**PRODUCT SALES ANALYSIS PROJECT-PHASE 3**

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**SEMESTER:**5

**COURSE NAME :** DATA ANALYTICS WITH COGNOS – GROUP 1 (IBM:DAC101)

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**PROJECT TITLE:** PRODUCT SALES ANALYSIS

**Phase 3: Development Part -1**

In this part you will begin building your project by loading and preprocessing the dataset. Start building the product sales analysis using IBM Cognos for visualization. Define the analysis objectives and collect sales data from source shared. Process and clean the collected data to ensure its accuracy and reliability.

**Project Objective:**

The project involves using IBM Cognos to analyze sales data from a company that has been selling four products for over ten years. The objective is to help the company improve inventory management and marketing strategies by understanding sales trends and customer behavior. This project includes defining analysis objectives, collecting sales data preprocessing and cleaning the provided dataset for ensuring the data accuracy and reliability, designing relevant visualizations in IBM Cognos, and deriving actionable insights.



**Analysis Objectives:**

The specific analysis objectives for this project are to:

* To identify trends in sales of all four products during certain months
* To identify the top selling product out of all four products
* To suggest whether dropping the production of any one of the products would result in a massive setback for the company

**Data Collection and Preparation:**

**Data Source:**

The data set is collected from Kaggle which is a leading collaborative data analytics and data science platform.

**Dataset Link :**

[**https://www.kaggle.com/datasets/ksabishek/product-sales-data**](https://www.kaggle.com/datasets/ksabishek/product-sales-data)

All the data are stored in the statsfinal.csv (Comma Separated Values) format, which is used to store the data efficiently.Using pandas, we can use the .csv format for Data Processing and Manipulation

**Data Description:**

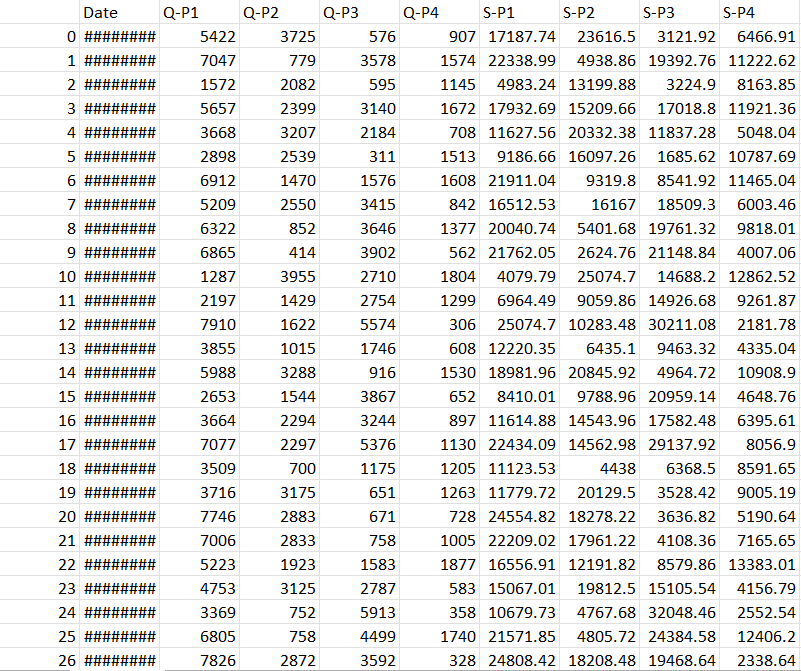
The dataset is comprised of various columns, each offering unique insights:

**Date**: This column marks the date of each data entry, allowing us to track the progression of sales and revenue over time.{ 13-06-2013 to 03-02-2023}

**P-Q1, P-Q2, P-Q3, P-Q4**: These columns denote the total unit sales for products P1, P2, P3, and P4, respectively. These figures provide an understanding of the sales volumes for each product.

**P- S1,P- S2, P-S3, P-S4**: These columns represent the total revenue generated from products P1, P2, P3, and P4, respectively. These monetary values offer a glimpse into the financial performance of each product.

