Optimizing the stocks of stationery firm

BUSINESS DATA MANAGEMENT - CAPSTONE PROJECT

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* Link to the Project Data : BDM Project Data

Executive Summary

Sarvjot Communications is a stationery shop which offers all kinds of stationery items required for school or college students. The business problems that could be identified from the discussion with the owner are as follows:

- the problem of reaching a large customer base.
- overstocking or stock outs at different times
- generation of less revenue

The approach followed to do this capstone project is as follows:

Step 1: Define your goals

Step 2: Decide how to measure goals

Step 3: Collect your data

Step 4: Analyze your data

Step 5: Visualize and interpret results

In the project proposal first two steps were completed and the goal chosen was to optimize the stocks of the selected stationary firm. Then the data was collected and pre-processed by entering the data into excel workbook manually. With the mid-term submission the analysis of the data was done using Microsoft Excel and its variety of tools such as Pivot Table, Charts and various formulas such as SUM, MAX, MIN, etc.

In this final report, the final step, i.e.Visualization of the Data and Interpretation of the results is done. The charts used to visualize the data are Column Charts, Line Chart, Pie Chart and Combo Chart.

Inferring from the charts and tables, it could be clearly seen that students' timeline dominates the sales of the shop i.e, examination season sees the least revenue and highest sales. Other inferences were made such as the top-4 products with regards to sales and revenue both.

However, it is important to continuously monitor the sales data and adjust strategies accordingly to maximize revenue generation.

Detailed Explanation of Analysis Process/Method

❖ Introduction

- The analysis of the data that has been collected is done through time-series analysis technique because the data has been collected over the span of 12 weeks from the first week of December to the last week of February.

- There are four main types of analyzing data and the following written approach is adopted for analyzing the data collected:

  ➔ Descriptive analysis
  ➔ Diagnostic analysis
  ➔ Predictive analysis
  ➔ Prescriptive analysis

- Descriptive analysis identifies what has already happened. Basic descriptive analysis of the data had already been presented in the mid term submission and under the 'Results and Findings' heading.

- Diagnostic analytics focuses on understanding why something has happened. With the help of tables, formulas, visualizations and other tools of MS Excel diagnosis is done and is presented under the 'Interpretation of Results' heading.

- Predictive analysis is used to identify future trends based on historical data.

- Prescriptive analysis helps to make recommendations for the future. This has been presented under the 'Recommendations' heading of this report.

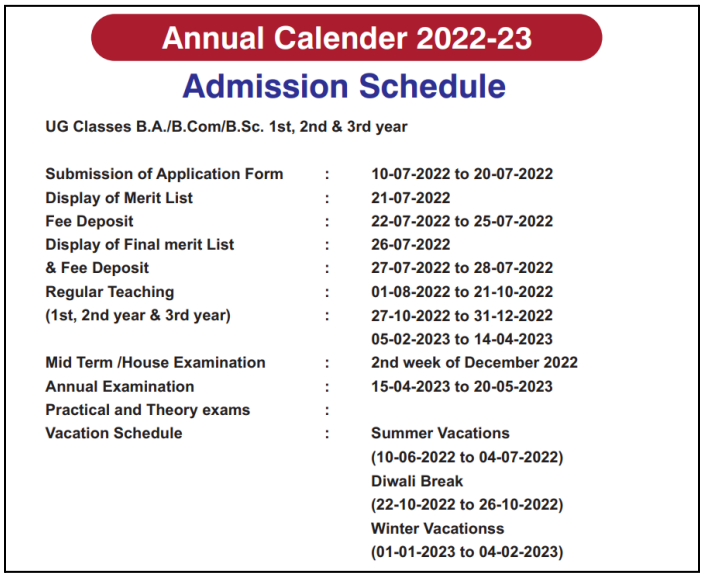
❖ Objective

- The main objective of this project is to identify the sales of the stocks based on a particular time period.

- Other than collecting the raw data an effort to understand the customer base was done.

- While discussing with the shop owner it was concluded that 80% of the customers of the shop are students and the rest of the 20% are office people and general working professionals. Focus was to get to know the timelines that affect the larger customer base, i.e, Students.

- This is the annual calendar of the only college in our town. It was taken from the website of the college (gcp.ac.in) to get an idea of the timely needs of students according to their institute calendar.



Annual Calender 2022-23

Admission Schedule

UG Classes B.A./B.Com/B.Sc. 1st, 2nd & 3rd year

Submission of Application Form	:	10-07-2022 to 20-07-2022
Display of Merit List	:	21-07-2022
Fee Deposit	:	22-07-2022 to 25-07-2022
Display of Final merit List	:	26-07-2022
& Fee Deposit	:	27-07-2022 to 28-07-2022
Regular Teaching	:	01-08-2022 to 21-10-2022
(1st, 2nd year & 3rd year)	:	27-10-2022 to 31-12-2022
		05-02-2023 to 14-04-2023
Mid Term /House Examination	:	2nd week of December 2022
Annual Examination	:	15-04-2023 to 20-05-2023
Practical and Theory exams	:	
Vacation Schedule	:	Summer Vacations
		(10-06-2022 to 04-07-2022)
		Diwali Break
		(22-10-2022 to 26-10-2022)
		Winter Vacationss
		(01-01-2023 to 04-02-2023)

Figure 1

- This is the annual calendar of one of the schools in our town. This helped to get information about the general timings of the regular school days, exams and holiday months of all of the schools in the town because the timeline followed is almost the same for every school here.

2. ANNUAL ACADEMIC CALENDAR:

UNIT TEST I	JUNE
TERM I	SEPTEMBER
UNIT TEST II	DECEMBER
ANNUAL EXAM (TERM II)	MARCH

Figure 2

UT I	1st Week of June
T I	September 15 to 30
UT II	Last week of November
T II	March 1 to 20

Figure 3

- These calendars were used to make a general timeline for the stationery firm to keep stocks accordingly.

