SUPPLY CHAIN ANALYTICS

About Dataset

Supply chain analytics is a valuable part of data-driven decision-making in various industries such as manufacturing, retail, healthcare, and logistics. It is the process of collecting, analyzing and interpreting data related to the movement of products and services from suppliers to customers.

Here is a dataset we collected from a Fashion and Beauty startup. The dataset is based on the supply chain of Makeup products. Below are all the features in the dataset:

- Product Type
- SKU(Stock Keeping Unit)
- Price
- Availability
- Number of products sold
- Revenue generated
- Customer demographics
- Stock levels
- Lead times
- Order quantities
- Shipping times
- Shipping carriers
- Shipping costs
- Supplier name
- Location
- Lead time
- Production volumes
- Manufacturing lead time
- Manufacturing costs
- Inspection results
- Defect rates
- Transportation modes
- Routes
- Costs

Steps Taken:

- 1. Downloaded the Datasets from Kaggle.
- 2. Understood the dataset.
- 3. Import Data in Mysql Workbench.
- 4. Cleaned the Data and Correct the Data types Issues
- 5. Created and Broke the tables into multiple table in star schema
- 6. Did Analysis.
- 7. Strategic Recommendation

Analysis:

1. Product and their quantity sold:-

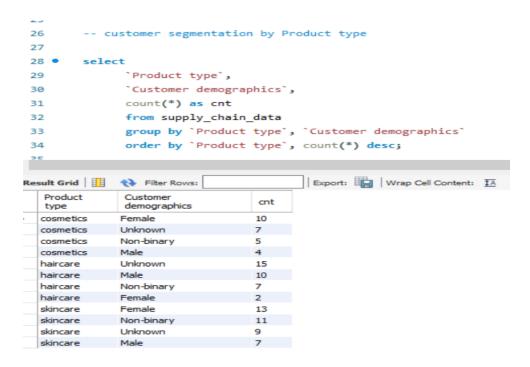
2. Total sales of the products in Rs.

```
-- total Sales of the product_type
11
12
      SELECT
13 •
        `Product type`,
14
        concat('₹', ' ', SUM(price * `Number of products sold`)) AS total_sales
15
       FROM supply_chain_data
17
       GROUP BY `Product type`;
Export: Wrap Cell Content: IA
            total_sales
             ₹ 632799
  haircare
  skincare
           ₹ 1053396
  cosmetics
             ₹ 599540
```

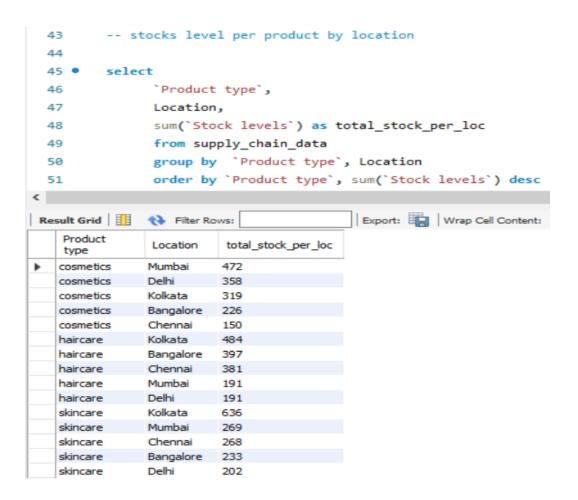
3. Number of Products sold per Category

```
9
           -- number of products sold per category
0
1
        select `Product type`,
                sum(`Number of products sold`) as total_product_sold
                from supply_chain_data
                group by 'Product type'
4
sult Grid
           Filter Rows:
                                          Export: Wrap Cell Content: IA
 Product
             total_product_sold
 type
haircare
             13611
            20731
skincare
cosmetics
             11757
```

