

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:-

```
7 • select `Product type`, count(1) as total_quantity_sold
8   from supply_chain_data
9   group by `Product type`;
```

Product type	total_quantity
haircare	34
skincare	40
cosmetics	26

2.Total sales of the products in Rs.

```
11 -- total Sales of the product_type
12
13 • SELECT
14   `Product type`,
15   concat('₹', ' ', SUM(price * `Number of products sold`)) AS total_sales
16 FROM supply_chain_data
17 GROUP BY `Product type`;
18
```

Product type	total_sales
haircare	₹ 632799
skincare	₹ 1053396
cosmetics	₹ 599540

3. Number of Products sold per Category

```
9 -- number of products sold per category
10
1 • select `Product type`,
2   sum(`Number of products sold`) as total_product_sold
3   from supply_chain_data
4   group by `Product type`
5
```

Product type	total_product_sold
haircare	13611
skincare	20731
cosmetics	11757

4. Customer segmentation by Product type

```
26 -- customer segmentation by Product type
27
28 • select
29     `Product type`,
30     `Customer demographics`,
31     count(*) as cnt
32 from supply_chain_data
33 group by `Product type`, `Customer demographics`
34 order by `Product type`, count(*) desc;
35
```

Result Grid			Filter Rows:	Export:	Wrap Cell Content:
Product type	Customer demographics	cnt			
cosmetics	Female	10			
cosmetics	Unknown	7			
cosmetics	Non-binary	5			
cosmetics	Male	4			
haircare	Unknown	15			
haircare	Male	10			
haircare	Non-binary	7			
haircare	Female	2			
skincare	Female	13			
skincare	Non-binary	11			
skincare	Unknown	9			
skincare	Male	7			

5. Stocks of products per location

```
43 -- stocks level per product by location
44
45 • select
46     `Product type`,
47     Location,
48     sum(`Stock levels`) as total_stock_per_loc
49 from supply_chain_data
50 group by `Product type`, Location
51 order by `Product type`, sum(`Stock levels`) desc
```

Result Grid				Filter Rows:	Export:	Wrap Cell Content:
	Product type	Location	total_stock_per_loc			
▶	cosmetics	Mumbai	472			
	cosmetics	Delhi	358			
	cosmetics	Kolkata	319			
	cosmetics	Bangalore	226			
	cosmetics	Chennai	150			
	haircare	Kolkata	484			
	haircare	Bangalore	397			
	haircare	Chennai	381			
	haircare	Mumbai	191			
	haircare	Delhi	191			
	skincare	Kolkata	636			
	skincare	Mumbai	269			
	skincare	Chennai	268			
	skincare	Bangalore	233			
	skincare	Delhi	202			

6. Shipping time based on product and location

```
54 -- shipping time based on product and location
55
56 WITH shipping_agg AS (
57     SELECT
58         `Product type`,
59         Location,
60         ROUND(AVG(`Shipping times`), 0) AS avg_ship_time
61     FROM supply_chain_data
62     GROUP BY `Product type`, Location
63 )
64 SELECT
65     *,
66     case
67         when avg_ship_time > AVG(avg_ship_time) OVER (PARTITION BY `Product type`) then 'Delayed Delivery' else 'On Time' end as del_flag
68     FROM shipping_agg
69     ORDER BY `Product type`, avg_ship_time;
70
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: [IA](#)

Product type	Location	avg_ship_time	del_flag
cosmetics	Bangalore	5	On Time
cosmetics	Mumbai	6	On Time
cosmetics	Chennai	6	On Time
cosmetics	Kolkata	7	Delayed Delivery
cosmetics	Delhi	8	Delayed Delivery
haircare	Delhi	4	On Time
haircare	Bangalore	5	On Time
haircare	Mumbai	6	Delayed Delivery
haircare	Kolkata	6	Delayed Delivery
haircare	Chennai	7	Delayed Delivery
skincare	Mumbai	5	On Time
skincare	Delhi	5	On Time

7. Finding suppliers capabilities on delivery