**Columns Being Used:**

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Data preprocessing is a crucial step to ensure data quality and consistency.

**Importing Libraries:**

We begin by importing the necessary Python libraries, primarily `pandas` for data manipulation and `dateutil` for date parsing.

**import pandas as pd**

**from dateutil import parser**

**Libraries Used:**

-**pandas**: A fundamental data manipulation library that allows us to work with structured data efficiently.

- **dateutil**:A library for parsing dates in various formats, which is used to parse the 'Date' column.

**Loading the Data:**

The raw data is loaded from a CSV file named 'statsfinal.csv' into a pandas DataFrame.

**df = pd.read\_csv('statsfinal.csv')**

**Custom Date Parsing Function:**

A custom date parsing function is defined to handle the 'Date' column, which may contain dates in various formats. This function attempts to parse the date, and if unsuccessful, it returns `None`.

**def parse\_date(date\_str):**

**try:**

**return parser.parse(date\_str)**

**except:**

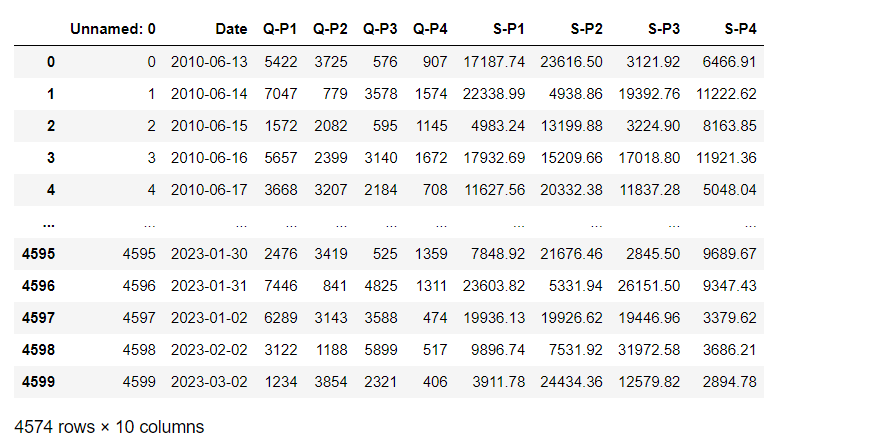
**return None**

**Applying the Custom Date Parsing Function:**

The custom date parsing function is applied to the 'Date' column, converting the dates into a consistent datetime format. Rows with invalid dates are also handled by dropping them from the DataFrame.

**df['Date'] = df['Date'].apply(parse\_date)**

**df = df.dropna(subset=['Date'])**

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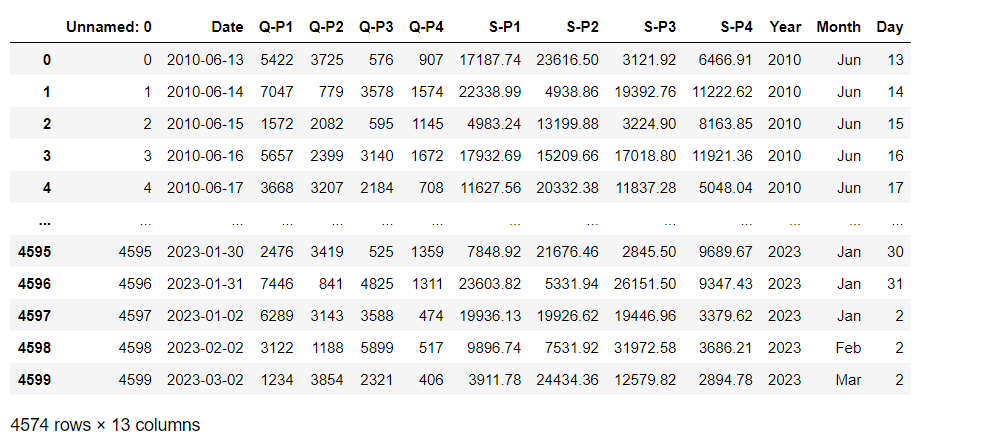
**Extracting Year, Month, and Day:**

Year, month, and day are extracted from the parsed dates to provide more detailed temporal information for analysis. The 'Year' and 'Day' columns are directly extracted, while the 'Month' column is generated with abbreviated month names (e.g., JAN, FEB).