4. Customer segmentation by Product type



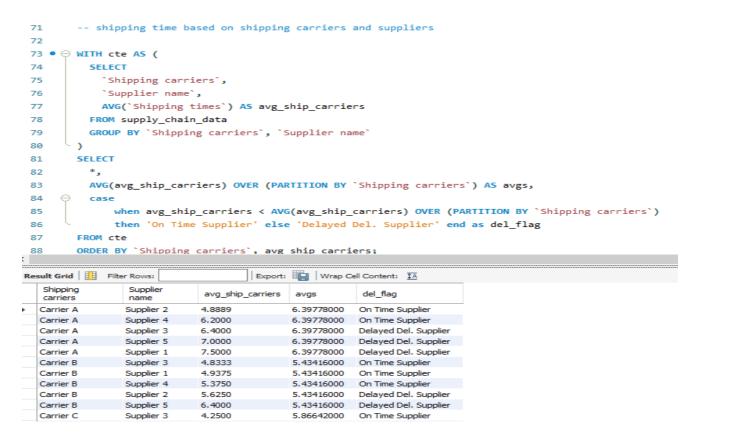
5. Stocks of products per location



6. Shipping time based on product and location

```
-- shipping time based on product and location
54
55
56 ● ⊖ WITH shipping_agg AS (
57
           SELECT
58
             `Product type`.
59
             Location,
             ROUND(AVG(`Shipping times`), 0) AS avg ship time
60
 61
           FROM supply_chain_data
           GROUP BY 'Product type', Location
62
 63
         SELECT
64
 65
66
           case
               when avg_ship_time > AVG(avg_ship_time) OVER (PARTITION BY `Product type`) then 'Delayed Delivery' else 'On Time' end as del_flag
 67
68
         FROM shipping agg
         ORDER BY 'Product type', avg_ship_time;
 69
                                       Export: Wrap Cell Content: IA
Result Grid | II Filter Rows:
  Product
              Location
                         avg_ship_time del_flag
  type
  cosmetics
               Bangalore
                                       On Time
  cosmetics
              Mumbai
                                      On Time
                                       On Time
  cosmetics
               Chennai
                                       Delayed Delivery
              Kolkata
               Delhi
  cosmetics
                                       Delayed Delivery
  haircare
              Delhi
                                      On Time
  haircare
               Bangalore
                                       On Time
                                      Delayed Delivery
  haircare
              Mumbai
               Kolkata
                                       Delayed Delivery
  haircare
                                       Delayed Delivery
  haircare
              Chennai
               Mumbai
              Delhi
  skincare
                                       On Time
```

7. Finding suppliers capabilities on delivery



8. Delayed Suppliers

```
73 • ⊝ WITH cte AS (
75
             `Shipping carriers`,
76
             `Supplier name`,
77
            AVG(`Shipping times`) AS avg_ship_carriers
78
          FROM supply_chain_data
          GROUP BY `Shipping carriers`, `Supplier name`
79
        ), delayed_supplier as (SELECT
80
81
          AVG(avg_ship_carriers) OVER (PARTITION BY `Shipping carriers`) AS avgs,
82
83
          case
               when avg ship_carriers < AVG(avg ship_carriers) OVER (PARTITION BY `Shipping carriers`)
84
               then 'On Time Supplier' else 'Delayed Del. Supplier' end as del_flag
85
86
       ORDER BY `Shipping carriers`, avg_ship_carriers)
87
         select * from delayed_supplier
88
89
         where del_flag = 'Delayed Del. Supplier'
90
Result Grid | Filter Rows:
                                       Export: Wrap Cell Content: IA
                  Supplier
  Shipping
                                                           del flag
                              avg ship carriers avgs
  Carrier A
                 Supplier 3
                              6.4000
                                              6.39778000 Delayed Del. Supplier
  Carrier A
               Supplier 5
                            7,0000
                                         6.39778000 Delayed Del. Supplier
  Carrier A
                 Supplier 1
                              7,5000
                                               6.39778000
                                                          Delayed Del. Supplier
                                           5.43416000 Delayed Del. Supplier
                            5.6250
  Carrier B
               Supplier 2
                 Supplier 5
                               6.4000
                                               5.43416000
                                                          Delayed Del. Supplier
                Supplier 2
                                             5.86642000 Delayed Del. Supplier
  Carrier C
                             6.4000
                 Supplier 1
                                               5.86642000 Delayed Del. Supplier
 Carrier C
                              7.8571
```

9. Total order placed by product

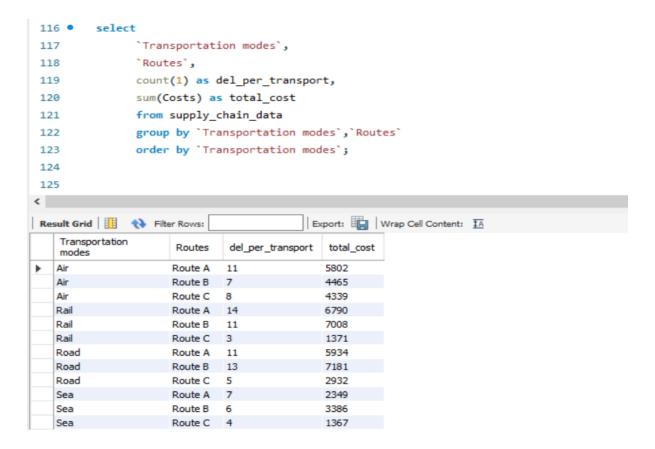
```
-- total order placed by product
91
92
        select `Product type`,
93 •
                sum('Order quantities') as total order
94
                from supply chain data
                group by
                           `Product type'
                                           Export: Wrap C
Result Grid
              Filter Rows:
  Product
               total order
  type
  haircare
               1480
  skincare
              2099
              1343
  cosmetics
```

