Supply Chain Optimization for Fashion and Beauty Products

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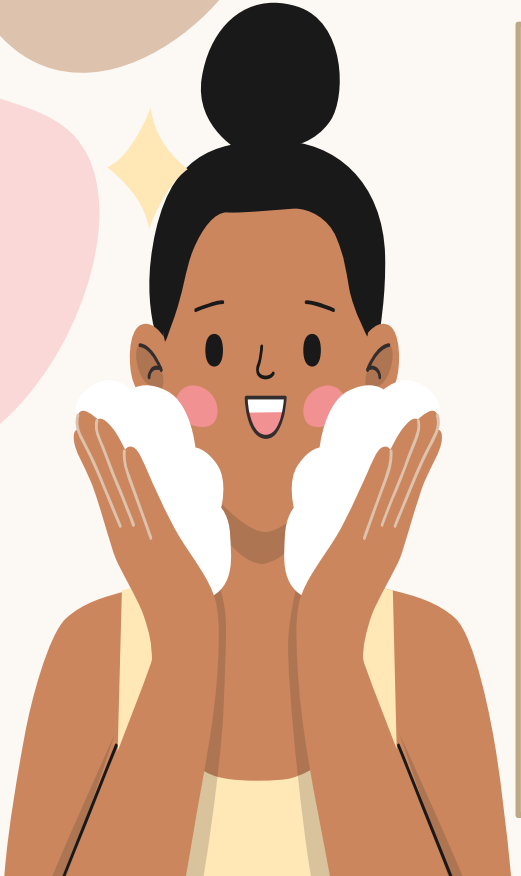
Project Summary

Utilized SQL to analyze and optimize the supply chain for a fashion and beauty products company, uncovering key insights to enhance sales and streamline operations. This project focused on leveraging data-driven strategies to improve business performance and profitability.

Tools Used

Data Understanding



Source file type : Microsoft Excel Comma Separated Values File (.csv)

Columns provided : Product type, SKU, 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, Production volumes, Manufacturing lead time, Manufacturing costs, Inspection results, Defect rates, Transportation modes, Routes, Costs.

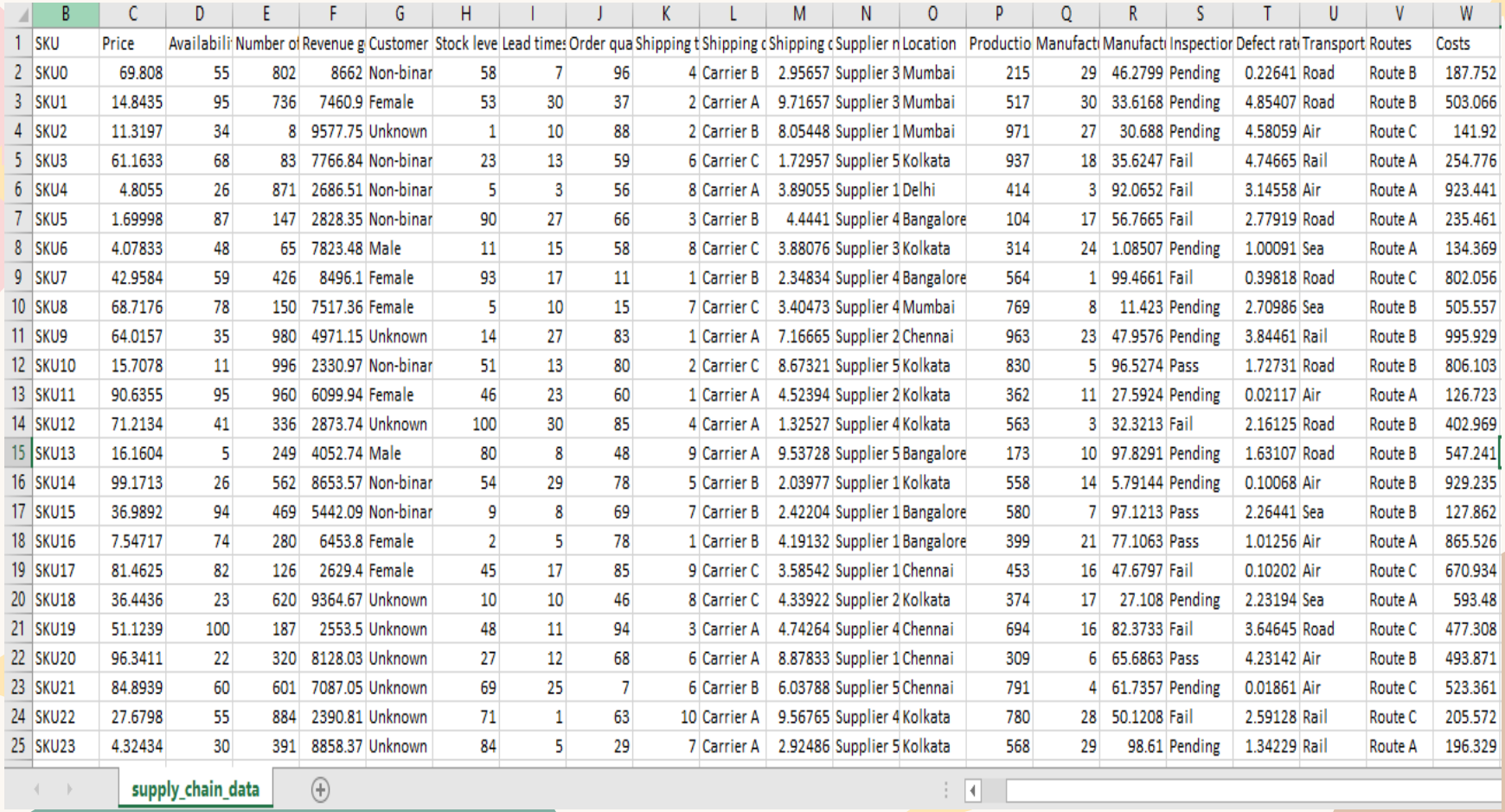
Data Dimensions: 100 rows and 23 columns.