**df['Year'] = df['Date'].dt.year**

**df['Month'] = df['Date'].dt.strftime('%b') # Abbreviated month names**

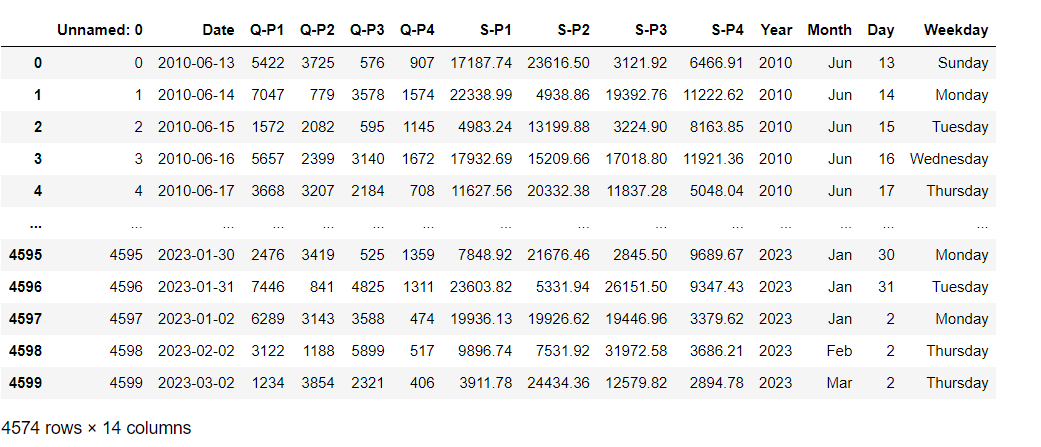
**df['Day'] = df['Date'].dt.day**

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**Deriving Weekday:**

The weekday information is derived from the 'Date' column, and it is added as a new column 'Weekday.' This provides information about the day of the week for each date**.**

**df['Weekday'] = df['Date'].dt.day\_name()**

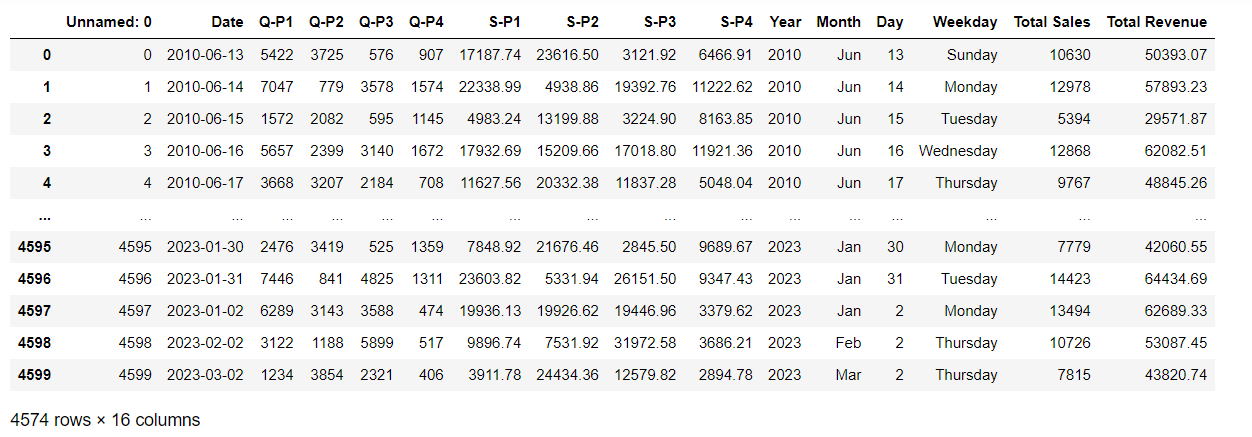
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**Calculating Total Sales and Total Revenue:**

