Supply Chain Management Dashboard

Tools used in building the Project:

1. Excel
2. SQL Server
3. Power BI

Objective of the Project:

1. What is the total revenue generated, and how does it compare to the average revenue per SKU?

2. How many units were sold, and what is the average price per product?

3. What is the availability rate, and how can it be improved?

4. How does the total revenue vary by gender (Male, Female, Non-binary, Unknown)?

5. What is the distribution of units sold across different genders?

6. How does the total revenue and ordered quantity vary by location (Mumbai, Kolkata, Chennai, Bangalore, Delhi)?

7. Which product types (Skincare, Haircare, Cosmetics) generate the highest total revenue and units sold?

8. Which are the top 5 SKUs by revenue, and how do they compare in terms of units sold?

9. What is the overall availability rate, and how does it compare to the total number of SKUs?

10. Which SKUs have the lowest stock levels, and what actions can be taken to improve their availability?

11. How does the average order quantity vary by order lead time?

12. Which SKUs have the highest stock levels, and how can this be optimized?

13. How does the availability rate differ across product types (Cosmetics, Haircare, Skincare)?

14. What is the stock turnover rate, and how can it be improved?

15. How do availability and stock levels correlate across different product types?

16. What is the average order quantity, and how does it relate to the average order lead time?

17. How does the average supplier lead time vary across different suppliers, and which supplier has the highest defect rate?

18. What is the inspection pass rate for each supplier, and how can it be improved for those with lower rates?

19. Which transportation mode (Air, Rail, Road, Sea) is most used, and how does this impact shipping lead time?

20. How does the average order lead time change with different order quantities (0-20, 21-50, 51-80, 81-100)?

21. How does the average shipping lead time differ across carriers (Carrier A, Carrier B, Carrier C), and which carrier is the most efficient?

22. How does the average supplier lead time vary by location (Bangalore, Chennai, Delhi, Kolkata, Mumbai)?

23. How does the average manufacturing lead time change with production volumes (100-200, 201-400, 401-600, 601-800, 801-1000)?

24. What is the average price per product, and how does it compare to the average manufacturing and shipping costs?

25. What is the defect rate across all products, and how does it relate to the inspection pass rate?

26. How does the defect rate vary by product type (Haircare, Skincare, Cosmetics)?

27. Which suppliers have the highest and lowest average manufacturing costs, and how can costs be optimized?

28. How do the average shipping costs differ across carriers (Carrier A, Carrier B, Carrier C) and transportation modes (Air, Rail, Road, Sea)?

29. What percentage of SKUs are pending, failed, or passed inspection, and how can the pending rate be reduced?

30. Which are the top 5 least defective SKUs, and what quality control measures can be applied to others?

31. Which are the top 5 most defective SKUs, and what steps can be taken to improve their quality?

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 products 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:

```sql
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:

```sql
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.

Objectives of Tableau Dashboard

1. Which product type generates the most revenue?
2. How does production volume affect the choice of transportation modes?
3. When were the orders shipped, categorized by location?
4. How many orders have been placed, classified by customers?
5. Which shipping carrier has the highest cost?
6. What is the total cost, total revenue, and lead time?
7. How do inspection results clarify stock level cases?

Objectives of Excel Dashboard

1. What is the total revenue generated, and how does it compare to the average manufacturing cost?

2. How does the average lead time of 16.0 days impact the total product sold (46,999 units)?

3. What is the average shipping cost, and how does it relate to the average defect rate of 2.3?

4. Which supplier contributes the most to revenue generation, and how can their performance be optimized?

5. How does revenue contribution vary by location (Mumbai, Kolkata, Chennai, Bangalore, Delhi)?

6. Which product type (Skincare, Haircare, Cosmetics) generates the highest revenue, and why?
7. How does the total product delivered vary across carriers (Carrier A, Carrier B, Carrier C)?
8. What strategies can be implemented to increase the total production volume of 56,784 units?

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 s 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 suppliers locations. There's a significant change 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 s 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 the 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 the highest manufacturing cost (₹49).
   - Skincare products have the lowest average shipping costs.
   - SKU42 and SKU65 show the highest defect rates (4.9%).
   - Supplier 4 has the highest manufacturing cost (₹63), while others have a more balanced cost structure.
   - Sea transportation by Carrier A has the lowest costs, whereas road transportation by Carrier C is the costliest.