Data Dictioary

- **Product type**: This tells us what kind of product it is, like haircare or skincare.
- **SKU**: These are the alphanumeric numbers assigned to each product to keep track of stock levels.
- **Price**: This tells us how much each product costs.
- **Availability**: This shows how many products are ready to be sold.
- **Number of products sold**: This tells us how many products have been bought by customers.
- **Revenue generated**: This is the amount of money we made from selling the products.
- **Customer demographics**: This tells us information about our customers, like if they are male, female, or non-binary.
- **Stock levels**: This shows how many products we still have in our warehouse.
- **Lead times**: This tells us how many days it takes to get the products ready to sell.
- **Order quantities**: This shows how many products customers ordered.
- **Shipping times**: This tells us how many days it takes to deliver the products to customers.
- **Shipping carriers**: This tells us which company is delivering the products.

Data Dictioary

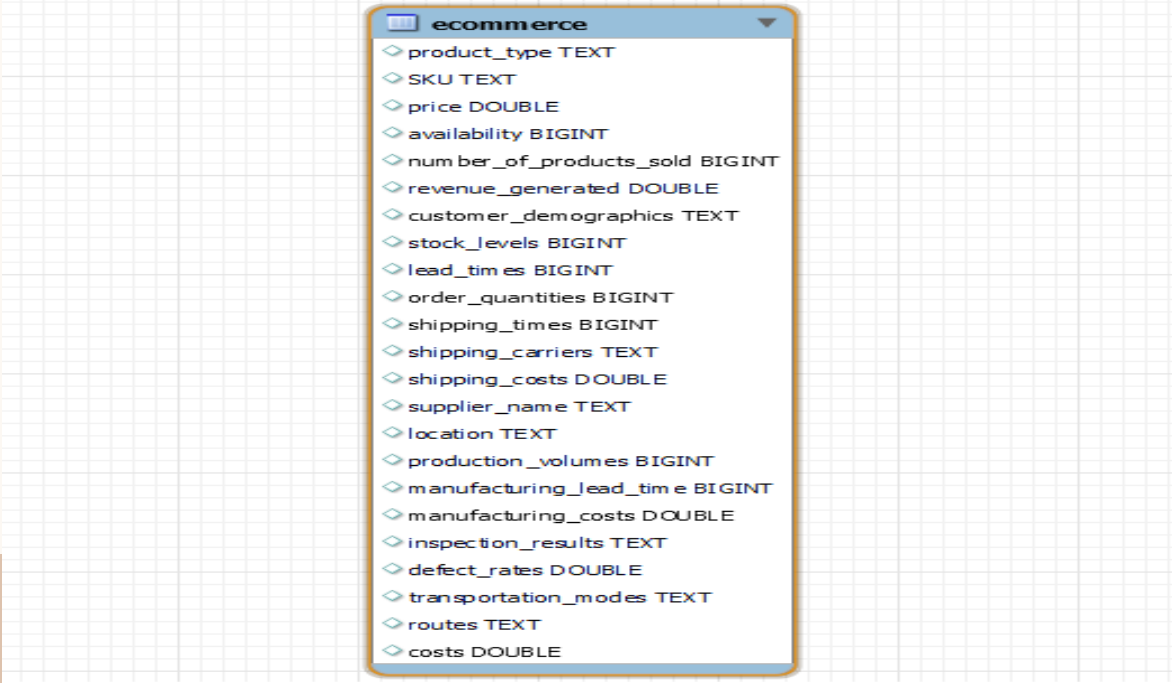
- **Shipping costs**: This is the amount of money it costs to ship the products to customers.
- **Supplier name**: This tells us the name of the company that provides us with the products.
- **Location**: This shows where the products are stored or shipped from, like Mumbai or Delhi.
- **Production volumes**: This shows how many products are made in the factory.
- **Manufacturing lead time**: This tells us how many days it takes to make the products.
- **Manufacturing costs**: This is the amount of money it costs to make the products.
- **Inspection results**: This tells us if the products passed or failed the quality check.
- **Defect rates**: This shows how many products have problems or defects.
- **Transportation modes**: This tells us how the products are transported, like by road, rail, or air.
- **Routes**: This shows the paths taken to deliver the products, like Route A or Route B.
- **Costs**: This is the cost related to various aspects of the supply chain, including transportation, logistics, storage and other costs.