Total sales and total revenue columns are calculated by summing the corresponding columns for each quarter. This provides a consolidated view of sales and revenue for each entry in the dataset**.**

**df['Total Sales'] = df['Q-P1'] + df['Q-P2'] + df['Q-P3'] + df['Q-P4']**

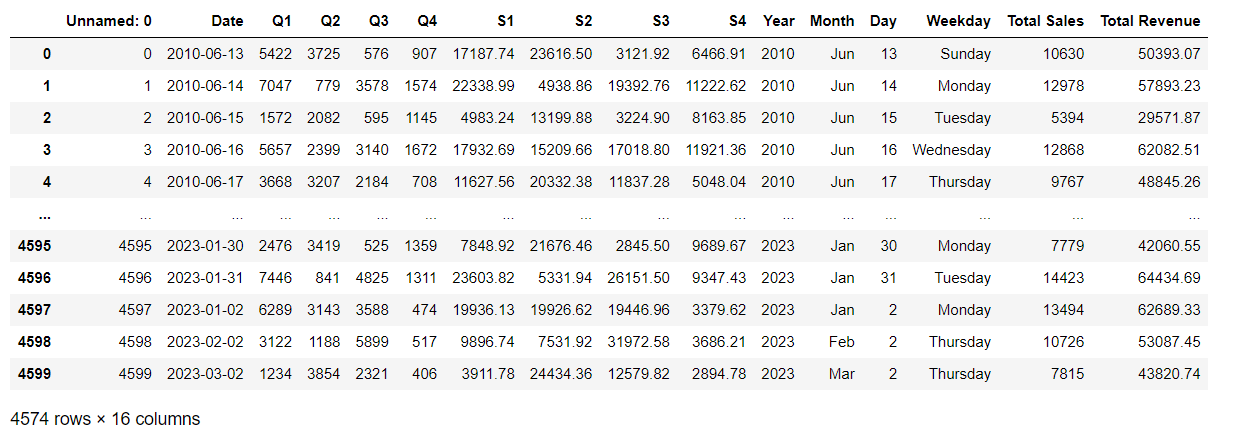
**df['Total Revenue'] = df['S-P1'] + df['S-P2'] + df['S-P3'] + df['S-P4']**

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**Renaming Columns:**

Column names are renamed to provide concise and consistent names. The 'Q-P1' to 'Q-P4' columns are renamed as 'Q1' to 'Q4,' and the 'S-P1' to 'S-P4' columns are renamed as 'S1' to 'S4.'

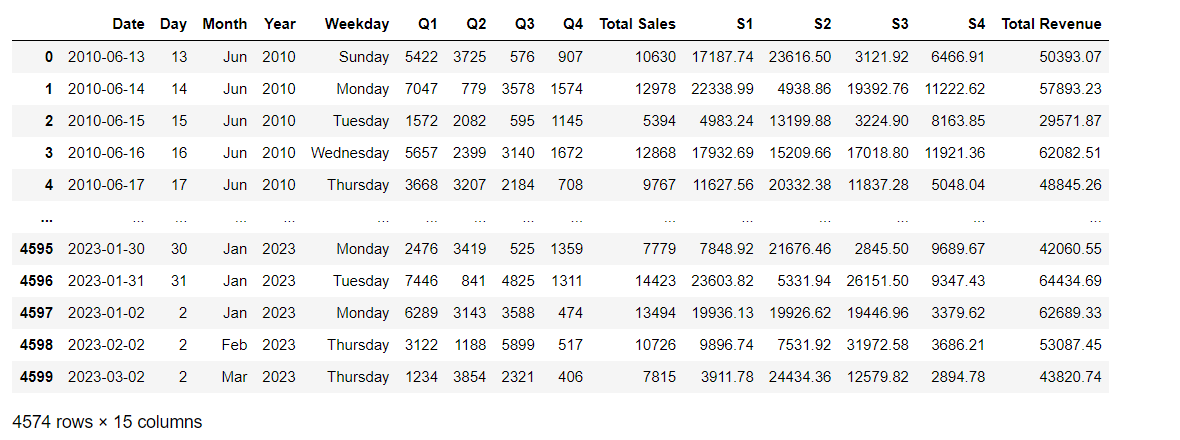
**df = df.rename(columns={ 'Q-P1': 'Q1', 'Q-P2': 'Q2', 'Q-P3': 'Q3', 'Q-P4': 'Q4','S-P1': 'S1','S-P2': 'S2','S-P3': 'S3','S-P4': 'S4'})**

