Supply Chain Management Dashboard

Tools used in building the Project:

1. Excel
2. SQL Server
3. Power BI

Objective of the Project:

Analyse Product Performance and Supply Chain Efficiency.

Dataset Overview:

The dataset includes the following columns:

- **Product Type**: Type or category of makeup product (e.g., lipstick, mascara).
- **SKU (Stock Keeping Unit)**: Unique identifier used to track each product.
- **Price**: Selling price per unit of each product.
- **Availability**: The quantity of product readily available for sale.
- **Number of Products Sold**: Total quantity of each product sold over a specific period.
- **Revenue Generated**: Total revenue earned from sales of each product.
- **Customer Gender**: Gender of the customers purchasing the product, for demographic analysis.
- **Stock Levels**: Current inventory count for each product in storage.
- **Delivery Lead Time**: Time from shipment to delivery of products to end customers.
- **Order Quantities**: Quantity ordered from suppliers to replenish stock.
- **Shipping Times**: Total time taken for a product to reach customers after shipment.
- **Shipping Carriers**: Companies used to deliver the products (e.g., FedEx, UPS).
- **Shipping Costs**: Costs associated with delivering each product to customers.
- **Supplier Name**: Name of the supplier providing the product or materials.
- **Location**: Geographical location of the supplier or distribution facility.
- **Supplier Lead Time**: Time from placing an order with a supplier to receiving the goods.
- **Production Volumes**: Quantity of each product produced during a given period.
- **Manufacturing Lead Time**: Time required to manufacture each product from start to finish.
- **Manufacturing Costs**: Costs incurred in producing each unit of the product.
- **Inspection Results**: Quality control results for products post-manufacturing.

- **Defect Rates**: Percentage of products that are defective relative to total production.
- **Transportation Modes**: Modes of transport used to ship products (e.g., air, sea, land).
- **Routes**: Specific routes taken by shipments from suppliers or warehouses to distribution points.
- **Costs**: Aggregate costs, possibly including manufacturing, shipping, and other overhead costs, for a comprehensive view of expenses per product.

Steps involved in building the Project:

1. Study the dataset visually in Excel.
2. Import the dataset in SQL Server Management Studio.
3. Verify the data imported.
   SQL Query:
   SELECT * FROM Supply_Chain;

4. Clean the Data and prepare for export to Power BI
   - **CHECKING FOR NULL VALUES IN EACH OF THE COLUMNS**
     SQL QUERY:

```
SELECT
  SUM(CASE WHEN Product_type IS NULL THEN 1 ELSE 0 END) AS
Product_type_nulls,
  SUM(CASE WHEN SKU IS NULL THEN 1 ELSE 0 END) AS SKU_nulls,
  SUM(CASE WHEN Price IS NULL THEN 1 ELSE 0 END) AS Price_nulls,
  SUM(CASE WHEN Availability IS NULL THEN 1 ELSE 0 END) AS
Availability_nulls,
  SUM(CASE WHEN Number_of_products_sold IS NULL THEN 1 ELSE 0 END) AS
Number_of_products_sold_nulls,
  SUM(CASE WHEN Revenue_generated IS NULL THEN 1 ELSE 0 END) AS
Revenue_generated_nulls,
  SUM(CASE WHEN Customer_Gender IS NULL THEN 1 ELSE 0 END) AS
Customer_Gender_nulls,
  SUM(CASE WHEN Stock_levels IS NULL THEN 1 ELSE 0 END) AS
Stock_levels_nulls,
  SUM(CASE WHEN Delivery_Lead_time IS NULL THEN 1 ELSE 0 END) AS
Delivery_Lead_time_nulls,
  SUM(CASE WHEN Order_quantities IS NULL THEN 1 ELSE 0 END) AS
Order_quantities_nulls,
  SUM(CASE WHEN Shipping_times IS NULL THEN 1 ELSE 0 END) AS
Shipping_times_nulls,
```

```
  SUM(CASE WHEN Shipping_carriers IS NULL THEN 1 ELSE 0 END) AS
Shipping_carriers_nulls,
  SUM(CASE WHEN Shipping_costs IS NULL THEN 1 ELSE 0 END) AS
Shipping_costs_nulls,
  SUM(CASE WHEN Supplier_name IS NULL THEN 1 ELSE 0 END) AS
Supplier_name_nulls,
  SUM(CASE WHEN Location IS NULL THEN 1 ELSE 0 END) AS Location_nulls,
  SUM(CASE WHEN Supplier_Lead_time IS NULL THEN 1 ELSE 0 END) AS
Supplier_Lead_time_nulls,
  SUM(CASE WHEN Production_volumes IS NULL THEN 1 ELSE 0 END) AS
Production_volumes_nulls,
  SUM(CASE WHEN Manufacturing_lead_time IS NULL THEN 1 ELSE 0 END) AS
Manufacturing_lead_time_nulls,
  SUM(CASE WHEN Manufacturing_costs IS NULL THEN 1 ELSE 0 END) AS
Manufacturing_costs_nulls,
  SUM(CASE WHEN Inspection_results IS NULL THEN 1 ELSE 0 END) AS
Inspection_results_nulls,
  SUM(CASE WHEN Defect_rates IS NULL THEN 1 ELSE 0 END) AS
Defect_rates_nulls,
  SUM(CASE WHEN Transportation_modes IS NULL THEN 1 ELSE 0 END) AS
Transportation_modes_nulls,
  SUM(CASE WHEN Routes IS NULL THEN 1 ELSE 0 END) AS Routes_nulls,
  SUM(CASE WHEN Costs IS NULL THEN 1 ELSE 0 END) AS Costs_nulls
FROM Supply_Chain;
```

