63.46	63.46	63.46
70	1705.45	1705.45	1705.45	1705.45	1705.45	1705.45	1705.45	1705.45
80	48.75	48.75	48.75	48.75	48.75	48.75		
80	59.12	59.12	59.12	59.12	59.12	59.12	59.12	
80	61.47	61.47	61.47	61.47	61.47	61.47	61.47	61.47

Cleaned Data (Depicted here is the sheet for GSM vs Quantity):

GSM	1-Apr-22 to 30-Apr	1-May-22 to 31-	1-Jun-22 to 30-	1-Jul-22 to 31-	1-Aug-22 to 31-	1-Sep-22 to 30-	1-Oct-22 to 31-	1-Nov-22 to 30-	1-Dec-22 to 31-
65	4130.000 Kgs	4130.000 Kgs	4130.000 Kgs	4185.000 Kgs					
65	1275.000 Kgs	1275.000 Kgs	1275.000 Kgs	1275.000 Kgs	1275.000 Kgs	1275.000 Kgs	1275.000 Kgs	1275.000 Kgs	1275.000 Kgs
70	14829.000 Kgs	14829.000 Kgs	14829.000 Kgs	14829.000 Kgs	14829.000 Kgs	14829.000 Kgs	14829.000 Kgs	14829.000 Kgs	14829.000 Kgs
70	3007.000 Kgs	3007.000 Kgs	3007.000 Kgs	3007.000 Kgs	3007.000 Kgs	3007.000 Kgs	3007.000 Kgs	3007.000 Kgs	3007.000 Kgs
70	606.00 Rm	606.00 Rm	606.00 Rm	606.00 Rm	361.00 Rm	329.00 Rm	329.00 Rm	329.00 Rm	329.00 Rm
80	20.00 Rm	20.00 Rm	20.00 Rm	20.00 Rm	20.00 Rm	20.00 Rm	20.00 Rm	20.00 Rm	20.00 Rm
80	975.00 Rm					700.00 Rm	700.00 Rm	700.00 Rm	1443.00 Rm
80	1.00 Rm	1.00 Rm	1.00 Rm	1.00 Rm	1.00 Rm	1.00 Rm	1.00 Rm	1.00 Rm	1.00 Rm
80	46.30 Rm	46.30 Rm	46.30 Rm	46.30 Rm	46.30 Rm	46.30 Rm	46.30 Rm	46.30 Rm	46.30 Rm
80	253.00 Rm	201.00 Rm	201.00 Rm	201.00 Rm	201.00 Rm	201.00 Rm	201.00 Rm	201.00 Rm	201.00 Rm

5.2. SALES DATA

Data Cleaning

A. Formatting : A new column of Month was created manually for monthly analysis.

B. Scaling of Values: Since huge numbers were being dealt with, **entries were scaled by 1**

Lakh for Gross Total.

Cleaned Data

Date	Month	Particulars	Quantity	Gross Total
01-Apr-22	April	Paper Hub	24.00 Pkt	91025.00 Dr
01-Apr-22	April	Concept Advertising Agency	13.50 Rm	75380.00 Dr
01-Apr-22	April	Indra Impex Corporation (Delhi)	17.00 Rm	63464.00 Dr
01-Apr-22	April	Thomson Press (India) Ltd. (100% EOU)	14100.000 Kgs	1899408.00 Dr
04-Apr-22	April	Lustra Print Process Pvt. Ltd.	5021.354 Kgs	636263.00 Dr
04-Apr-22	April	SRV Services	12.00 Rm	35675.00 Dr
04-Apr-22	April	Niyogi Offset Pvt. Ltd.	18.00 Rm	101242.00 Dr
04-Apr-22	April	Archana Advertising Pvt. Ltd.	1156.575 Kgs	144170.00 Dr
05-Apr-22	April	Deeptee Paper Mart	55.00 Rm	160591.00 Dr
05-Apr-22	April	Thomson Press (India) Ltd. (100% EOU)	9100.000 Kgs	1227408.00 Dr

5.3. PREPARATION OF GRAPHS

Line chart for GSM Vs Procurement Value: A line chart was plotted to visualise the distribution of the procurement value (Quantity x Rate) for each GSM paper over various months from April 2022 to March 2023.