	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	SKU	Price	Availabili	Number of	Revenue g	Customer	Stock leve	Lead times	Order qua	Shipping t	Shipping c	Shipping c	Supplier n	Location	Productio	Manufacti	Manufacti	Inspectior	Defect rati	Transport	Routes	Costs
2	SKU0	69.808	55	802	8662	Non-binar	58	7	96	4	Carrier B	2.95657	Supplier 3	Mumbai	215	29	46.2799	Pending	0.22641	Road	Route B	187.752
3	SKU1	14.8435	95	736	7460.9	Female	53	30	37	2	Carrier A	9.71657	Supplier 3	Mumbai	517	30	33.6168	Pending	4.85407	Road	Route B	503.066
4	SKU2	11.3197	34	8	9577.75	Unknown	1	10	88	2	Carrier B	8.05448	Supplier 1	Mumbai	971	27	30.688	Pending	4.58059	Air	Route C	141.92
5	SKU3	61.1633	68	83	7766.84	Non-binar	23	13	59	6	Carrier C	1.72957	Supplier 5	Kolkata	937	18	35.6247	Fail	4.74665	Rail	Route A	254.776
6	SKU4	4.8055	26	871	2686.51	Non-binar	5	3	56	8	Carrier A	3.89055	Supplier 1	Delhi	414	3	92.0652	Fail	3.14558	Air	Route A	923.441
7	SKU5	1.69998	87	147	2828.35	Non-binar	90	27	66	3	Carrier B	4.4441	Supplier 4	Bangalore	104	17	56.7665	Fail	2.77919	Road	Route A	235.461
8	SKU6	4.07833	48	65	7823.48	Male	11	15	58	8	Carrier C	3.88076	Supplier 3	Kolkata	314	24	1.08507	Pending	1.00091	Sea	Route A	134.369
9	SKU7	42.9584	59	426	8496.1	Female	93	17	11	1	Carrier B	2.34834	Supplier 4	Bangalore	564	1	99.4661	Fail	0.39818	Road	Route C	802.056
10	SKU8	68.7176	78	150	7517.36	Female	5	10	15	7	Carrier C	3.40473	Supplier 4	Mumbai	769	8	11.423	Pending	2.70986	Sea	Route B	505.557
11	SKU9	64.0157	35	980	4971.15	Unknown	14	27	83	1	Carrier A	7.16665	Supplier 2	Chennai	963	23	47.9576	Pending	3.84461	Rail	Route B	995.929
12	SKU10	15.7078	11	996	2330.97	Non-binar	51	13	80	2	Carrier C	8.67321	Supplier 5	Kolkata	830	5	96.5274	Pass	1.72731	Road	Route B	806.103
13	SKU11	90.6355	95	960	6099.94	Female	46	23	60	1	Carrier A	4.52394	Supplier 2	Kolkata	362	11	27.5924	Pending	0.02117	Air	Route A	126.723
