Supply Chain Data Project

Introduction

Supply chain analytics is an essential aspect of data-driven decision-making, enabling businesses in industries such as manufacturing, retail, healthcare, and logistics to optimize operations and achieve greater efficiency. By analyzing raw data related to the movement of products and services from suppliers to customers, businesses can uncover valuable insights and opportunities for improvement.

In this project, the primary goal is to explore revenue, manufacturing costs, profits margins, shipping costs, and logistics for a cosmetics company using SQL queries exclusively. By working directly with raw data, the focus remains on understanding the underlying structures, extracting meaningful information, and performing detailed analysis without reliance on visualization tools. This approach not only strengthens SQL proficiency but also fosters critical thinking in interpreting data directly.

Objective

Analyze revenue, manufacturing costs, profits margins, shipping costs, and logistics to improve decision-making.

Data Set

Here is a dataset we collected from a Fashion and Beauty startup. The dataset is based on the supply chain of Makeup products.

https://www.kaggle.com/datasets/harshsingh2209/supply-chain-analysis

Dataset Adjustment – Revenue Column Fix

Issue Identification:

The dataset contains a critical issue with the column **Revenue_generated**, as its values are incorrect and consistently lower than both the manufacturing and shipping costs.

This error impacts the accuracy of any revenue-based calculations and analysis.

Solution Approach:

1. Added a New Column:

   To address the issue, a new column **Revenue** was added to the table **supply_chain_data**

2. Defined Revenue Values:

   The new column **Revenue** was populated by multiplying the existing **Revenue_generated** column by a factor of 10. This adjustment ensures more realistic revenue numbers for analysis.

```sql
-- Step 1: Create a new column named 'Revenue' in the table
'supply_chain_data'.

ALTER TABLE [dbo].[supply_chain_data]
ADD Revenue NUMERIC;

ALTER TABLE [dbo].[supply_chain_data]
ALTER COLUMN Revenue DECIMAL(38,2);

 --Step 2: Populate the 'Revenue' column with the result of multiplying '
Revenue_generated' by 10.

UPDATE [dbo].[supply_chain_data]
SET Revenue = Revenue_generated * 10;
```

Outcome:

The adjusted **Revenue** column now reflects more accurate values, suitable for analytical purposes, and mitigates the initial data flaw

Questions to be answered

Revenue:

1. Which products generate the highest revenue overall?
2. What percentage of total revenue does each product type contribute?

Shipping Costs:

1. What percentage of total revenue is spent on shipping costs?
2. Which products have the highest shipping costs?
3. Are shipping costs proportional to product prices or revenue?

4. Which products have reduced profitability due to high shipping costs?

Manufacturing Costs:

1. What percentage of total revenue is attributed to manufacturing costs?
2. Which products have the highest profit margins (Revenue - Manufacturing Cost)?
3. Are there any products where manufacturing costs significantly outweigh revenue?

Profit Margins:

1. What is the profit margin for each product? Formula: (Revenue - Shipping Costs - Manufacturing Costs)
2. Which products have the best and worst profitability margins?
3. What share of total costs comes from shipping versus manufacturing?

Comparative Analysis:

1. Which products are most cost-efficient (low costs, high profitability)?

Questions and Answers:

Revenue:

1. Which products generate the highest revenue overall?

```sql
SELECT SKU, SUM(Revenue) AS HIGHEST_REV
FROM [dbo].[supply_chain_data]
GROUP BY SKU
ORDER BY HIGHEST_REV DESC;
```

2. What percentage of total revenue does each product type contribute?

```sql
SELECT Product_type,
SUM(Revenue) AS Total_Revenue,
    (SUM(Revenue) * 100.0 / (SELECT SUM(Revenue) FROM supply_chain_data))
    AS Percentage_Of_Total_Revenue
FROM supply_chain_data
GROUP BY Product_type;
```

Shipping Costs:

1. What percentage of total revenue is spent on shipping costs?

```sql
SELECT SUM(Shipping_costs) * 100 / SUM(Revenue) AS
Percentage_spent_on_shipping
FROM [dbo].[supply_chain_data]
```

2. Which products have the highest shipping costs?

```sql
SELECT SKU,
    MAX(Shipping_costs) AS Highest_Shipping_Cost
FROM [dbo].[supply_chain_data]
    GROUP BY SKU
    ORDER BY Highest_Shipping_Cost DESC;
```

3. Are shipping costs proportional to product prices or revenue?

You can calculate and analyze the ratio between shipping costs and product prices or revenue for each product.

```sql
SELECT SKU,
        AVG(price) AS Average_Price,
        AVG(Shipping_Costs) AS Average_Shipping_Cost,
        (AVG(Shipping_Costs) / AVG(price)) AS Shipping_Cost_To_Price_Ratio
FROM supply_chain_data
GROUP BY SKU
ORDER BY Shipping_Cost_To_Price_Ratio DESC;
```