❖ Pre-Processing of the Data

- Getting the data wasn't an easy task because there was not any sales data written on paper or any digital source. The discussion with the owner was the only means to write the data manually into excel. The data was entered into the spreadsheet by getting the sales figure from the shop owner orally.

- The data had only the Name of the Product, their rate and the quantity sold weekly.

- The 'Paste Transpose' function of excel was very handy as it helped to get the Week-Wise Sales data by transposing the rows and columns of the primary data. This helped to calculate the sales per-week much more easily.

Weekly Sales	
Week	TOTAL WEEKLY SALES
1	105
2	122
3	116
4	107
5	64
6	136
7	160
8	160
9	161
10	183
11	179
12	152

Table 1

- The revenue data was on papers and had to be entered into excel for further data processing. There was a relation between the 'Total Sale Amount' and the rest of the three variables, i.e., 'Rent', 'Account' and 'Cash Balance'. The formula in the 'figure-4' was used to calculate the 'Cash Balance' from the rest of the three variables. Cash balance basically was the amount of money that was paid through cash by customers.

Date	Day	Total Sale Amount	Rent	Account	Cash Balance
05-12-2022	Monday	₹ 1,520.00	₹ 300.00	₹ 60.00	=C2-D2-E2

Figure 4

- The analysis was to be done on a weekly basis. Revenue Data was given on the daily basis which was further cleaned and processed and converted into weekly revenue data by using formulas and pivot tables.

- Using the formula shown in 'figure-5', the week of the particular date was identified.

Date	Day	Total Sale Amount	Rent	Account	Cash Balance	Week
05-12-2022	Monday	₹1,520.00	₹300.00	₹60.00	₹1,160.00	=YEAR(A2)&"-"&TEXT(WEEKNUM(A2,2),"00")
06-12-2022	Tuesday	₹3,450.00	₹300.00	₹1,790.00	₹1,360.00	2022-50

Figure 5

- Pivot table was further used to transform the daily data into the weekly data. Since using the above formula, the last week of December and first week of January were treated separately, they had to be merged together and then a final table was formed. The table is shown below.

Week	Total Sale Amount	Rent	Account	Cash Balance
1	10375	2100	3005	5270
2	10006	2100	2816	5090
3	12191	2100	6491	3600
4	6365	1500	1795	3070
5	8498	2100	2978	3420
6	7417	1800	1997	3620
7	8532	2100	3232	3200
8	8316	2100	2766	3450
9	6977	1800	1677	3500
10	5976	1500	966	3510
11	8336	2100	2126	4110
12	14044	2100	2454	9490

Table 2

❖ Descriptive Analysis

- With the help of Excel, different formulas could be used to get the Summary Statistics of the data which was extremely helpful in the analysis process.

- Further to understand the data precisely and easily, pictorial representations were used.

- To know the share of each item in the sales, a pie chart was used. It was filtered to Top 5 products with respect to their sales.

- Another pie chart was generated to check the best 4 products wrt their share in the revenue.
- Line charts helped a lot to see the trend across the days of the week.
- Column charts were extremely useful in showing data changes over the period of time and for illustrating comparisons among items.
- The descriptive statistics were calculated using Excel formulas like MAX, MIN and SUM. These formulas were applied to each item and generated descriptive statistics for the entire dataset.

❖ Diagnostic Analysis

- Since the main goal was to check the stockouts and overstocking problem of the firm, the trends across the weeks were very helpful along with the school and college annual calendars.
- The weekly total sale chart came in handy to check which time of the month saw the most and least sales and the annual calendars helped to identify why such problems occurred.

Results and Findings

The insights drawn from the analysis of the data are the following:

➢ To find out the top 4 products who had the most sales in the span of 12 weeks, SORT and FILTER function was used to create the 'Table-3'.

Best 4 Products and Others (wrt Sale)	
Name of the Item	TOTAL SALE
Pen Type-1	400
Pen Type-2	176
Fevicol	124
Eraser	118
Others	827

Table-3

- Visualizing data gives more insights. Thus the following chart was generated out of the above table.

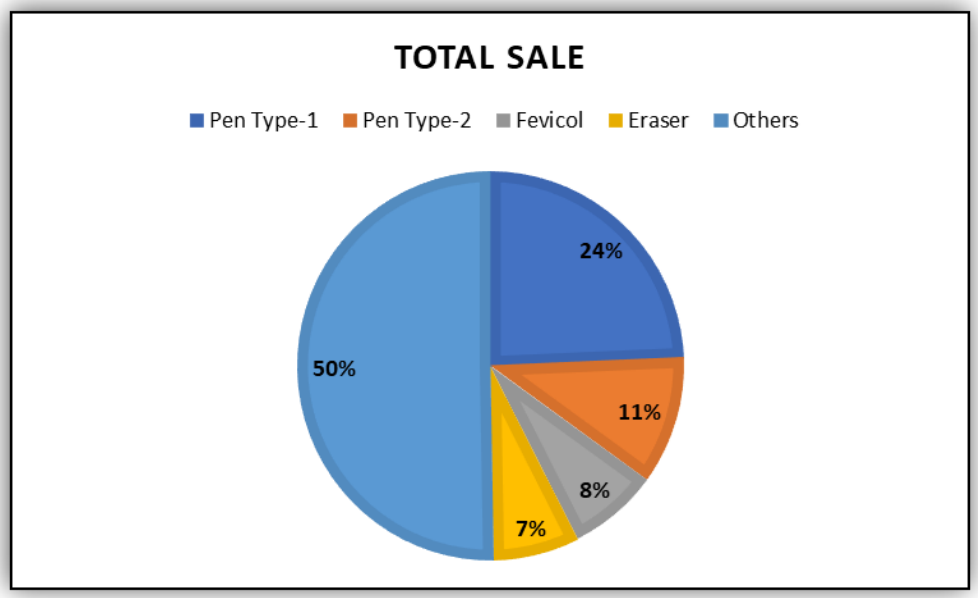


CHART-1 – PIE CHART (Product Sales Share)

- Pie charts are used to represent the proportional data or relative data in a single chart.
- Chart-1 basically shows the 'Share' of Quantity of a product sold across all the twelve weeks.

