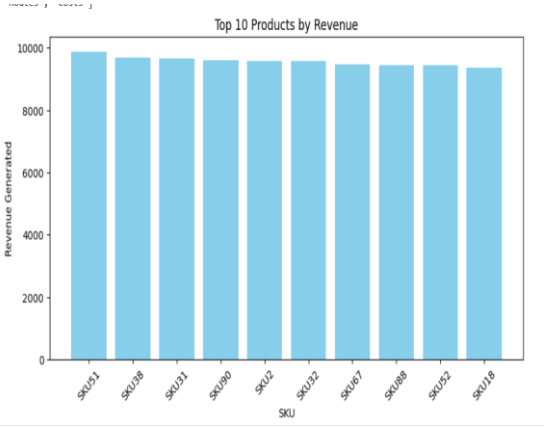
Product & Sales Analysis

1. Which products generate the highest revenue?

(SQL) (Python)

	Product_Type	SKU	Revenue_Generated
▶	haircare	SKU51	9866.46546
	cosmetics	SKU38	9692.31804
	skincare	SKU31	9655.13510
	skincare	SKU90	9592.63357
	haircare	SKU2	9577.74963
	skincare	SKU32	9571.55049
	skincare	SKU67	9473.79803
	cosmetics	SKU88	9444.74203
	skincare	SKU52	9435.76261
	haircare	SKU18	9364.67351



The highest revenue-generating products are **haircare SKU51, cosmetics SKU38, and skincare SKU31**, with revenues exceeding **$9600**. Haircare and skincare dominate the top-selling categories.

2. What is the correlation between price and the number of products sold?

(SQL) (Python)

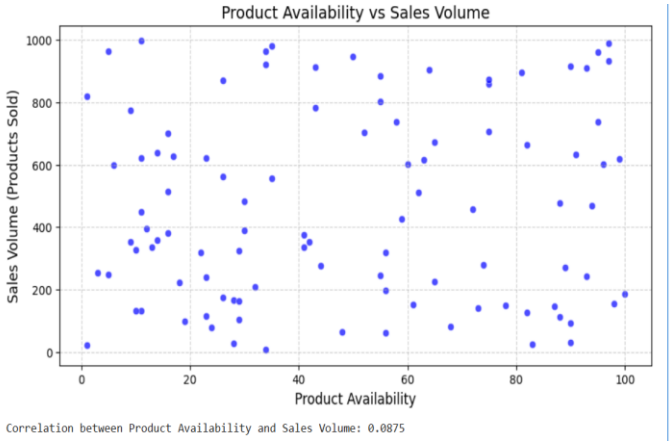
	Price	Number_of_Products_Sold
	69.80801	802
	14.84352	736
	15.70780	996
	90.63546	960
	71.21339	336
	16.16039	249
	99.17133	562
	36.98924	469
	7.54717	280
	81.46253	126
	36.44363	620
	51.12387	187
	11.31968	8
	96.34107	320
	84.89387	601
	27.67978	884

The correlation between **price and the number of products sold** is **0.0057**, indicating **almost no relationship** between price and sales volume. Price changes do not significantly impact sales.

3. How does product availability affect sales volume?

(SQL) (Python)

Availability	Avg_Sales_Volume
1	422.0000
3	253.0000
5	606.0000
6	598.0000
9	563.5000
10	230.5000
11	550.2500
12	394.0000
13	336.0000
14	498.0000
16	531.3333
17	627.0000
18	223.0000
19	99.0000

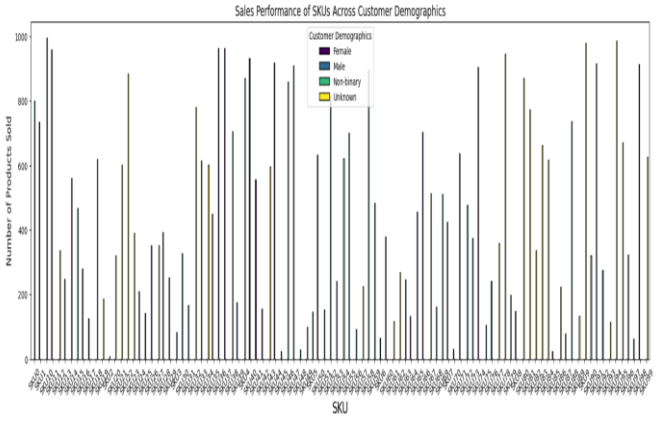


Product availability has little correlation with sales volume, as shown by the scattered data points. This suggests that other factors, such as demand or pricing, may have a greater impact on sales.