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**Reordering the Columns:**

The columns in the DataFrame are reordered to follow a specific order: 'Date,' 'Day,' 'Month,' 'Year,' 'Weekday,' 'Q1' to 'Q4,' 'Total Sales,' 'S1' to 'S4,' and 'Total Revenue.'

**df = df[['Date', 'Day', 'Month', 'Year', 'Weekday', 'Q1', 'Q2', 'Q3', 'Q4', 'Total Sales', 'S1', 'S2', 'S3', 'S4', 'Total Revenue']]**

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**Saving Preprocessed Data:**

The preprocessed data is saved to a new CSV file named 'Preprocessed\_Data.csv' without including the index**.**

**df.to\_csv('Preprocessed\_Data.csv', index=False)**

**Printing the Updated DataFrame:**

The code concludes by printing the updated DataFrame, which now includes the parsed date, derived date components, total sales, total revenue, and renamed columns.

**print(df)**

This code demonstrates a comprehensive approach to loading, cleaning, and preprocessing a dataset, preparing it for further analysis or modeling, while also enhancing its readability and interpretability**.**

Code Link: The above code is provided as DAC\_Phase3\_CODE.ipynb in this github link

<https://github.com/SHERLIN-BRITTO/ProductSalesAnalysis-Project>

**IBM Cognos Analytics:**

IBM Cognos Analytics is a business intelligence and analytics platform developed by IBM. It empowers organizations to transform data into actionable insights by providing tools for data visualization, reporting, dashboards, and advanced analytics. With its user-friendly interface and support for data integration from various sources, Cognos Analytics enables users to create interactive visualizations, generate custom reports, and design dynamic dashboards. Its incorporation of AI and machine learning features enhances data analysis, while the platform's security, governance, and collaboration capabilities make it a comprehensive solution for data-driven decision-making across industries, fostering efficiency and informed strategic choices.

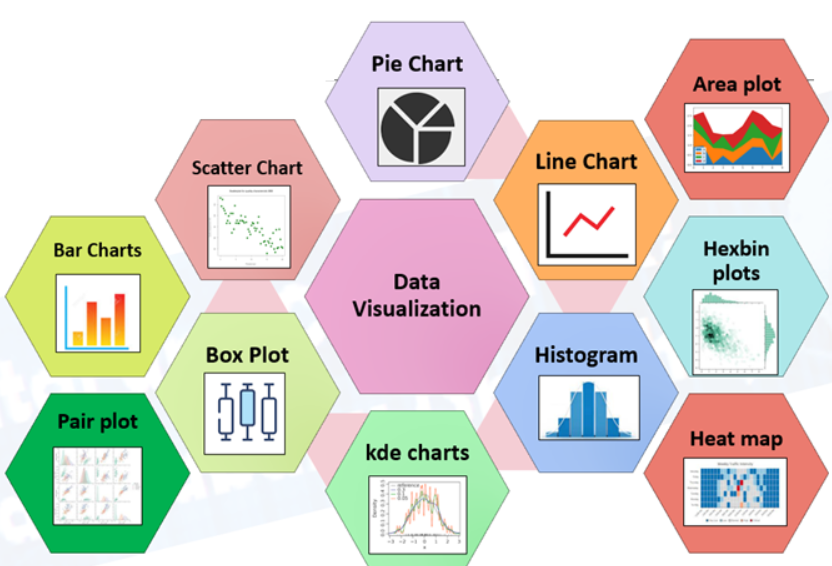
**Loading the Data into IBM Cognos**

Once our data is clean and processed, launch IBM cognos analytics on cloud trial version and load our dataset into IBM Cognos using **Upload data** option.