- From the above chart it can be clearly seen that 'PEN TYPE 1' is the most sold product. This chart helped us to identify the most favorable item.

➢ On the basis of revenue, the best 4 products were filtered out. The same can be seen in 'Table-4'

Best 4 Products and Others (wrt Revenue)	
Items	**Revenue Generated**
Pen Type-2	11440
Pen Type-1	10000
A4-Sheet Bundles	8100
Pencil Pack	7560
Others	27495

Table-4

- To find out which product contributed to the most share of the total revenue the following chart was generated out of the 'Table-3'.

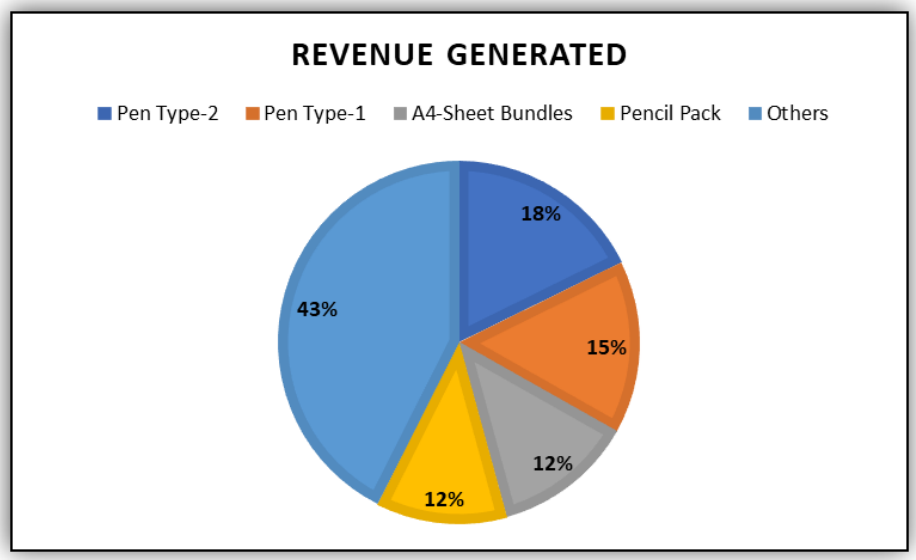


CHART-2 – PIE CHART (Share of Revenue)

- Chart-2 represents the 'Share' of Revenue generated by the best four products and the rest of the products across all the twelve weeks.

- From the above chart it can be clearly seen that 'PEN TYPE 2' contributed the most to the revenue generated in 3 months . This chart helped us to identify the most profitable product.

- From ‘Chart-1’ and ‘Chart-2’ it can be concluded that ‘PEN TYPE-1’ and ‘PEN TYPE-2’ dominate the overall sales and revenue generation of the shop.

➢ The quantity of the products sold weekly is necessary to get a better view of at what times sales are highest and lowest and to check the trend across the 3 months. For that the following chart ‘CHART-3’ was generated.