4. Are there specific SKUs that consistently perform better across different customer demographics?

(SQL) (Python)

SKU	Customer_Demographics	Total_Sales
SKU0	Non-binary	802
SKU1	Female	736
SKU10	Non-binary	996
SKU11	Female	960
SKU12	Unknown	336
SKU13	Male	249
SKU14	Non-binary	562
SKU15	Non-binary	469
SKU16	Female	280
SKU17	Female	126
SKU18	Unknown	620
SKU19	Unknown	187
SKU2	Unknown	8
SKU20	Unknown	320



Some SKUs, like SKU10 and SKU11, consistently perform well across multiple customer demographics. The bar chart confirms that specific products appeal to diverse groups.

5. What are the best-selling products in each customer demographic?

(SQL)

SKU	Customer_Demographics	Total_Sales	Sales_Rank
SKU36	Female	963	1
SKU37	Female	963	1
SKU91	Male	916	1
SKU10	Non-binary	996	1
SKU94	Unknown	987	1

	SKU	Customer demographics	Number of products sold
30	SKU36	Female	963
91	SKU91	Male	916
2	SKU10	Non-binary	996
94	SKU94	Unknown	987

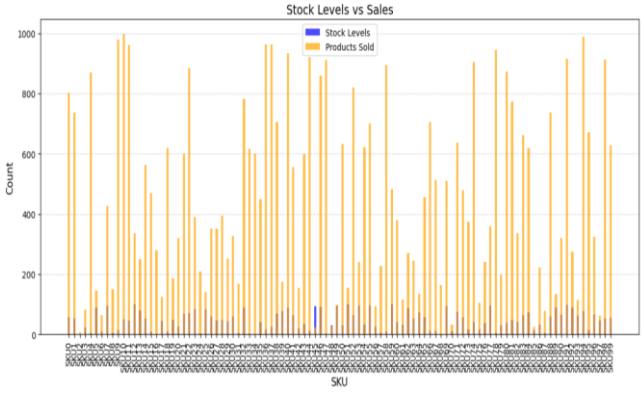
Each customer demographic has a distinct best-selling product, with SKU10 leading among non-binary customers and SKU36 among females. The table confirms sales rankings for each group.

Inventory & Stock Management

6. What are the stock levels for different SKUs, and how do they compare to sales trends?

(SQL) (Python)

SKU	Stock_Levels	Number_of_Products_Sold
SKU12	100	336
SKU59	100	484
SKU51	100	154
SKU91	98	916
SKU49	97	99
SKU55	97	701
SKU53	96	242
SKU77	96	359
SKU69	95	511
SKU7	93	426
SKU45	93	24
SKU46	92	859
SKU5	90	147
SKU92	90	276
SKU89	90	134
SKU40	90	933

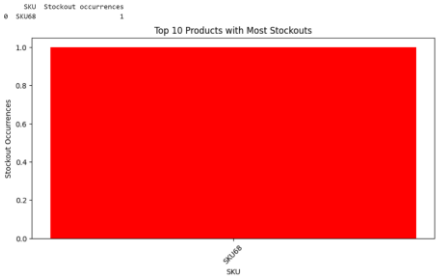


Stock levels vary across SKUs, with some high-selling products having **low stock**, indicating a need for restocking. **Sales trends are inconsistent with stock levels**, suggesting potential supply chain inefficiencies.

7. How often do stockouts occur, and which products are most affected?

(SQL) (Python)

SKU	Stockout_Occurrences
SKU68	1

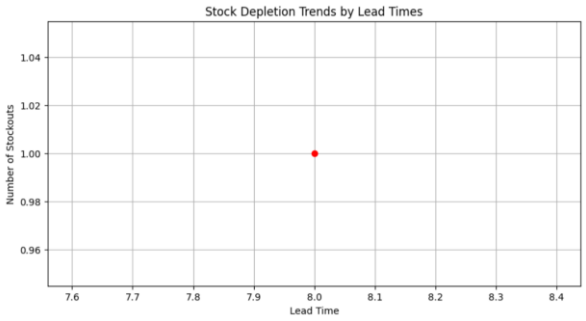


Stockouts are rare, with SKU68 being the only product affected. The bar chart highlights its occurrence, indicating potential supply chain inefficiencies.

8. Are there seasonal trends in stock depletion?

(SQL) (Python)

Lead_Times	Stockout_Occurrences
8	1



No strong seasonal trends in stock depletion are observed, with stockouts occurring sporadically. The data suggests that stock depletion may be influenced by factors other than lead times.