14	SKU12	71.2134	41	336	2873.74	Unknown	100	30	85	4	Carrier A	1.32527	Supplier 4	Kolkata	563	3	32.3213	Fail	2.16125	Road	Route B	402.969
15	SKU13	16.1604	5	249	4052.74	Male	80	8	48	9	Carrier A	9.53728	Supplier 5	Bangalore	173	10	97.8291	Pending	1.63107	Road	Route B	547.241
16	SKU14	99.1713	26	562	8653.57	Non-binar	54	29	78	5	Carrier B	2.03977	Supplier 1	Kolkata	558	14	5.79144	Pending	0.10068	Air	Route B	929.235
17	SKU15	36.9892	94	469	5442.09	Non-binar	9	8	69	7	Carrier B	2.42204	Supplier 1	Bangalore	580	7	97.1213	Pass	2.26441	Sea	Route B	127.862
18	SKU16	7.54717	74	280	6453.8	Female	2	5	78	1	Carrier B	4.19132	Supplier 1	Bangalore	399	21	77.1063	Pass	1.01256	Air	Route A	865.526
19	SKU17	81.4625	82	126	2629.4	Female	45	17	85	9	Carrier C	3.58542	Supplier 1	Chennai	453	16	47.6797	Fail	0.10202	Air	Route C	670.934
20	SKU18	36.4436	23	620	9364.67	Unknown	10	10	46	8	Carrier C	4.33922	Supplier 2	Kolkata	374	17	27.108	Pending	2.23194	Sea	Route A	593.48
21	SKU19	51.1239	100	187	2553.5	Unknown	48	11	94	3	Carrier A	4.74264	Supplier 4	Chennai	694	16	82.3733	Fail	3.64645	Road	Route C	477.308
22	SKU20	96.3411	22	320	8128.03	Unknown	27	12	68	6	Carrier A	8.87833	Supplier 1	Chennai	309	6	65.6863	Pass	4.23142	Air	Route B	493.871
23	SKU21	84.8939	60	601	7087.05	Unknown	69	25	7	6	Carrier B	6.03788	Supplier 5	Chennai	791	4	61.7357	Pending	0.01861	Air	Route C	523.361
24	SKU22	27.6798	55	884	2390.81	Unknown	71	1	63	10	Carrier A	9.56765	Supplier 4	Kolkata	780	28	50.1208	Fail	2.59128	Rail	Route C	205.572
25	SKU23	4.32434	30	391	8858.37	Unknown	84	5	29	7	Carrier A	2.92486	Supplier 5	Kolkata	568	29	98.61	Pending	1.34229	Rail	Route A	196.329

supply_chain_data

Entity Relationship Diagram



Insights

Revenue Analysis

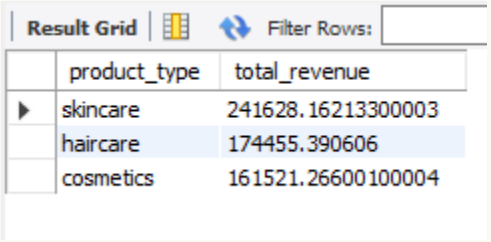
```sql
SELECT
    SUM(revenue_generated) AS total_revenue
FROM
    ecommerce;
```