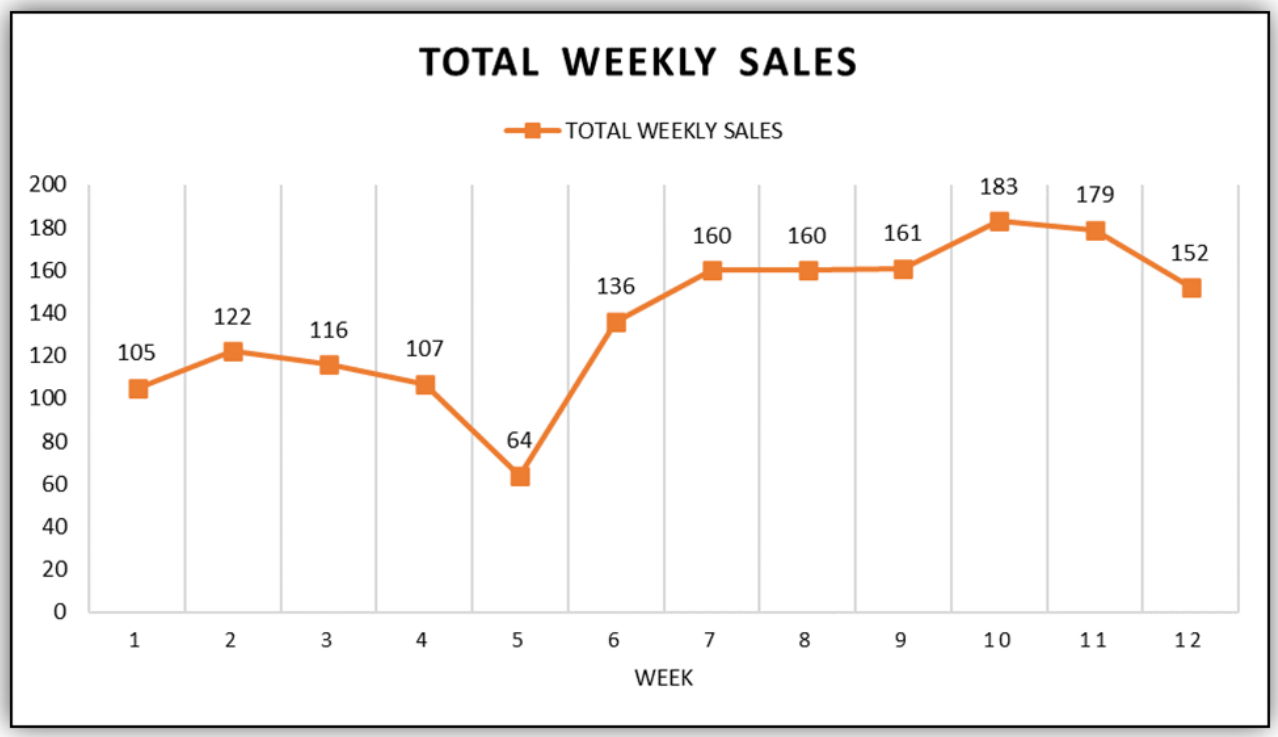


CHART-3 – LINE CHART (Weekly Sales of all products altogether)

- Line graphs are used to track changes over short and long periods of time.
- The above line chart is made to see the trend in the ‘Quantity of Products’ sold weekly.
- We can clearly see that Week-10 sold the maximum quantity of products i.e., 183 items sold in a single week.
- Week-10,11 and 12 which is the time period of February month is the revision period of schools which was analyzed from the annual calendars of schools. This period had the most number of sales. It can be concluded that students MOSTLY visit stationery shops around the period before Examinations, i.e, month of March.

- Week-5 being a holiday period in both colleges and schools faced least sales i.e, only 64 items were sold.

➢ Weekly Revenue Generation can also help us in a better way to check the profitability across the weeks. The following chart - 'CHART-4' was prepared for the same.

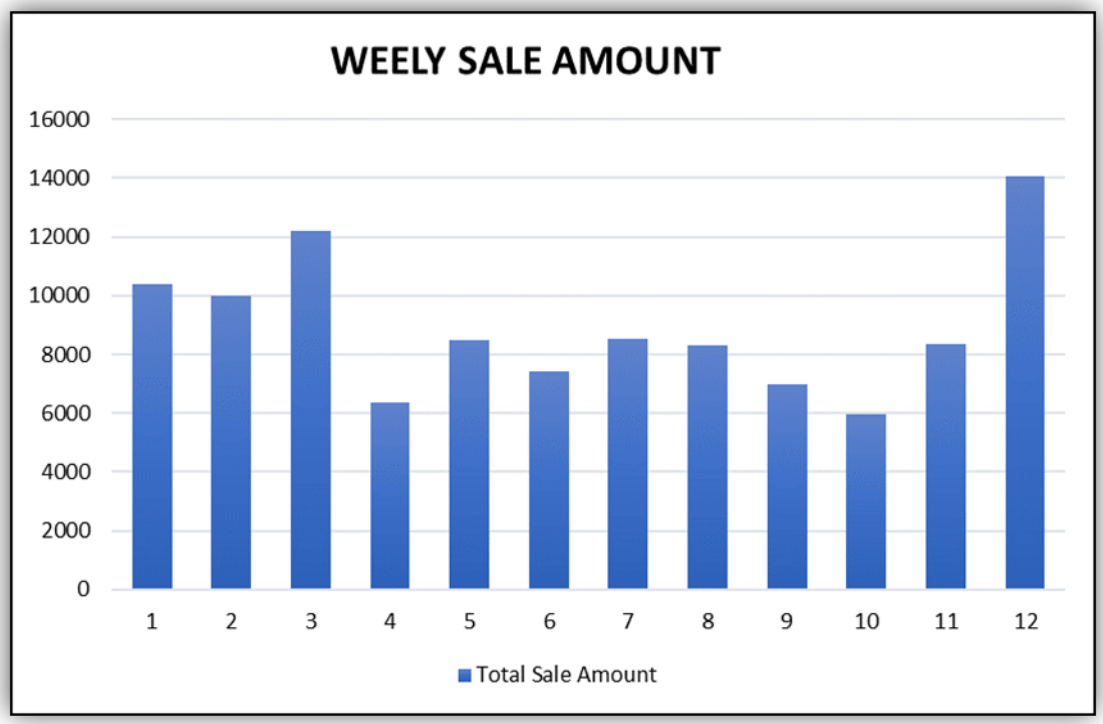


CHART-4 – COLUMN CHART (Weekly Revenue of all products altogether)

- Chart-4 is the column representation of the Weekly Revenue generated from the sales of products.

- Column charts work well in showing data changes over a period of time by displaying the comparisons among subjects on an overall chart. They are often used to show data comparisons in a visual way.

- Here it can be seen that Week-10 generated the least amount of revenue. But from Chart-3 we found that it was the week where the highest products were sold. From this it can be concluded that cheap items were mostly sold in Week-10.

- Week-12 generated the most amount of revenue.

- Although Week-5 saw the least sales as represented by ‘CHART-3’ but from ‘CHART-4’ we can conclude that with regards to revenue generation Week-5 did a lot better than a lot of weeks. This means that high price items were sold during the 5th week, i.e, the first week of January.

➢ Weekdays also matter a lot in analyzing the trend of sales. Using the pivot table, DAY-WISE data was extracted. Table-4 shows the revenue generated in 3 months according to ‘DAYS’.

Day-Wise Sale	
Days	**Sum of Total Sale Amount**
Monday	17787
Tuesday	19603
Wednesday	17849
Thursday	14554
Friday	10401
Saturday	15304
Sunday	11535

Table-4

- To get a better understanding of the trend across the days of the week, a line chart was made.