9. How do lead times impact stock levels?

(SQL) (Python)

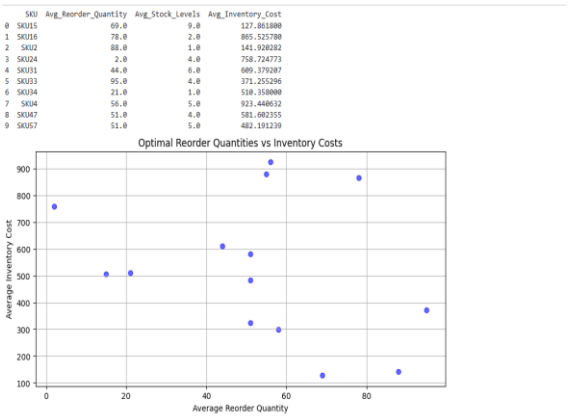
Lead_Times	Avg_Stock
7	52.0000
30	76.5000
13	54.3333
23	30.4000
8	33.8000
29	63.4000
5	35.2500
17	37.3333
10	5.3333
11	72.7500
12	18.5000
25	60.6000
1	69.3333
26	43.0000

Lead times show a **fluctuating impact on stock levels**, with longer lead times generally associated with **higher average stock** levels. This suggests that businesses may **overstock to compensate for delays** in supply.

10. What reorder quantities optimize inventory costs while preventing stockouts?

(SQL) (Python)

SKU	Avg_Reorder_Quantity	Avg_Stock_Levels	Avg_Inventory_Cost
SKU15	69.0000	9.0000	127.861800000
SKU2	88.0000	1.0000	141.920280000
SKU68	58.0000	0.0000	299.706300000
SKU78	51.0000	5.0000	323.592200000
SKU33	95.0000	4.0000	371.255300000
SKU57	51.0000	5.0000	482.191240000
SKU8	15.0000	5.0000	505.557130000
SKU34	21.0000	1.0000	510.358000000
SKU47	51.0000	4.0000	581.602360000
SKU31	44.0000	6.0000	609.379210000
SKU24	2.0000	4.0000	758.724770000



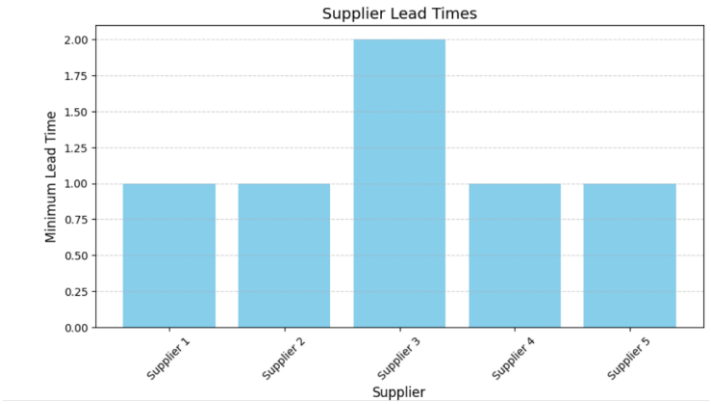
Optimal reorder quantities balance inventory costs while preventing stockouts. The scatter plot shows varying reorder levels, indicating that larger reorder quantities generally lead to higher inventory costs.

Supplier & Manufacturing Analysis

11. Which suppliers provide the fastest lead times?

(SQL) (Python)

Supplier_Name	Min_Lead_Time
Supplier 5	1
Supplier 2	1
Supplier 4	1
Supplier 1	1
Supplier 3	2

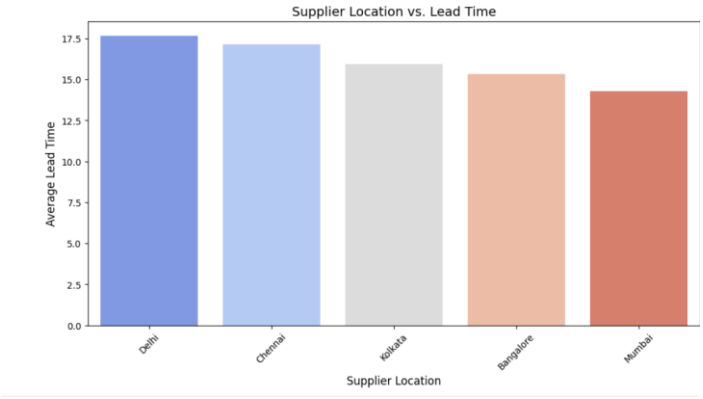


Suppliers 1, 2, 4, and 5 provide the **fastest lead times** with a minimum lead time of **1 day**, while **Supplier 3** has a slightly longer lead time of **2 days**.