**Building Visualizations**

Once the data is loaded into Cognos, we can start building visualizations to help analyze our sales data. Cognos offers a variety of visualization tools, such as charts, graphs, and maps.

**Visualization Strategies:**

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Cognos supports a variety of chart types, including bar charts, line charts, pie charts, scatter plots, heat maps, and more. We can select the chart type that best suits their data and objectives.We will use IBM Cognos to create interactive dashboards to visualize the insights extracted from the data.

The following are some examples of data visualizations that we may create:

* Line charts showing sales trends over time
* Coulumn charts showing the top selling products

**i.Identify trends in sales of all four products during certain month**

To identify trends in the sales of all four products during certain months, Line charts or area charts are commonly used for this type of analysis.

**1.Create a New Report:**

Log in to IBM Cognos Analytics.Create a new report to visualize the sales trends.

**2.Select Data Source:**

In the report, select the data source that contains your sales data.

**3. Choose Visualization Type:**

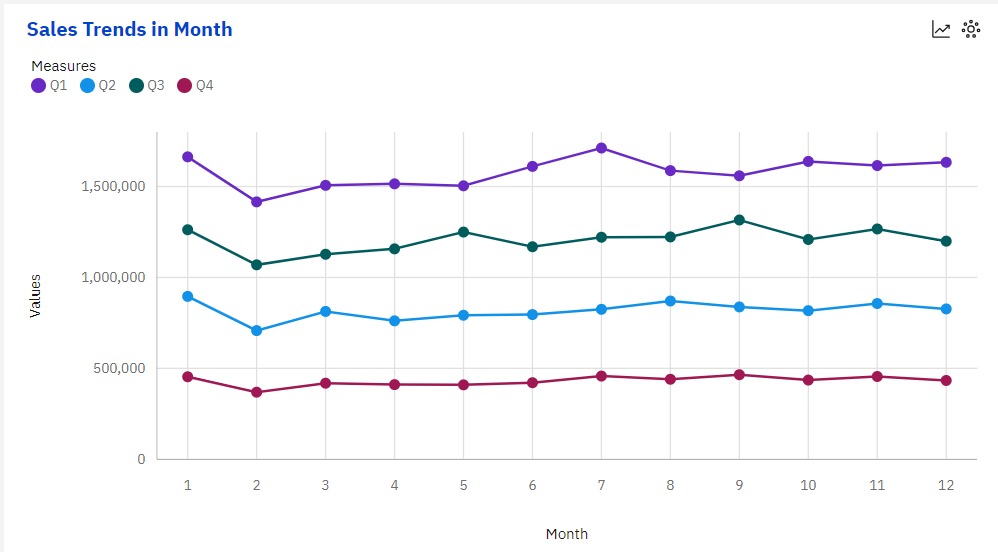
Select the appropriate visualization type to represent sales trends. Line charts or area charts are commonly used for this type of analysis.

**4. Add Data to the Chart:**

Drag and drop the "Month" column to the x-axis .Drag and drop the columns for the sales of each product (e.g., "Q1," "Q2," "Q3," and "Q4") to the y-axis .