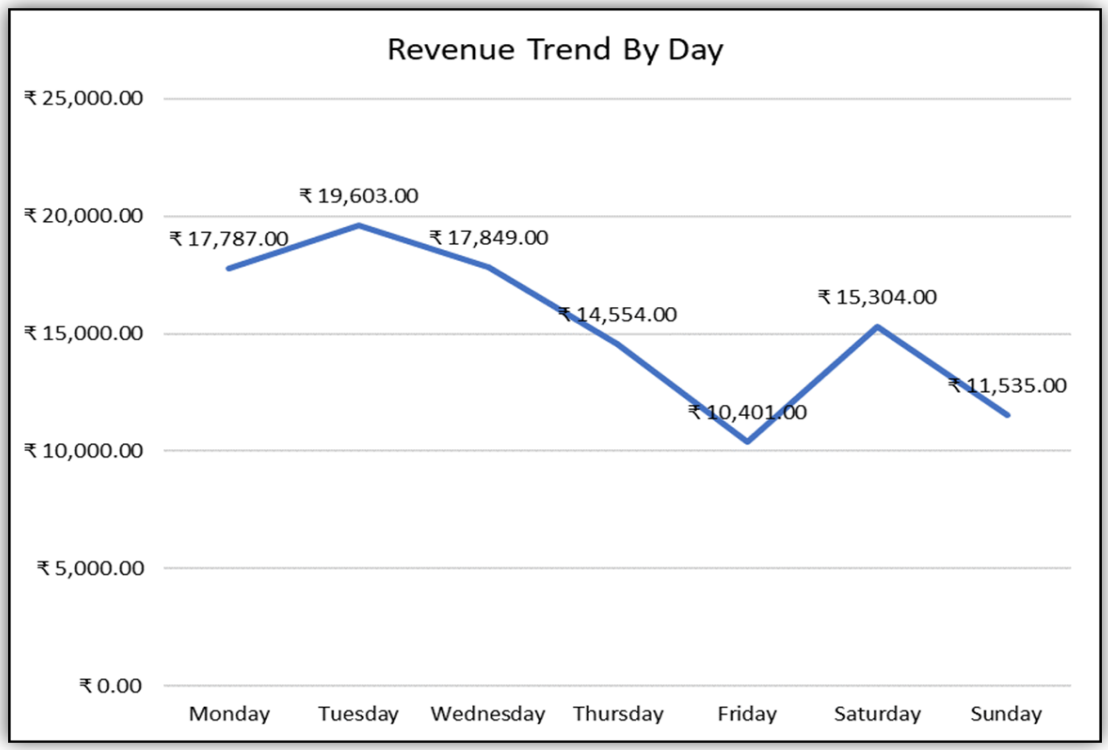


CHART-5 – LINE CHART (Revenue Trend by Day)

- From the ‘CHART-5’ the highest and the lowest revenue generating day can be identified.
- Tuesday has been the day highly contributing towards the revenue of the shop.
- Fridays saw the least amount of revenue.
- The above chart clearly represents that the beginning of the week is highly profitable whereas weekends face a dip in the revenue generation process.

➢ A Pareto chart is a graph that combines a bar graph and a line graph, and it is used to identify the most significant factors that contribute to a particular problem or situation. The chart is based on the Pareto principle, which states that roughly 80% of effects come from 20% of causes.

- In the effort of trying to identify those 20% of the products which contribute to 80% revenue of the shop, the following Revenue Pareto Chart (CHART-6) was made.