12. Is there a relationship between supplier location and lead time?

(SQL) (Python)

	Location	Avg_Lead_Time
▶	Delhi	17.6667
	Chennai	17.1500
	Kolkata	15.9200
	Bangalore	15.3333
	Mumbai	14.2727

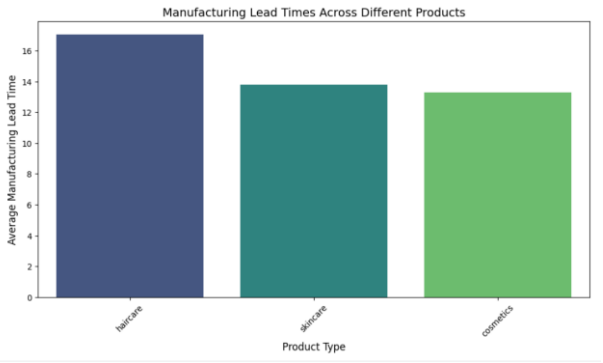


Suppliers in Delhi and Chennai have the longest lead times, while Mumbai has the shortest. The bar chart confirms regional differences in supplier efficiency.

13. How do manufacturing lead times compare across different products?

(SQL) (Python)

	Product_Type	Avg_Manufacturing_Lead_Time
▶	haircare	17.0588
	skincare	13.7750
	cosmetics	13.3077

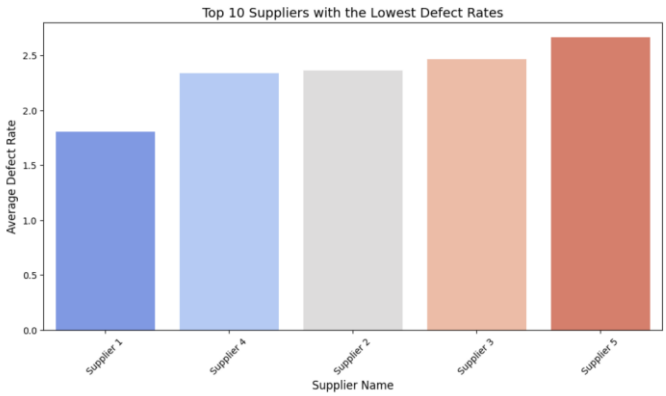


Haircare products have the longest manufacturing lead times, while skincare and cosmetics take less time. The bar chart visually confirms these differences in production efficiency.

14. Which suppliers have the lowest defect rates?

(SQL)

Supplier_Name	Avg_Defect_Rate
Supplier 1	1.803630000
Supplier 4	2.337396666
Supplier 2	2.362749545
Supplier 3	2.465786000
Supplier 5	2.665408333

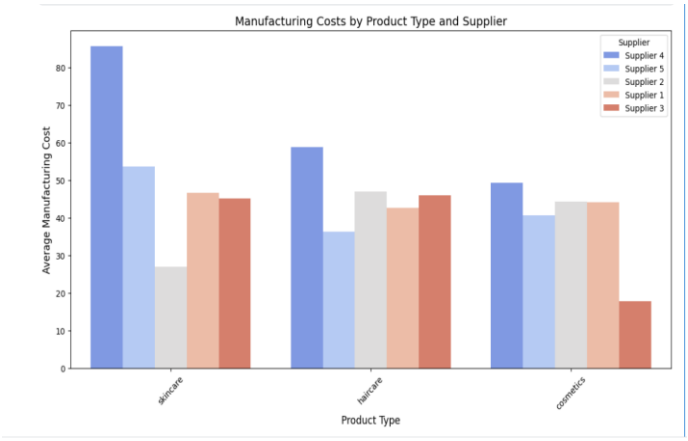


Supplier 1 has the lowest defect rate, making it the most reliable option. The bar chart confirms variations among suppliers, helping in quality-driven supplier selection.

15. How do manufacturing costs vary by product type and supplier?

(SQL) (Python)

Product_Type	Supplier_Name	Avg_Manufacturing_Cost
skincare	Supplier 4	85.636552500
haircare	Supplier 4	58.869662000
skincare	Supplier 5	53.670044285
cosmetics	Supplier 4	49.383065000
haircare	Supplier 2	47.051472000
skincare	Supplier 1	46.679267333
haircare	Supplier 3	45.991944000
skincare	Supplier 3	45.194261111
cosmetics	Supplier 2	44.375454285
cosmetics	Supplier 1	44.095978571
haircare	Supplier 1	42.599570000

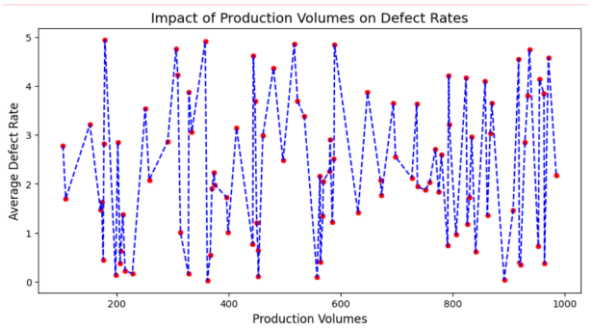


Manufacturing costs vary significantly by supplier and product type, with Supplier 4 having the highest costs for skincare. The bar chart highlights cost differences, helping identify the most cost-efficient suppliers.