Result Grid

	total_revenue
▶	577604.81874

Revenue Analysis by Product Type

```sql
SELECT
    product_type, SUM(revenue_generated) AS total_revenue
FROM
    ecommerce
GROUP BY product_type
ORDER BY total_revenue DESC;
```



product_type	total_revenue
skincare	241628.16213300003
haircare	174455.390606
cosmetics	161521.26600100004

Revenue Analysis by Location

```sql
SELECT
    location, SUM(revenue_generated) AS total_revenue
FROM
    ecommerce
GROUP BY location
ORDER BY total_revenue DESC;
```

Result Grid | Filter Rows:

location	total_revenue
Mumbai	137755.02688
Kolkata	137077.55100500002
Chennai	119142.81575000001
Bangalore	102601.72388000002
Delhi	81027.70122500003

Revenue Contribution Percentage Analysis

```sql
SELECT
    location,
    (SUM(revenue_generated) / 577604.81874) * 100 AS total_revenue_percentage
FROM
    ecommerce
GROUP BY location
ORDER BY total_revenue_percentage DESC;
```

Result Grid | Filter Rows:

location	total_revenue_percentage
Mumbai	23.849355547362272
Kolkata	23.73206499627618
Chennai	20.627046708145684
Bangalore	17.763308156572812
Delhi	14.028224591643063

Stock Levels and Lead Times Analysis

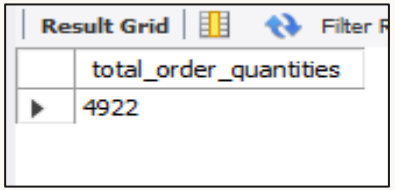
```sql
SELECT
    product_type,
    SUM(stock_levels) AS total_stock_levels,
    AVG(lead_times) AS average_lead_times
FROM
    ecommerce
GROUP BY product_type
ORDER BY total_stock_levels DESC;
```

Result Grid | Filter Rows: | Export:

product_type	total_stock_levels	average_lead_times
haircare	1644	15.5294
skincare	1608	16.7000
cosmetics	1525	15.3846

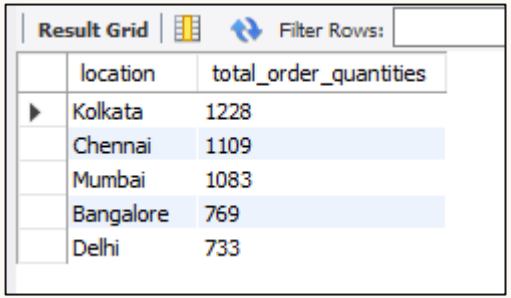
Order Quantities Analysis

```sql
SELECT
    SUM(order_quantities) AS total_order_quantities
FROM
    ecommerce
ORDER BY total_order_quantities DESC;
```



Order Quantities Analysis by Location

```sql
SELECT
    location, SUM(order_quantities) AS total_order_quantities
FROM
    ecommerce
GROUP BY location
ORDER BY total_order_quantities DESC;
```



Result Grid | Filter Rows:

location	total_order_quantities
Kolkata	1228
Chennai	1109
Mumbai	1083
Bangalore	769
Delhi	733

Most Costly (Manufacturing) Products Analysis

```sql
SELECT
    product_type,
    AVG(manufacturing_costs) AS average_manufacturing_cost
FROM
    ecommerce
GROUP BY product_type
ORDER BY average_manufacturing_cost DESC;
```

Result Grid | Filter Rows:

product_type	average_manufacturing_cost
skincare	48.993157373824985
haircare	48.45799342029411
cosmetics	43.052740496153845

Manufacturing Cost vs. Selling Price Analysis

```sql
SELECT
    product_type,
    AVG(manufacturing_costs) AS average_manufacturing_cost,
    AVG(price) AS avg_selling_price
FROM
    ecommerce
GROUP BY product_type;
```

Result Grid | Filter Rows: | Export: | Wrap

product_type	average_manufacturing_cost	avg_selling_price
haircare	48.45799342029411	46.01427887361765
skincare	48.993157373824985	47.25932887995002
cosmetics	43.052740496153845	57.36105759961537