Result: No Null Values were found

- **CHECKING FOR DUPLICATE ROWS**
  SQL QUERY:

```
WITH CTE_Duplicates AS (
  SELECT
    *,
    ROW_NUMBER() OVER (PARTITION BY
      Product_type, SKU, Price, Availability,
      Number_of_products_sold, Revenue_generated, Customer_Gender,
      Stock_levels, Delivery_Lead_time, Order_quantities, Shipping_times,
      Shipping_carriers, Shipping_costs, Supplier_name, Location,
      Supplier_Lead_time, Production_volumes, Manufacturing_lead_time,
      Manufacturing_costs, Inspection_results, Defect_rates,
      Transportation_modes, Routes, Costs
    ORDER BY (SELECT NULL)) AS RowNum
  FROM Supply_Chain
)
```

```
SELECT *
FROM CTE_Duplicates
WHERE RowNum > 1;
```

Result: No Duplicate Values were found

5. Import the dataset to Power BI.
6. Build the following measures required for the project.

DAX Queries of the measures:

1. Availability = SUM('Supply Chain'[Availability])
2. Availability Rate = DIVIDE(SUM('Supply Chain'[Stock levels]),SUM('Supply Chain'[Availability]))
3. Avg Manufacturing Cost = AVERAGE('Supply Chain'[Manufacturing costs])
4. Avg Manufaturing lead time = AVERAGE('Supply Chain'[Manufacturing lead time])
5. Avg Order Lead time = AVERAGE('Supply Chain'[Order Lead time])
6. Avg Order Qty = AVERAGE('Supply Chain'[Order quantities])
7. Avg price per product = AVERAGE('Supply Chain'[Price])
8. Avg Revenue per product = DIVIDE([Total Revenue], COUNTROWS('Supply Chain'),0)
9. Avg Shipping Cost = AVERAGE('Supply Chain'[Shipping costs])
10. Avg Shipping Lead Time = AVERAGE('Supply Chain'[Shipping times])
11. Avg Supplier lead time = AVERAGE('Supply Chain'[Supplier Lead time])
12. Defect Rate = AVERAGE('Supply Chain'[Defect rates])/100
13. Inspection Pass Rate = DIVIDE(COUNTROWS(FILTER('Supply Chain','Supply Chain'[Inspection results]= "Pass")),COUNTROWS('Supply Chain'),0)
14. Ordered Qty = SUM('Supply Chain'[Order quantities])
15. Stock level = SUM('Supply Chain'[Stock levels])
16. Stock Turnover Rate = DIVIDE(SUM('Supply Chain'[Number of products sold]),SUM('Supply Chain'[Stock levels]),0)
17. Total Revenue = SUM('Supply Chain'[Revenue generated])
18. Total SKUs = COUNTROWS('Supply Chain')
19. Units Sold = SUM('Supply Chain'[Number of products sold])