16. What is the impact of production volumes on defect rates?

(SQL) (Python)

Production_Volumes	Avg_Defect_Rate
104	2.779190000
109	1.698110000
152	3.213330000
171	1.467540000
173	1.631070000
176	0.447190000
177	2.825810000
179	4.939260000
198	0.131960000
202	2.849660000
206	0.372300000



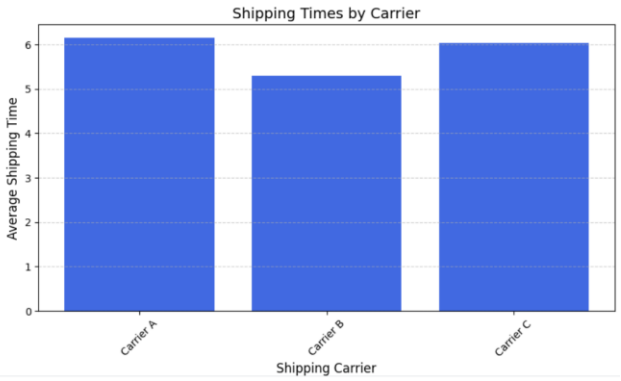
Defect rates fluctuate with production volumes, showing no clear linear relationship. Higher production volumes do not consistently lead to higher or lower defect rates, indicating other influencing factors.

Shipping & Logistics

17. Which shipping carriers provide the fastest delivery times?

(SQL) (Python)

Shipping_Carriers	Avg_Shipping_Time
Carrier B	5.3023
Carrier C	6.0345
Carrier A	6.1429

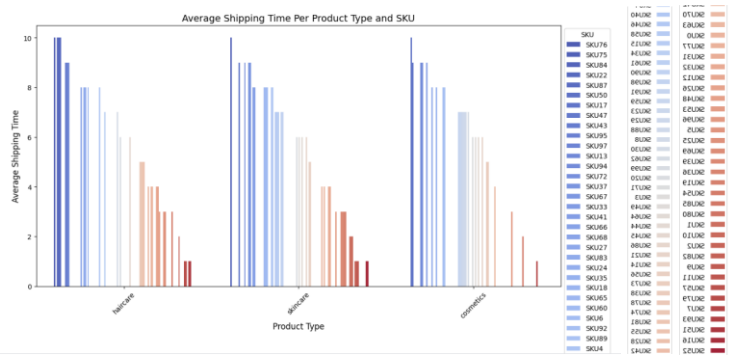


Carrier B provides the **fastest delivery time** with an average of **5.30 days**, while **Carrier A and Carrier C** have longer delivery times of **6+ days**.

18. What is the average shipping time per product type or SKU?

(SQL) (Python)

Product_Type	SKU	Avg_Shipping_Time
skincare	SKU75	10.0000
cosmetics	SKU50	10.0000
haircare	SKU87	10.0000
haircare	SKU84	10.0000
haircare	SKU76	10.0000
haircare	SKU22	10.0000
skincare	SKU13	9.0000
cosmetics	SKU94	9.0000
cosmetics	SKU33	9.0000
haircare	SKU95	9.0000
skincare	SKU47	9.0000

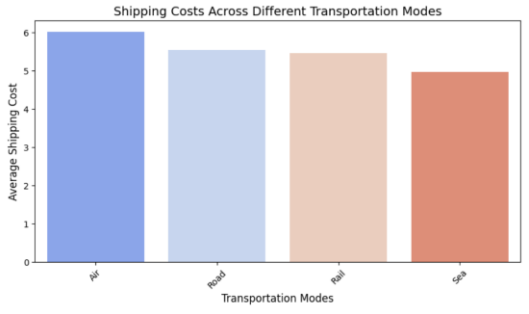


Skincare products generally have the longest shipping times, while cosmetics and haircare have slightly lower averages. The bar chart highlights SKU-level variations in shipping time.