10. Inspection Results based on each product

```
    inspection results based on each product

99
         select `Product type`,
100
                   `Inspection results`,
101
102
                   count(*) as cnt
                   from supply_chain_data
104
                   group by `Product type`,
                                                 `Inspection results`
                   order by `Product type`;
L05
                                               Export: Wrap Cell Content
               Filter Rows:
Result Grid
   Product
type
                Inspection results
                                  cnt
  cosmetics
                                  10
                Fail
  cosmetics
               Pass
  cosmetics
                Pending
                                  10
  haircare
               Fail
                                  13
  haircare
                                 15
  haircare
               Pending
  skincare
              Pass
                                 11
  skincare
                Pending
```

11. Transportation mode and costs



Detailed Key Findings

1. Product Performance & Sales Insights

- **Skincare** dominates in both revenue (₹1,053,396) and units sold (20,731), indicating strong market demand.
- Haircare has the highest stock in Kolkata (484 units) but lower sales (₹632,799), suggesting overstocking or regional mismatch.
- **Cosmetics** show moderate sales (₹599,540) and units sold (11,757), but suffer from high inspection failure rates.

2. Customer Demographics & Segmentation

- Cosmetics are most popular among female (10) and non-binary (5) customers.
- **Haircare** has a large number of customers with **unknown demographics** (15), which limits targeted marketing and personalization.
- Skincare shows a balanced demographic spread, making it a versatile product line for broader campaigns.

3. Inventory Distribution by Location

- **Skincare** has the highest stock in Kolkata (636 units), followed by Mumbai and Chennai.
- Haircare is heavily stocked in Kolkata and Bangalore, but sales don't match inventory levels.
- Cosmetics are well-distributed but show signs of overstock in Mumbai (472 units) and Delhi (358 units).

4. Shipping Time & Delivery Reliability

- Delayed deliveries are frequent in Kolkata and Delhi for cosmetics and haircare.
- Skincare maintains consistent "On Time" delivery across all locations.
- Carrier A and Carrier C have multiple suppliers flagged as Delayed Delivery Suppliers, while Carrier
 B shows better reliability.

5. Supplier Delivery Performance

- Carrier A: 3 out of 5 suppliers are delayed (e.g., Supplier 1 with avg. delivery time of 7.5 days).
- Carrier B: 2 out of 5 suppliers are delayed, but overall performance is better.
- Carrier C: Supplier 1 has the worst delay (avg. 7.86 days), well above the carrier average.

6. Inspection & Quality Control

- Cosmetics: 10 failed, 10 pending, only 6 passed inspections—indicating serious quality issues.
- Haircare: 13 failed, 15 pending, 6 passed—also problematic.
- **Skincare**: 13 failed, 16 pending, but 11 passed—better but still room for improvement.

7. Transportation Modes & Cost Analysis

Mode	Route B Cost	Total Deliveries	Observations
Road	₹7,181	13	Most expensive
Rail	₹7,008	11	High cost, frequent use
Air	₹4,465	7	Moderate cost, fast delivery
Sea	₹3,386	6	Cheapest, underutilized

•

Route B consistently incurs the highest costs across all modes.

• Sea transport is underused despite being the most cost-effective.

Strategic Recommendations for Supply Chain Optimization

1. Inventory Rebalancing & Demand Alignment

- Redistribute excess stock from Kolkata (especially haircare and skincare) to high-demand regions like Mumbai and Bangalore.
- Implement real-time inventory tracking using RFID or IoT to monitor stock levels and reduce overstocking.

2. Supplier Performance Management

- Audit and renegotiate contracts with delayed suppliers under Carrier A and C.
- Introduce a supplier scorecard system evaluating delivery times, defect rates, and inspection outcomes.
- Consider consolidating suppliers under Carrier B for better reliability.

3. Quality Control Enhancement

- Automate inspection processes for cosmetics and haircare, focusing on high-failure SKUs.
- Use **predictive analytics** to flag defect-prone batches before shipment.
- Establish quality benchmarks and enforce stricter compliance for manufacturing partners.

4. Transportation Cost Optimization

- Shift more shipments to sea transport for non-urgent deliveries to reduce costs.
- Reevaluate Route B logistics—consider alternative routing or renegotiating carrier rates.
- Explore multi-modal transport strategies (e.g., sea + road) to balance cost and speed.

5. Customer Data Enrichment

Launch initiatives to capture missing demographic data, especially for haircare customers.

• Use enriched data to **personalize marketing campaigns** and improve product targeting.

6. Demand Forecasting & Order Planning

- Leverage historical sales data and seasonal trends to predict demand more accurately.
- Align **production volumes and order quantities** with forecasted demand to minimize waste and delays.

7. Carrier Strategy Refinement

- Prioritize Carrier B for high-value and time-sensitive shipments.
- Develop carrier performance dashboards to monitor delivery metrics in real time.
- Introduce **penalty clauses** for delayed deliveries in supplier contracts.