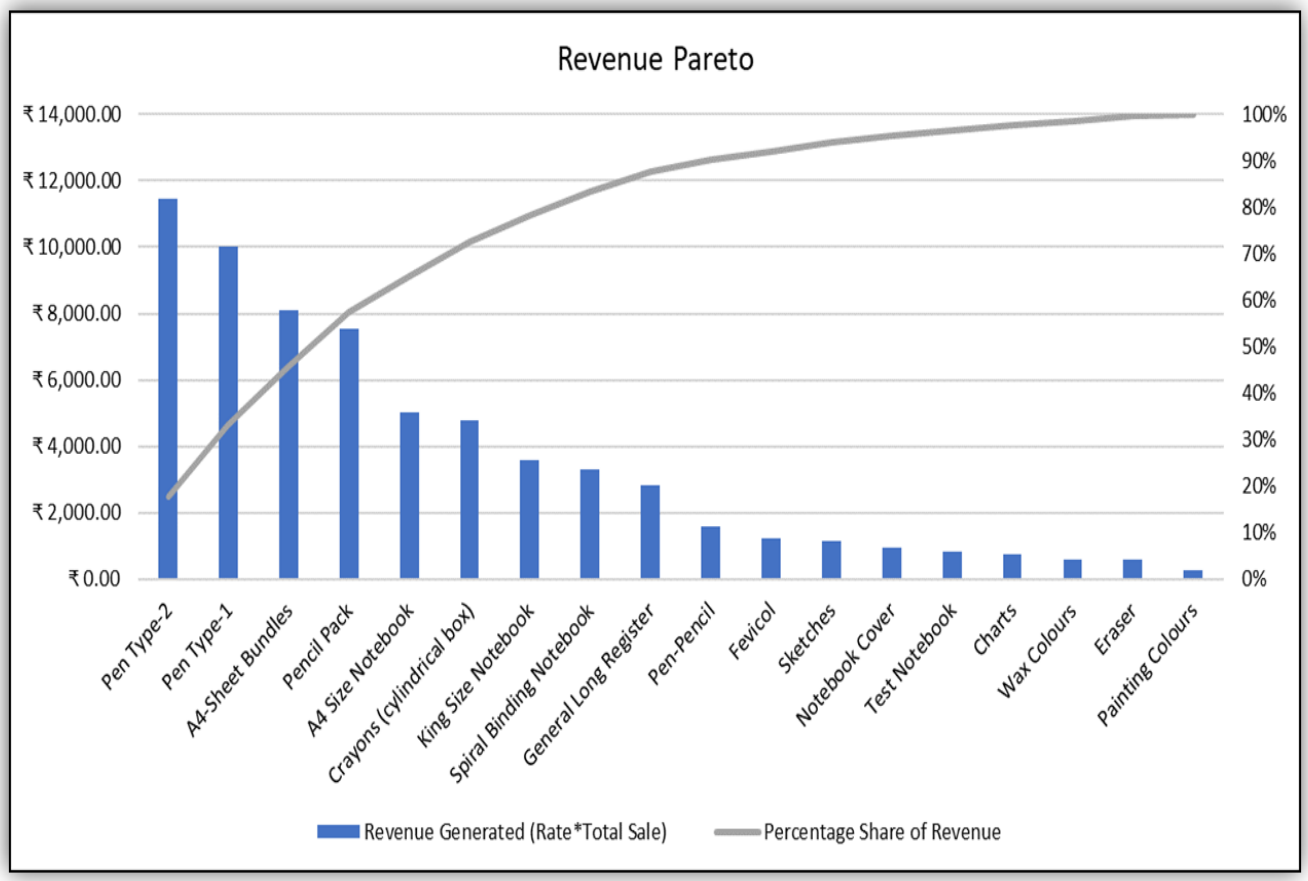


CHART-6 – PARETO CHART (Revenue Pareto)

- The insights which can be drawn from the chart are that the data collection which was done for 3 months i.e, December, January and February is not following the Pareto Principle.
- It is observed that 20% of the items generated 60% of the revenue for the shop.
- Somehow this observation could also be put to use for better stock-ins of the firm.
- Whereas it can be noticed that 80% of the revenue generation comes from 45% of the products sales.

➢ To understand whether Pareto Principle applies on the SALES of the products another Pareto Chart was prepared.

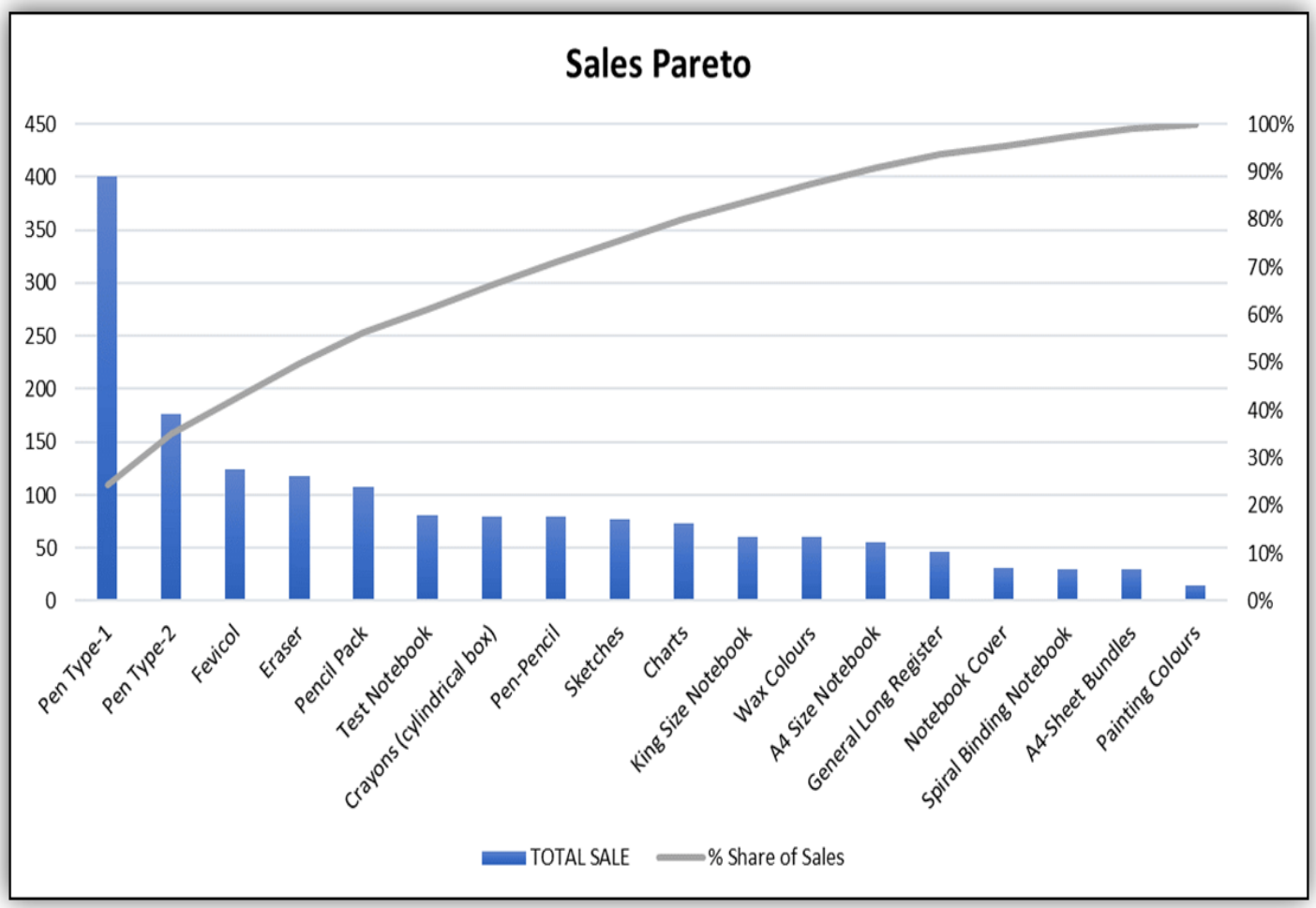


CHART-7 – COMBO CHART (Sales Pareto)

- Clearly it could be seen that we cannot follow the pareto principle on the ‘SALES DATA’.