```
71 -- shipping time based on shipping carriers and suppliers
72
73 WITH cte AS (
74     SELECT
75         `Shipping carriers`,
76         `Supplier name`,
77         AVG(`Shipping times`) AS avg_ship_carriers
78     FROM supply_chain_data
79     GROUP BY `Shipping carriers`, `Supplier name`
80 )
81 SELECT
82     *,
83     AVG(avg_ship_carriers) OVER (PARTITION BY `Shipping carriers`) AS avgs,
84     case
85         when avg_ship_carriers < AVG(avg_ship_carriers) OVER (PARTITION BY `Shipping carriers`)
86         then 'On Time Supplier' else 'Delayed Del. Supplier' end as del_flag
87     FROM cte
88     ORDER BY `Shipping carriers`, avg ship carriers;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: [IA](#)

Shipping carriers	Supplier name	avg_ship_carriers	avgs	del_flag
Carrier A	Supplier 2	4.8889	6.39778000	On Time Supplier
Carrier A	Supplier 4	6.2000	6.39778000	On Time Supplier
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
Carrier B	Supplier 3	4.8333	5.43416000	On Time Supplier
Carrier B	Supplier 1	4.9375	5.43416000	On Time Supplier
Carrier B	Supplier 4	5.3750	5.43416000	On Time Supplier
Carrier B	Supplier 2	5.6250	5.43416000	Delayed Del. Supplier
Carrier B	Supplier 5	6.4000	5.43416000	Delayed Del. Supplier
Carrier C	Supplier 3	4.2500	5.86642000	On Time Supplier

8. Delayed Suppliers

```
73 • WITH cte AS (  
74     SELECT  
75         `Shipping carriers`,  
76         `Supplier name`,  
77         AVG(`Shipping times`) AS avg_ship_carriers  
78     FROM supply_chain_data  
79     GROUP BY `Shipping carriers`, `Supplier name`  
80 ), delayed_supplier as (SELECT  
81     *,  
82     AVG(avg_ship_carriers) OVER (PARTITION BY `Shipping carriers`) AS avgs,  
83     case  
84         when avg_ship_carriers < AVG(avg_ship_carriers) OVER (PARTITION BY `Shipping carriers`)  
85         then 'On Time Supplier' else 'Delayed Del. Supplier' end as del_flag  
86     FROM cte  
87     ORDER BY `Shipping carriers`, avg_ship_carriers)  
88 select * from delayed_supplier  
89 where del_flag = 'Delayed Del. Supplier'  
90
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: |

Shipping carriers	Supplier name	avg_ship_carriers	avgs	del_flag
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
Carrier B	Supplier 2	5.6250	5.43416000	Delayed Del. Supplier
Carrier B	Supplier 5	6.4000	5.43416000	Delayed Del. Supplier
Carrier C	Supplier 2	6.4000	5.86642000	Delayed Del. Supplier
Carrier C	Supplier 1	7.8571	5.86642000	Delayed Del. Supplier

9. Total order placed by product

```
91 -- total_order placed by product  
92  
93 • select `Product type`,  
94         sum(`Order quantities`) as total_order  
95     from supply_chain_data  
96     group by `Product type`
```

Result Grid | Filter Rows: | Export: | Wrap C

Product type	total_order
haircare	1480
skincare	2099
cosmetics	1343

10. Inspection Results based on each product

```
98 -- inspection results based on each product  
99  
100 • select `Product type`,  
101         `Inspection results`,  
102         count(*) as cnt  
103     from supply_chain_data  
104     group by `Product type`, `Inspection results`  
105     order by `Product type`;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content

Product type	Inspection results	cnt
cosmetics	Fail	10
cosmetics	Pass	6
cosmetics	Pending	10
haircare	Fail	13
haircare	Pass	6
haircare	Pending	15
skincare	Fail	13
skincare	Pass	11
skincare	Pending	16

11. Transportation mode and costs

```
116 • select
117     `Transportation modes`,
118     `Routes`,
119     count(1) as del_per_transport,
120     sum(Costs) as total_cost
121 from supply_chain_data
122 group by `Transportation modes`,`Routes`
123 order by `Transportation modes`;
124
125
```

<				
Result Grid				
		Filter Rows:	Export:	Wrap Cell Content:
	Transportation modes	Routes	del_per_transport	total_cost
►	Air	Route A	11	5802
	Air	Route B	7	4465
	Air	Route C	8	4339
	Rail	Route A	14	6790
	Rail	Route B	11	7008
	Rail	Route C	3	1371
	Road	Route A	11	5934
	Road	Route B	13	7181
	Road	Route C	5	2932
	Sea	Route A	7	2349
	Sea	Route B	6	3386
	Sea	Route C	4	1367



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.