Overall Product Profitability Analysis

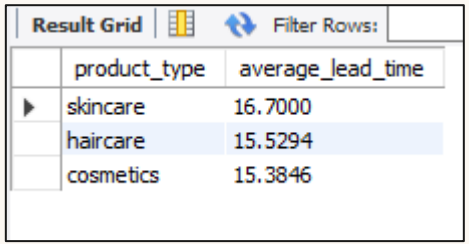
```sql
SELECT
    product_type,
    SUM(revenue_generated) AS total_revenue,
    SUM(Costs) AS total_cost,
    SUM(revenue_generated) - SUM(Costs) AS overall_profit
FROM
    ecommerce
GROUP BY product_type
ORDER BY overall_profit DESC;
```

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

product_type	total_revenue	total_cost	overall_profit
skincare	241628.16213300003	22229.31806769999	219398.84406530004
haircare	174455.390606	17328.862864799998	157126.5277412
cosmetics	161521.26600100004	13366.3972829	148154.86871810004

Average Lead Time Analysis

```sql
SELECT
    product_type, AVG(lead_times) AS average_lead_time
FROM
    ecommerce
GROUP BY product_type
ORDER BY average_lead_time DESC;
```



product_type	average_lead_time
skincare	16.7000
haircare	15.5294
cosmetics	15.3846

Impact of Lead Time on Stock Levels and Availability Analysis

```sql
SELECT
    product_type,
    AVG(lead_times) AS average_lead_time,
    AVG(stock_levels) AS average_stock_levels, AVG(availability) AS average_product_availability
FROM
    ecommerce
GROUP BY product_type;
```

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

product_type	average_lead_time	average_stock_levels	average_product_availability
haircare	15.5294	48.3529	43.2647
skincare	16.7000	40.2000	50.9250
cosmetics	15.3846	58.6538	51.2308

Correlation Between Inspection Result and Defect Rate Analysis

```sql
SELECT
    inspection_results, AVG(defect_rates) AS average_defect_rate
FROM
    ecommerce
GROUP BY inspection_results
ORDER BY average_defect_rate DESC;
```

Result Grid | Filter Rows:

inspection_results	average_defect_rate
Fail	2.569302145083333
Pending	2.154217774926829
Pass	2.0390431860434783

Analysis of Most Common Transportation Modes

```sql
SELECT
    transportation_modes, COUNT(*) AS total_count
FROM
    ecommerce
GROUP BY transportation_modes
ORDER BY total_count DESC;
```

Result Grid | Filter Rows:

transportation_modes	total_count
Road	29
Rail	28
Air	26
Sea	17

Analysis of Transportation Modes Impact on Lead Time and Cost

```sql
SELECT
    transportation_modes,
    AVG(lead_times) AS average_lead_time,
    AVG(costs) AS average_cost
FROM
    ecommerce
GROUP BY transportation_modes
ORDER BY average_lead_time DESC;
```

Result Grid | Filter Rows: | Export: | Wrap

transportation_modes	average_lead_time	average_cost
Air	18.2692	561.7125960615384
Road	17.1379	553.3859875482757
Rail	14.8929	541.7475556571429
Sea	12.1765	417.8191482647058

Analysis of Most Commonly Used Routes

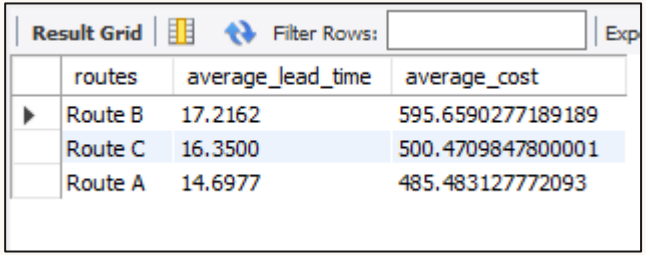
```sql
SELECT
    routes, COUNT(*) AS route_count
FROM
    ecommerce
GROUP BY routes
ORDER BY route_count DESC;
```