19. How do shipping costs vary across different transportation modes?

(SQL) (Python)

Transportation_Modes	Avg_Shipping_Cost
Air	6.017838846
Road	5.542115517
Rail	5.469098214
Sea	4.970291764

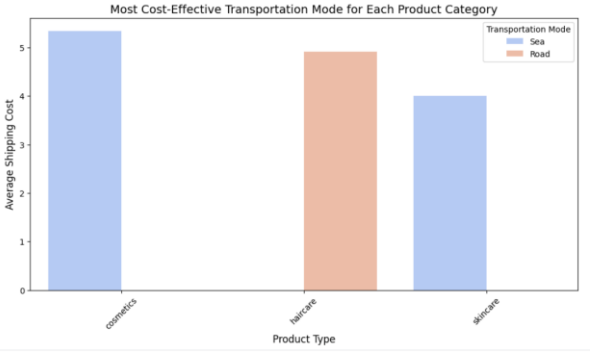


Air transport has the highest shipping costs, while Sea is the most cost-effective mode. The bar chart confirms this trend, helping optimize transportation choices.

20. What is the most cost-effective transportation mode for each product category?

(SQL)

Product_Type	Transportation_Modes	Avg_Shipping_Cost
cosmetics	Sea	5.341815000
cosmetics	Road	5.798748333
cosmetics	Rail	6.074353333
cosmetics	Air	7.210218000
haircare	Road	4.918496666
haircare	Rail	5.641049000
haircare	Sea	6.099107500
haircare	Air	7.629356250
skincare	Sea	4.006805714
skincare	Air	4.567528461
skincare	Rail	4.672786666

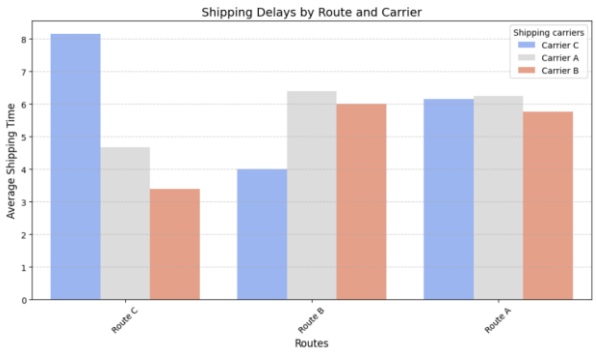


Sea and Rail are the most cost-effective transportation modes for cosmetics, haircare, and skincare. The bar chart highlights the lowest shipping costs for each product category.

21. Are there significant delays in shipping times due to specific routes or carriers?

(SQL) (Python)

Routes	Shipping_Carriers	Avg_Shipping_Time
Route C	Carrier C	8.1429
Route B	Carrier A	6.3846
Route A	Carrier A	6.2500
Route A	Carrier C	6.1429
Route B	Carrier B	6.0000
Route A	Carrier B	5.7647
Route C	Carrier A	4.6667
Route B	Carrier C	4.0000
Route C	Carrier B	3.4000



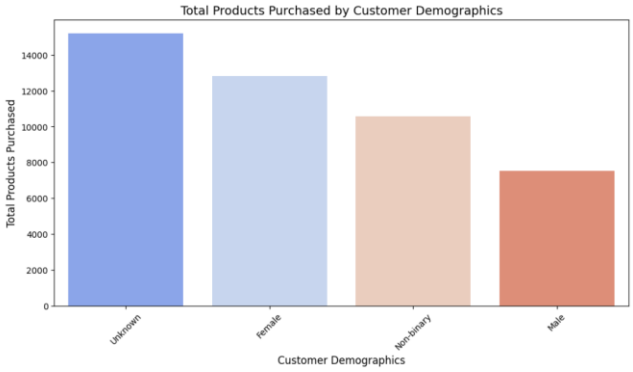
Route C with Carrier C experiences the **longest shipping delays** (8.14 days), while **Route C with Carrier A** has the shortest shipping time (3.4 days). **Significant variations exist across routes and carriers, indicating potential inefficiencies.**

Customer & Market Trends

22. Which customer demographics purchase the most products?

(SQL) (Python)

Customer_Demographics	Total_Products_Purchased
Unknown	15211
Female	12801
Non-binary	10580
Male	7507

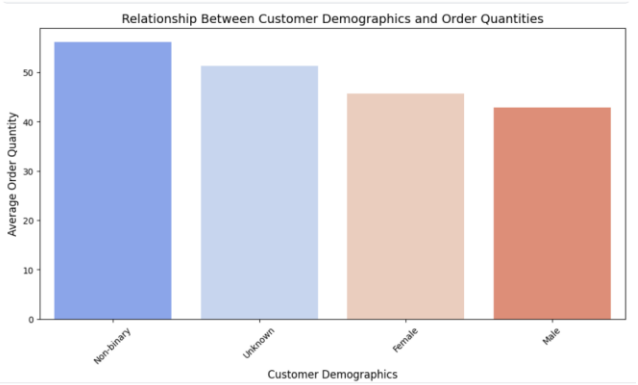


The 'Unknown' and Female demographics purchase the most products, while Males buy the least. The bar chart confirms this pattern, showing clear purchasing differences across customer groups.