This line chart was plotted after obtaining a pivot table with GSM defining column names and each row defining the month.

Stacked Bar chart for GSM Vs Procurement Value: This was chosen to understand the overall yearly trend of procurement of papers.

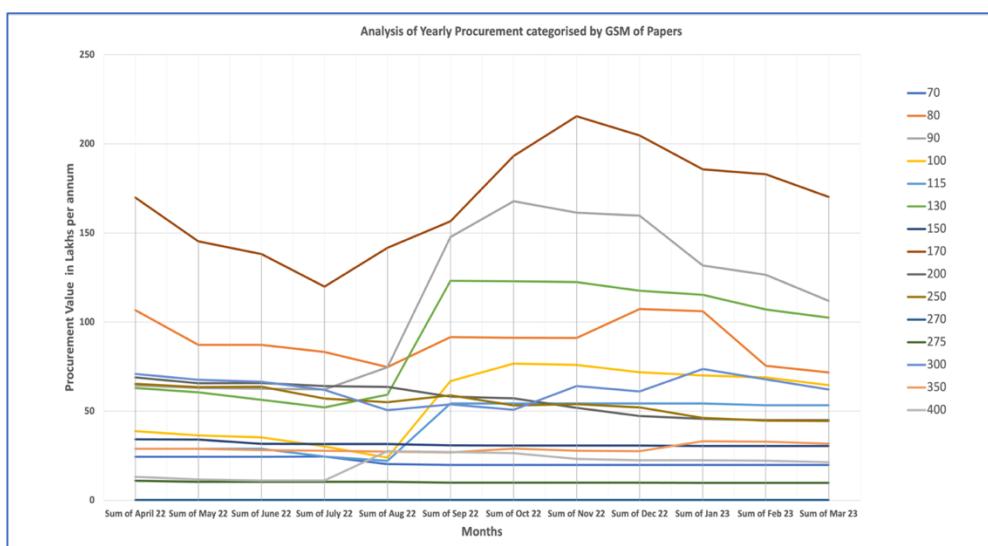
Monthly Sales Data:

This was prepared after preparing a pivot table with months as rows and values with sum of Gross Total monthly. This was chosen to understand the yearly Sales Trend and compare the procurement and sales trends of the papers.

5. Data Analysis (Results and Findings)

4. Procurement distribution of different categories of Paper over the year

Graph 1 : Analysis of Yearly Procurement categorised by GSM of Papers



Inferences from the plot: The plot gives the trend of procurement of various grades of paper.

- Highest Value is of 170 Grade paper.

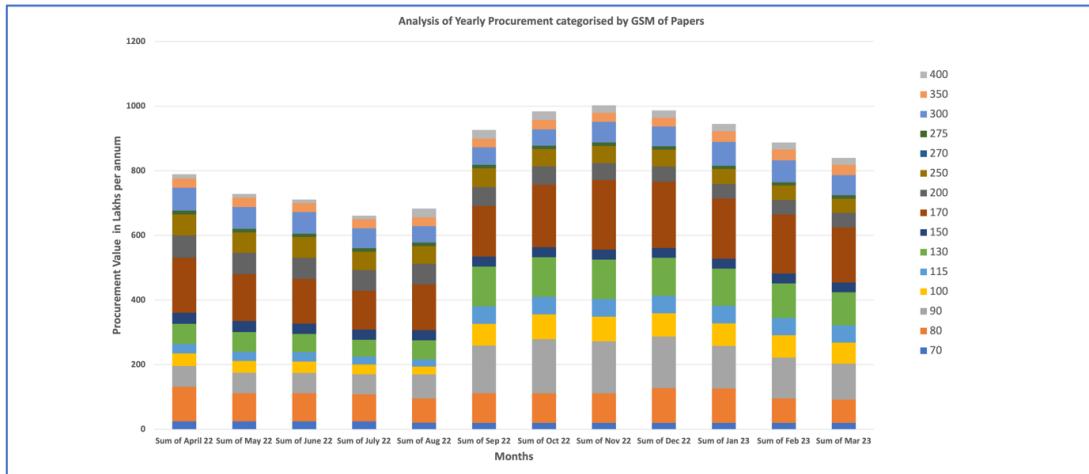
Observation: Many plots have sharp drops. This can have multiple explanations.