**5.Analyze the Trends:**

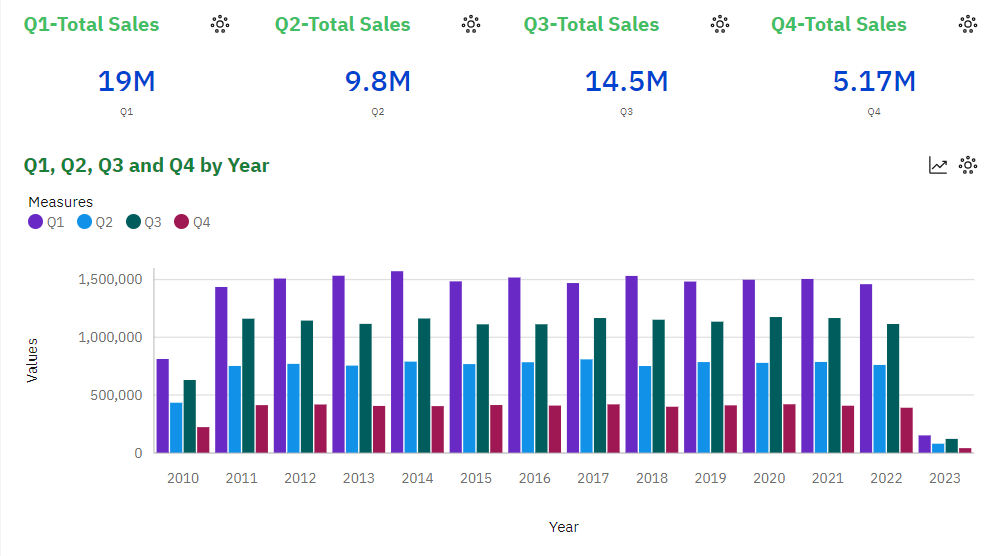
Review the chart to identify trends. Look for patterns, spikes, or dips in sales for each product during specific months.



* We can observe that all products drop in month 2 (Feb)
* We can observe that all products rise in month 1(Jan)

**ii. To identify the top selling product out of all four products**

We can use column graph to find this**.**

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Q1-UNIT SALES OF P1

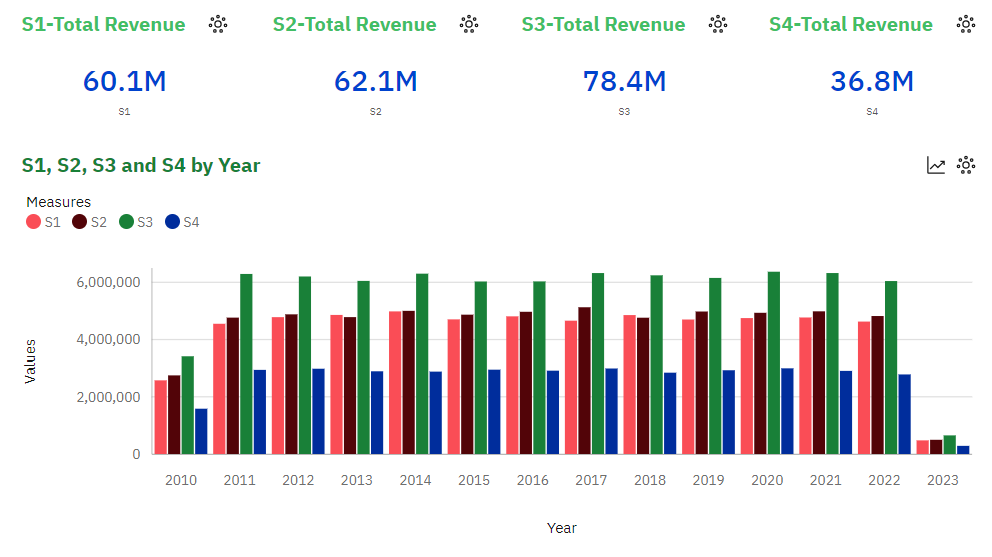
Q2-UNIT SALES OF P2

Q3-UNIT SALES OF P3

Q4-UNIT SALES OF P4

**Insights:**

* + We can observe that P1 has the highest unit sales for each year. And it's highest is in year 2014.
  + We can observe that P4 has the lowest unit sales of all the products.

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S1-REVENUE GENERATED BY P1

S2-REVENUE GENERATED BY P2

S3-REVENUE GENERATED BY P3

S4-REVENUE GENERATED BY P4

**Insights:**

* We can observe that P3 brought in the most revenue. This could be as a result of multiple things:

-P3 was sold for higher than the rest, as it had the second highest unit sales for each year.