23. What is the relationship between customer demographics and order quantities?

(SQL) (Python)

Customer_Demographics	Avg_Order_Quantity
Non-binary	56.1739
Unknown	51.2903
Female	45.6400
Male	42.8095

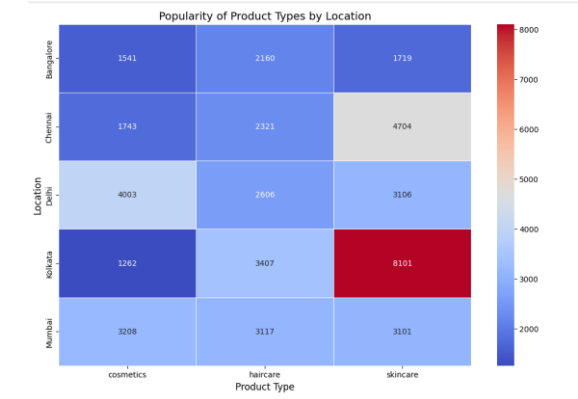


Non-binary and 'Unknown' customers place the highest average order quantities, while males order the least. The bar chart confirms this trend, indicating demographic-based purchasing behaviors.

24. Are certain product types more popular in specific locations?

(SQL) (Python)

Product_Type	Location	Total_Sales
haircare	Bangalore	2160
skincare	Bangalore	1719
cosmetics	Bangalore	1541
skincare	Chennai	4704
haircare	Chennai	2321
cosmetics	Chennai	1743
cosmetics	Delhi	4003
skincare	Delhi	3106
haircare	Delhi	2606
skincare	Kolkata	8101
haircare	Kolkata	3407



Skincare is most popular in Kolkata, while haircare dominates in Bangalore and Chennai. The heatmap confirms regional product preferences for optimized inventory.

25. How do shipping times and costs affect customer purchasing behavior?

(SQL) (Python)

Customer_Demographics	Avg_Shipping_Time	Avg_Shipping_Cost	Total_Purchases
Unknown	5.7742	5.946914193	15211
Female	5.4800	5.449541600	12801
Non-binary	5.5217	4.855787391	10580
Male	6.2857	5.835184761	7507

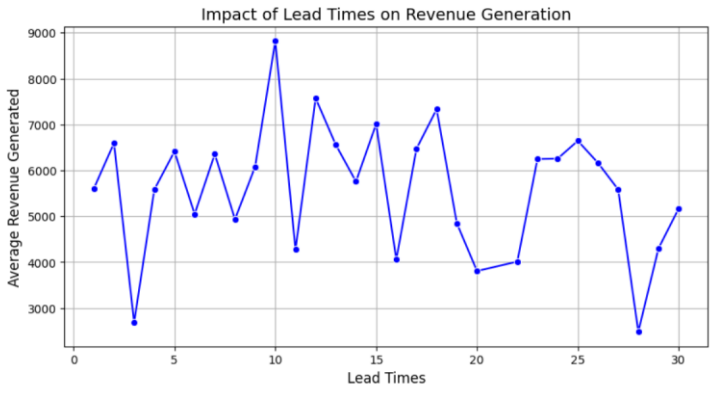
Customer demographics with lower shipping times and costs tend to make more purchases.
The "Unknown" and "Female" categories show the highest purchases, correlating with relatively lower shipping costs and times. **Longer shipping times (e.g., Male) are associated with fewer total purchases, indicating that faster delivery improves customer purchasing behavior.**

Cost & Efficiency Optimization

26. How do lead times impact revenue generation?

(SQL) (Python)

Lead_Times	Avg_Revenue
1	5602.419685000
2	6592.836230000
3	2686.505150000
4	5579.461940000
5	6413.054635000
6	5047.179350000
7	6354.600100000
8	4933.713880000
9	6080.127625000
10	8819.928783333
11	4272.427602500

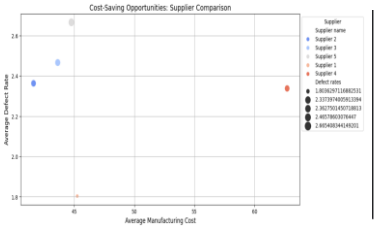


Revenue generation fluctuates with lead times, showing no clear linear correlation. However, shorter and moderate lead times generally correspond to higher revenue, suggesting that reducing lead times may improve sales.