Result Grid | Filter Row

routes	route_count
Route A	43
Route B	37
Route C	20

Analysis of Route Impact on Costs and Lead Times

```sql
SELECT
    routes,
    AVG(lead_times) AS average_lead_time,
    AVG(costs) AS average_cost
FROM
    ecommerce
GROUP BY routes
ORDER BY average_lead_time DESC;
```



Result Grid | Filter Rows: | Exp

routes	average_lead_time	average_cost
Route B	17.2162	595.6590277189189
Route C	16.3500	500.4709847800001
Route A	14.6977	485.483127772093

Average Defect Rate Analysis by Product

```sql
SELECT
    product_type, AVG(defect_rates) AS average_defect_rate
FROM
    ecommerce
GROUP BY product_type
ORDER BY average_defect_rate DESC;
```

Result Grid | Filter Rows:

product_type	average_defect_rate
haircare	2.4831501929705877
skincare	2.334680781974999
cosmetics	1.9192869782307693

Correlation Analysis of Inspection Result and Manufacturing Cost

```sql
SELECT
    inspection_results,
    AVG(manufacturing_costs) AS average_manufacturing_cost
FROM
    ecommerce
GROUP BY inspection_results
ORDER BY average_manufacturing_cost DESC;
```

Result Grid | Filter Rows:

inspection_results	average_manufacturing_cost
Fail	52.230454779777766
Pass	46.14342190378261
Pending	43.53839629960975

Analysis of Production Volume's Relationship with Stock Levels and Order Quantities

```
SELECT product_type, AVG(production_volumes) AS average_production_volume, AVG(stock_levels) AS average_stock_levels,
AVG(order_quantities) AS average_order_quantities FROM ecommerce
GROUP BY product_type;
```

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

product_type	average_production_volume	average_stock_levels	average_order_quantities
haircare	586.9706	48.3529	43.5294
skincare	609.1500	40.2000	52.4750
cosmetics	479.2692	58.6538	51.6538

Alignment of Production Volumes with Market Demands

```
SELECT location, AVG(production_volumes) AS average_production_volume, AVG(stock_levels) AS average_stock_levels,
AVG(order_quantities) AS average_order_quantities FROM ecommerce
GROUP BY location;
```

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

location	average_production_volume	average_stock_levels	average_order_quantities
Mumbai	598.1818	42.3636	49.2273
Kolkata	618.0400	57.5600	49.1200
Delhi	557.4667	50.0667	48.8667
Bangalore	434.8333	47.5556	42.7222
Chennai	599.2000	39.9500	55.4500

Analysis of Percentage of Production Volumes Aligned with Market Demands

```sql
WITH total_revenue AS (
    SELECT SUM(revenue_generated) AS total_revenue
    FROM ecommerce
)
SELECT location,
       SUM(revenue_generated) AS revenue,
       (SUM(revenue_generated) / (SELECT total_revenue FROM total_revenue) * 100) AS total_revenue_percentage
FROM ecommerce
GROUP BY location
ORDER BY revenue DESC;
```

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

location	revenue	total_revenue_percentage
Mumbai	137755.02688	23.849355547362272
Kolkata	137077.55100500002	23.73206499627618
Chennai	119142.81575000001	20.627046708145684
Bangalore	102601.72388000002	17.763308156572812
Delhi	81027.70122500003	14.028224591643063

Conclusion

I. The highest revenue was generated by Mumbai (23.84%), but stock levels are low.
II. Skincare products are the most expensive, most profitable and generate the highest revenue. Production volume, lead time and ordered quantities are also the highest, but stock levels are the lowest.
III. The highest number of products are ordered from Kolkata.
IV. The average manufacturing cost of haircare products is 48.45 Rs, and its average selling price is 46.01 Rs, which is a matter of concern.
V. The least revenue and profit are generated by cosmetics products.
VI. The highest average lead time is for skincare products, and its average stock levels are the lowest.
VII. The most common mode of transportation is by road.
VIII. The most common route is Route A, which has the lowest average lead time and average cost.
IX. Route impacts cost and lead time.
X. The transportation mode with the highest average lead time and average cost is by air.
XI. Haircare products have the highest defect rate.
XII. Route B has the highest lead time and average cost.

Thank you