- From this chart also it could be observed that 20% of the items contribute to the 60% sales of the shop.

➢ A clustered chart is a type of graph that displays data in groups or clusters, where each cluster contains multiple data points.

- To check the Maximum and the Minimum sale of products across the span of twelve weeks help of clustered chart was taken. CHART-8 shows the minimum sale and the maximum sale of each product that happened across a 12-week period.

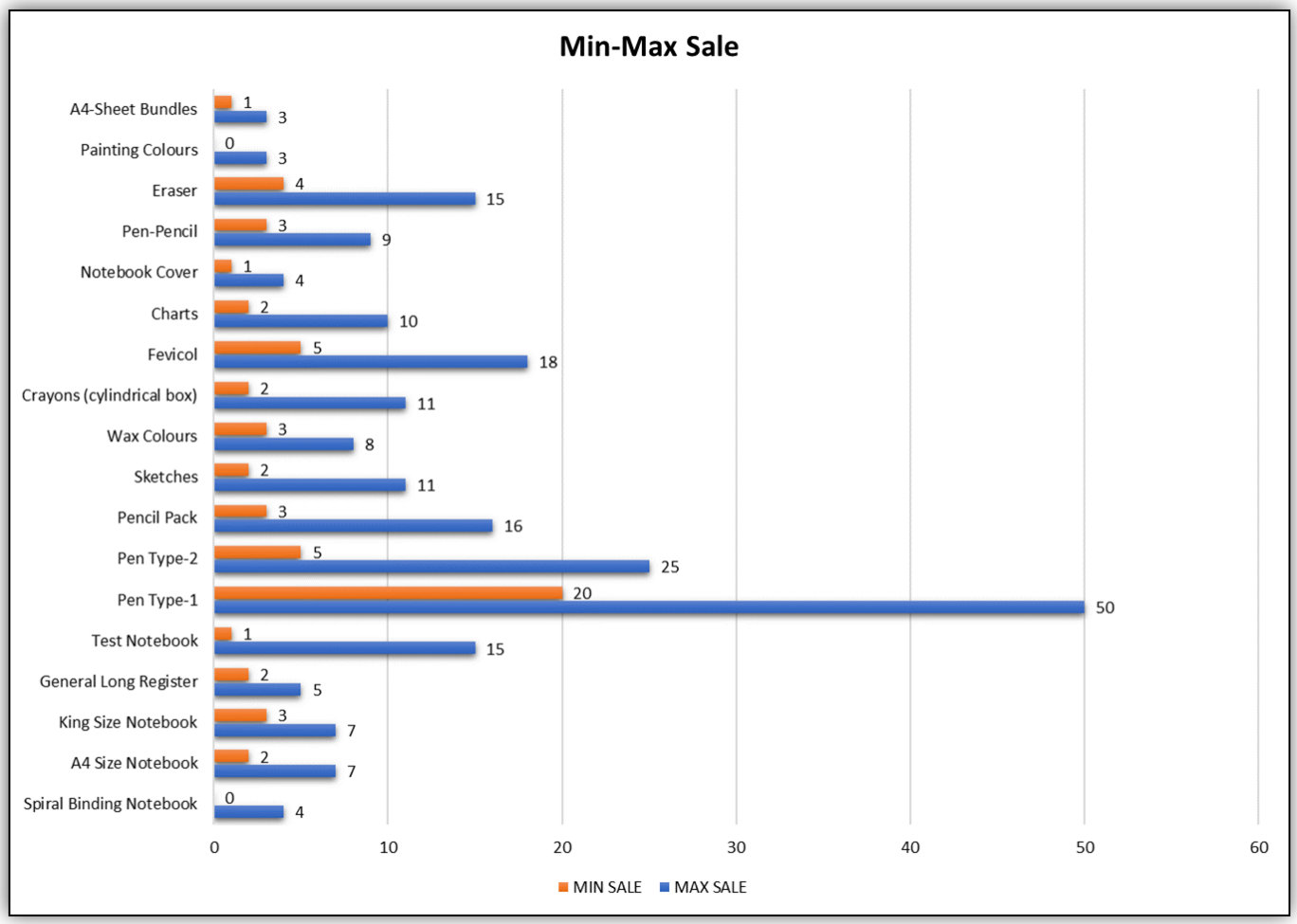


CHART-8 – CLUSTERED CHART (Min-Max Sale)

- The above chart shows that the maximum sale among all the products have been of ‘Pen-Type1’ in a single week.

- Even the minimum sale of ‘Pen-Type1’ has been more than 95% of the products in the shop.

- There are products which even saw no sales in a whole week such as ‘Spiral-Binding Notebook’ and ‘Painting Colors’.

- It can be observed that Pens are the most bought item from the selected firm.

➢ To understand more precisely if monthly revenue generation gives any insights about the stocks or not, ‘Table-5’ was generated through the Pivot Table tool of excel.