27. Are there cost-saving opportunities by switching suppliers or shipping carriers?

(SQL) (Python)

Shipping_Carriers	Avg_Shipping_Cost	Avg_Shipping_Time
Carrier B	5.509247209	5.3023
Carrier A	5.554921785	6.1429
Carrier C	5.599290689	6.0345

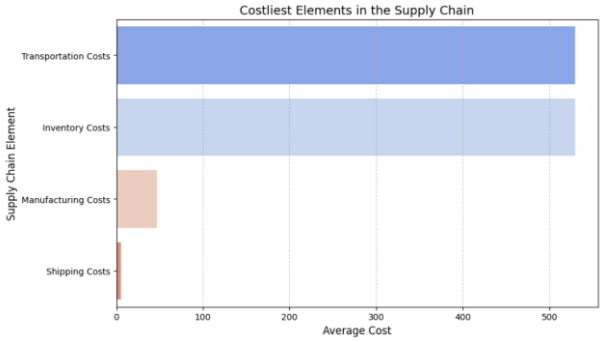


Carrier B offers the **lowest shipping costs and fastest delivery times**, indicating a cost-saving opportunity by switching from **Carriers A or C**. Similarly, evaluating supplier costs and defect rates can **help identify more efficient alternatives**.

28. What are the costliest elements in the supply chain?

(SQL) (Python)

Cost_Type	Avg_Cost
Transportation Costs	529.245782700
Inventory Costs	529.245782700
Manufacturing Costs	47.266693300
Shipping Costs	5.548148700

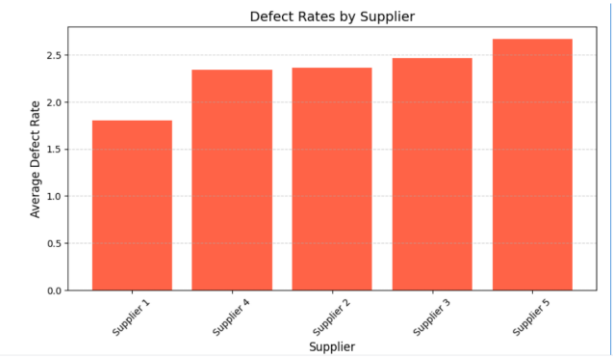


Transportation and inventory costs are the most significant expenses in the supply chain, while manufacturing and shipping costs are relatively lower. Optimizing transportation and inventory management could lead to major cost savings.

29. What strategies can be implemented to reduce defect rates?

(SQL) (Python)

Supplier_Name	Avg_Defect_Rate
Supplier 1	1.803630000
Supplier 4	2.337396666
Supplier 2	2.362749545
Supplier 3	2.465786000
Supplier 5	2.665408333



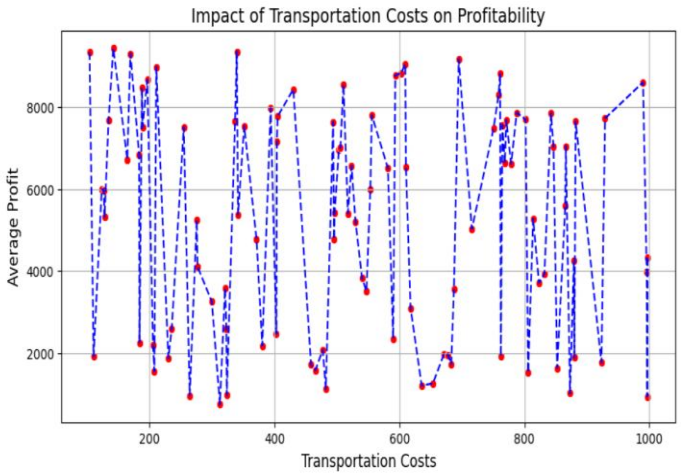
Supplier 1 has the **lowest defect rate (1.80)**, while **Supplier 5** has the **highest (2.67)**. Strategies to reduce defect rates include **enhanced quality control, supplier audits, and process improvements.**

30. How do transportation costs impact overall profitability?

(SQL)

Transportation_Costs	Avg_Profit
103.91625	9340.825780000
110.36434	1910.785470000
123.43703	5993.887590000
126.72303	5973.221090000
127.86180	5314.224990000
134.36910	7689.107460000
141.92028	9435.829350000
164.36653	6721.222820000
169.27180	9304.526230000
183.27290	6831.615090000
183.93297	2254.406960000
187.75208	8474.244710000
188.74214	7509.682630000
196.32945	8662.038120000
205.57200	2185.235870000
207.66321	1544.717880000
210.74301	8974.442820000

(Python)



Higher transportation costs do not show a clear correlation with profitability, as profits fluctuate across different cost levels. This suggests that other factors also influence overall profitability.