7. Build custom columns using Add Column in Power Query Editor to categorise Order quantities and Production Volumes.
   M Query:
   - Ordered Quantity

```
if [Order quantities] <= 20 then "0-20"
else if [Order quantities] <= 50 then "21-50"
else if [Order quantities] <= 80 then "51-80"
else if [Order quantities] <= 100 then "81-100"
```

```
else "Above 100"
```

- Production Volume

```
if [Production volumes] >= 100 and [Production volumes] <= 200 then "100-200"
else if [Production volumes] <= 400 then "201-400"
else if [Production volumes] <= 600 then "401-600"
else if [Production volumes] <= 800 then "601-800"
else if [Production volumes] <= 1000 then "801-1000"
else "Above 1000"
```

8. Build the Visuals.

Pages of the Project:

1. **Sales Overview:** Provides a comprehensive overview of sales performance across key dimensions such as gender, product type, SKU, and location.
   Insights:
   - Total revenue generated is ₹577.60K, with an average revenue per product of ₹5.78K.
   - Customers whose gender was Unknown contributed the highest revenue (29.97%), followed by females (27.96%). Non-binary and Males also contributed significantly.
   - Cities like Kolkata and Mumbai show higher revenue and ordered quantities compared to other locations like Bangalore and Delhi.
   - SKU51 leads the revenue with ₹9.9K, closely followed by SKU38 and SKU31.
   - SKU10 tops the sales with 996 units sold.
   - Skincare products outperform haircare and cosmetics in both revenue and units sold.

2. **Stock & Inventory**: Analyses stock availability, inventory levels, and trends related to order lead time to ensure supply meets demand.
   Insights:
   - The average availability rate is 98.70, with skincare products having the highest availability (114.49) suggesting overstocking.
   - Haircare leads in stock levels, followed by skincare and cosmetics.
   - SKU68, SKU2, and SKU34 are critically low on stock, indicating potential supply chain risks.

- Order quantities fluctuate significantly over the lead time, highlighting areas for optimizing inventory planning.
- SKU12, SKU51, and SKU59 maintain the highest stock levels.

3. **Supply Chain Efficiency:** Evaluates supply chain efficiency by analysing lead times, transportation modes, supplier performance, and manufacturing quality metrics.
   Insights:
   - The average order lead time is 16 days, and the average supplier lead time is 17 days, indicating potential bottlenecks in sourcing.
   - The average manufacturing lead time is 15 days, while the average shipping lead time is 6 days, with shipping being relatively efficient.
   - Rail and road transport are used almost equally, followed by air and sea.
   - An overall low defect rate of 2.28% indicates good manufacturing quality. The inspection pass rate of 23% could be improved.
   - Supplier 3 has the highest lead time (20 days) across all supplier locations. There's a significant variation in lead times across locations.
   - Orders between 21–50 units have the shortest lead time (13 days), while larger orders (81–100 units) take significantly longer (19 days).
   - As production volumes increase, manufacturing lead time rises, reaching 18 days for the highest volume tier (801–1000 units), indicating capacity constraints.
   - All shipping carriers have similar average lead times (~6 days), with no significant performance differentiation.

4. **Cost Analysis & Quality Control:** Evaluates cost efficiency and quality control metrics to identify opportunities for cost reduction and quality improvements.
   Insights:
   - Haircare has the highest defect rate (2.5%), while cosmetics have the lowest (1.9%).
   - 23% of SKUs passed inspection, while 41% are pending, indicating requirement for improving inspection efficiency.
   - Cosmetics have the highest average price per product (₹57) and shipping cost (₹6) while skincare has highest manufacturing cost (₹49).
   - Skincare products have the lowest average shipping costs.
   - SKU42 and SKU65 show highest defect rates (4.9%).
   - Supplier 4 incurs the highest manufacturing cost (₹63), while others have more balanced cost structure.

- Sea transportation by Carrier A provide the lowest costs, whereas road transportation by Carrier C is the costliest.