- Due to seasonal changes, it was an informed decision by the firm to cut down the procurement of certain paper.
- Due to excess inventory in the previous month

This can be explained only by using Sales Data, which will be done in the Final Report.

2. Analysis of Yearly Stock categorised by GSM of papers

Graph 2: Distribution of Various GSM papers in monthly stock



It can be observed that volume of stock has an increasing trend during the months of August to December indicating higher sales during this time compared to the other half of the year.

3. Monthly Sales data

Graph 3: Monthly Sales



The monthly sales Data peaks during the months of January to May, showing a mildly opposite trend that the Stock Data. This will be further analysed to identify the optimum Stock Requirements.

4. Customer Segmentation

Based on the percentiles Obtained, Three Customer Segments were formed: High, Medium and Low value customers based on their recent purchase. This will be dealt with further in the Final Report.

Row Labels			
Indra Impex Corporation (Delhi)	Paramount Printographics		Polykam Offset
Niyogi Offset Pvt. Ltd.	Kohinoor Ribbon Factory Pvt. Ltd.		Vardhaman Packaging Industries
Venus Album Co. Pvt. Ltd	Sun N Sun International		Prime Papyrus Products Pvt. Ltd.
Archana Advertising Pvt. Ltd.	Sterling Publishers Private Limited		Vinayak Colour Offset
Imaginative Colours Pvt. Ltd.	Right Choice Exports		Sumeet Papers
S Narayan & Sons	Indi Colour Prints		Design N Art
Thomson Press (India) Ltd. (100% EOU)	Color Mill		Seigospace Dotcom Pvt Ltd.
VK Global Digital Pvt. Ltd. (Manesar)	Grafiko Advt. Pvt. Ltd.		Rajkamal Circuits (India)
Living Media India Ltd. (FC)	Orange Print & Media Solutions		Manohar Filaments Pvt. Ltd.
Premier Fine Printers Publishers Pvt Ltd	Pragati Accessories Pvt. Ltd.		Educational Aids (India)
Sun N Sun Creations	Print Works (Prop: Mr. Santosh Kumar Patel)		Thomson Press (India) Ltd. (Noida)
Business Media Pvt. Ltd.	Shree Enterprises		Unity Packers & Corrugators
Samrat Offset Pvt. Ltd.	Sagarika Enterprises		Kapoor Enterprises
Omega Traders (India)	Graphica Digital		Sportsmen Souvenir Publ.
Sangat Printers Pvt. Ltd. (Manesar)	Gondals Press India Ltd.		Mahatma Hansraj Modern School
SML Labels (India) Pvt. Ltd.	Kakkar Enterprises (Prop: Mr. Vikram Kumar)		Creative Graphix
Thomson Press India Ltd. (Faridabad)	Galaxy Offset India Pvt. Ltd. (Manesar)		Prime Papyrus Products P. Ltd
Sumat Pershad and Sons	Aegean Offset Printers		IM Global Media & Communication
Nine Packaging Pvt. Ltd.	Global Enterprises		SRV Services
Tulip 3P Media Pvt. Ltd.	Vignette		Dixit Colour Master
Gee Aar Graphics	Vandana Enterprises		Future Vision Tags, Labels and Packaging
JVS Print Media Pvt. Ltd.	Jain Co Art India		AQTV Communications (Prop: Mr. Yogesh Banga)
Sanat Printers	Indira Gandhi School of Education		Batra Paper Mart (Creditors)

6. Further Scope of Study

- After gaining a sufficient understanding of both the Sales and the Stock data, the project will further probe into the data to identify optimum price levels, valuable customers, and strategic recommendations to enhance the paper trading business's inventory management practices.
- Present actionable recommendations for enhancing operational efficiency, optimizing pricing strategies, and improving inventory management.
- Plot the Monthly distribution of Sales using a stacked Bar chart depicting the High, Medium and Low value customer based on their recent purchase.