Months	Revenue Generated	%age Change
Dec	38572	
Jan	34853	-10%
Feb	33608	-4%

Table-5

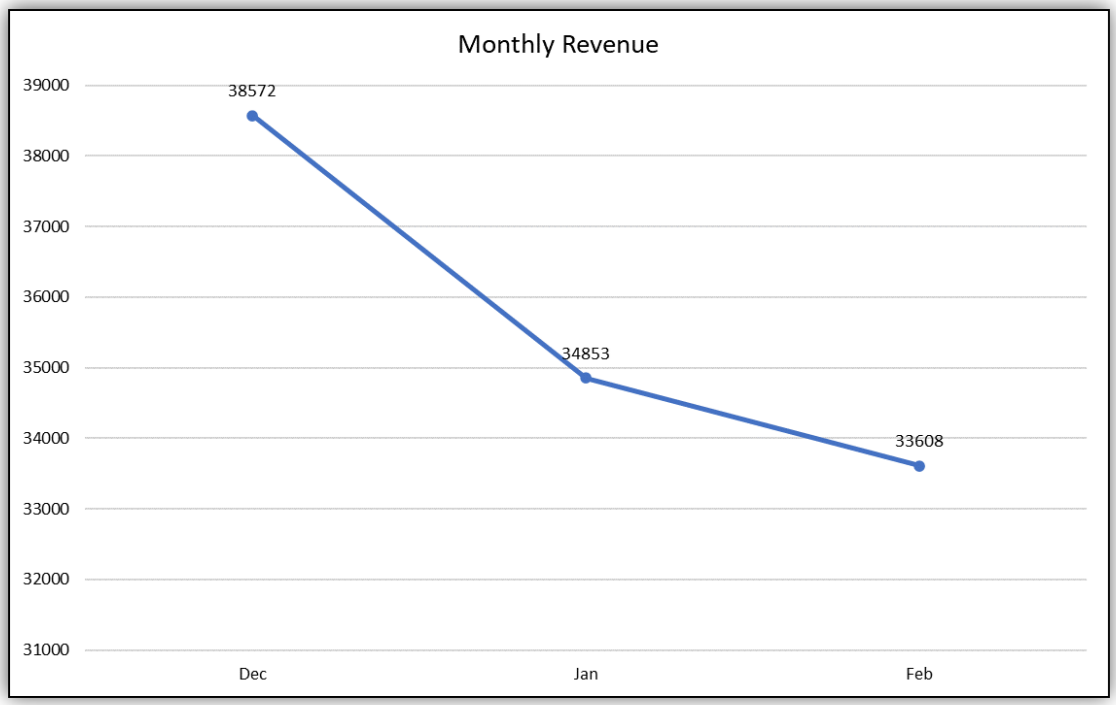


CHART-9 – LINE CHART (Monthly Revenue)

- There has been a decrease in the amount of revenue generated across the three months span.

- From the table it can be seen that from December to January there is 10% decrease in the revenue generation of the shop and 4% decrease from January to February.

Interpretation of Results

After reviewing the analysis and findings, the report can now be wrapped up with proposed solutions and recommendations aimed at propelling the business towards progress and benefit.

Through the use of diverse graphs and data analysis across various fields, a comprehensive understanding of the data could be gained and valuable conclusions and insights could be derived on optimizing the stocks of the selected stationery firm. Following are the interpretations :

1. 'PEN TYPE 1' is the most sold product.

2. 'PEN TYPE 2' contributed the most to the revenue generated in 3 months .

3. Week-10,11 and 12 which is the time period of February month is the revision period of schools which was analyzed from the annual calendars of schools. This period had the most number of sales. It can be concluded that students MOSTLY visit stationery shops around the period before Examinations, i.e, month of March.

4. But February has been the month which generated the least amount of revenue. The reason behind the same could be that cheaper items such as 'Test Notebooks' worth Rs. 10, 'Pens' worth Rs. 5 or Rs. 10, instead of complete 'Pencil-Boxes' only single 'Pencil' worth Rs. 5 or Rs.10 might have been sold during the month of February.

5. From my understanding and analysis of the data, it was observed that when the time of examinations is near, there has been a hike in the quantity of products sold but dip in the revenue generated.

6. Observing the annual school and college calendars, it can be concluded that Week-5 i.e, first week of January was a holiday period in both colleges and schools which became the reason for it facing the least sales out of all the 12 weeks.

7. The beginning of the week is highly profitable whereas weekends face a dip in the revenue generation process. While discussing with the shop owner it was found that the shop is generally closed on Sundays and sometimes opened after 2pm on Sunday. An insight I got from the owner was that as the weekend approaches he feels a decrease in the sales of the products and the same was deduced from CHART-5. It can be concluded that students might prefer buying their stationery needs while going to school.

8. It is observed that 20% of the items generated 60% of the revenue for the shop. Which means more than half of the revenue is generated by selling the top-4 products of the shop.

9. From Table-4 it was observed that from December to January there is 10% decrease in the revenue generation of the shop and 4% decrease from January to February. The reason behind this could be the examination season where students generally prefer buying only pens and test notebooks which cost very less.

Recommendations

After generalizing all the interpretations, the following recommendations have been made :

1. Increase the inventory of 'PEN TYPE 1' as it is the most sold product. This will help to meet the demand of the customers and generate more revenue.

2. Since 'PEN TYPE 2' contributed the most to the revenue generated in 3 months, it would be beneficial to promote this product more and make it easily accessible to the customers.

3. Plan marketing campaigns and offer discounts during the period of February and March to attract more customers and increase revenue. This can be done by bundling cheaper items such as 'Test Notebooks', 'Pens' and 'Pencils' with the purchase of other products.

4. Try to keep the shop open on weekends for longer hours to cater to the students who might not prefer buying their stationery needs while going to school rather on holidays.

5. Focus on the top-4 products of the shop as they generate more than half of the revenue. Make sure that the inventory of these products is always well-stocked to avoid running out of stock during peak sales periods.

6. To avoid the dip in the revenue which was observed from December to January, adjustments need to be made in the inventory or marketing strategies accordingly to prevent further losses during these periods. It is important to keep track of the inventory and adjust the stock levels of these items accordingly. Additionally, offering bundled discounts or promotions during this period could help to increase sales and revenue.

Overall, it is important to continuously monitor the sales data and adjust strategies accordingly to maximize revenue generation.