* We can observe than P1 and P2 brought in similar revenues for each year. With P2 bringing in slightly more.

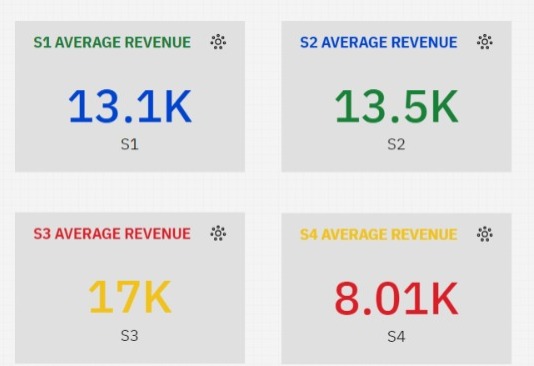
-P1 despite having the most unit sold, brought in the second lowest revenue each year.

**iii.Suggest whether dropping the production of any one of the products would result in a massive setback for the company**

We can use summary chart or KPI chart to find the above



**P4 has the least unit sales**



**P4 has generated the least revenue.**

**Suggestion:**

Dropping the production of any product, especially when it's one of the existing product lines, is a significant business decision that should be carefully considered. In our analysis, we've identified that Product P4 has the least unit sales and has generated the least revenue. Here's an elaboration on this decision and how to mitigate the potential setback:

**Analysis of Dropping Product P4:**

1. **Impact on Revenue**:Dropping Product P4 may indeed result in a decrease in overall company revenue. This is because it's contributing the least to the revenue. However, it's essential to understand the extent of the impact. A financial analysis should be conducted to quantify the revenue loss.

2. **Customer Segmentation**:Analyze the customer segments that purchase Product P4. Are there any loyal customers who rely on this product? Dropping it may result in customer churn if there is a customer base that specifically prefers this product.

3. **Market Demand**:Assess whether there's a continuing market demand for a product similar to P4. If there's no demand, dropping it may not be as significant. However, if there is demand, consider the potential loss of market share.

4. **Profit Margin**: Evaluate the profit margin for Product P4. If it's low or negative, the impact on profitability may not be as severe. On the other hand, if it's a high-margin product, dropping it may hurt profitability.

**Mitigation Strategies:**

1. **Increase Production of Highest Selling Product (P1):** To compensate for the potential setback, you can increase the production and marketing efforts for the highest-selling product, which is presumably generating the most revenue. This can help offset the revenue loss from dropping Product P4.

2. **Marketing Campaign**:Conduct a targeted marketing campaign to promote the highest-revenue-generating product (e.g., P1). This campaign should focus on retaining existing customers who were purchasing Product P4 and attracting new customers.

3.**Diversification**: Consider diversifying your product portfolio by introducing new products that align with market demand. This can help offset the revenue loss and reduce the dependence on any single product.

4. **Customer Retention**: Implement customer retention strategies to retain existing customers. Offer incentives, discounts, or promotions to encourage them to continue buying from the company even if Product P4 is discontinued.

5. **Market Research**:Conduct market research to understand the preferences and needs of your target audience. This can help in product development and marketing strategies.

6. **Cost Reduction**:Evaluate cost reduction strategies to minimize the impact of dropping Product P4 on the company's cost structure.

**Conclusion:**

In conclusion, the analysis of product sales data, performed using IBM Cognos Analytics, has provided valuable insights. The identification of top-selling products, sales trend of products over months,impact assessment of dropping a product, and the strategic recommendation to mitigate setbacks by promoting the highest-revenue-generating product demonstrate informed decision-making. The company's commitment to customer retention, market diversification, and cost management will play a crucial role in ensuring continued growth and financial stability. This analysis equips the company with actionable strategies to navigate potential challenges and foster sustained success in its competitive landscape.In phase 4,we will predict the future sales and revenue in 2024 and to get an estimate on no of units of each product that could be sold on 31st of Dec , every year , if all their retail centers were kept open.