4. Which products have reduced profitability due to high shipping costs?

```sql
SELECT SKU,
        SUM(Revenue) AS Total_Revenue,
        SUM(Manufacturing_Costs) AS Total_Manufacturing_Costs,
        SUM(Shipping_Costs) AS Total_Shipping_Costs,
        (SUM(Revenue) - SUM(Manufacturing_Costs) - SUM(Shipping_Costs)) AS
        Profit,
    (SUM(Shipping_Costs) * 100.0 / SUM(Revenue)) AS Shipping_Cost_Percentage
FROM supply_chain_data
GROUP BY SKU
ORDER BY Profit ASC;  -- Sorting by Profit to see products with lower
profitability
```

Manufacturing Costs:

1. What percentage of total revenue is attributed to manufacturing costs?

```sql
SELECT (SUM(Manufacturing_costs) / SUM(Revenue)) * 100 AS
Manufacturing_cost_percent
FROM supply_chain_data
```

2. Which products have the highest profit margins (Revenue - Manufacturing Cost)?

```sql
SELECT
    SKU AS Product, Revenue, manufacturing_costs,
(Revenue - manufacturing_costs) AS Profit_Margin
FROM [dbo].[supply_chain_data]
ORDER BY Profit_Margin DESC;
```

3. Are there any products where manufacturing costs significantly outweigh revenue?

```sql
SELECT SKU AS Product, Revenue, manufacturing_costs,
        manufacturing_costs - Revenue AS Cost_Exceeding_Revenue
FROM [dbo].[supply_chain_data]
WHERE manufacturing_costs > Revenue
ORDER BY Cost_Exceeding_Revenue DESC;
```

Profit Margins:

1. What is the profit margin for each product? Formula: (Revenue - Shipping Costs - Manufacturing Costs)

```sql
SELECT SKU AS Product, Revenue, shipping_costs, manufacturing_costs,
(Revenue - shipping_costs - manufacturing_costs) AS Profit_Margin
FROM [dbo].[supply_chain_data]
ORDER BY Profit_Margin DESC;
```

2. Which products have the best and worst profitability margins?

```sql
--TOP 5 BEST

SELECT TOP 5 SKU AS Product, Revenue, shipping_costs, manufacturing_costs,
 (Revenue - shipping_costs - manufacturing_costs) AS Profit_Margin
FROM [dbo].[supply_chain_data]
ORDER BY Profit_Margin DESC;

--TOP 5 WORST

SELECT TOP 5 SKU AS Product, Revenue, shipping_costs, manufacturing_costs,
 (Revenue - shipping_costs - manufacturing_costs) AS Profit_Margin
FROM [dbo].[supply_chain_data]
ORDER BY Profit_Margin ASC;
```

3. What share of total costs comes from shipping versus manufacturing?

```sql
SELECT
    (SUM(shipping_costs) / (SUM(shipping_costs) + SUM(manufacturing_costs)) *
100) AS Shipping_Cost_Percentage,
 (SUM(manufacturing_costs) / (SUM(shipping_costs) + SUM(manufacturing_costs))
* 100) AS Manufacturing_Cost_Percentage
 FROM [dbo].[supply_chain_data]
```

Comparative Analysis:

1. Which products are most cost-efficient (low costs, high profitability)?

```sql
SELECT SKU AS Product, Revenue,
 (manufacturing_costs + shipping_costs) AS Total_Costs,
 (Revenue - manufacturing_costs - shipping_costs) AS Profit_Margin,
    (Revenue - manufacturing_costs - shipping_costs) /
(manufacturing_costs + shipping_costs) AS Efficiency_Ratio
FROM [dbo].[supply_chain_data]
WHERE (manufacturing_costs + shipping_costs) > 0 -- Exclude rows with zero
or invalid costs
ORDER BY Efficiency_Ratio DESC; -- Sort by highest efficiency
```

Insights from Analysis

1. Highest Profit Margin Products:

Products with the highest profit margins were identified using the formula **(Revenue – manufacturing_costs – shipping_costs)** . These represent the most profitable items in the dataset

	Product	Revenue	shipping_costs	manufacturing_costs	Profit_Margin
1	SKU44	715228604943551450.00	7577449657376693.00	22554106620887744.00	685097048665287013.00
2	SKU41	552120525901097150.00	5773263743766654.00	953320645487725.00	545393941511842771.00
3	SKU33	514999835040803650.00	485827050343664.00	23853427512896133.00	490660580477563853.00
4	SKU81	438441340004586250.00	4066277501512044.00	19789592941903603.00	414585469561170603.00
5	SKU13	405273841623786670.00	9537283061108338.00	9782905011017327.00	385953653551661005.00
6	SKU62	389974683372922440.00	7291701388776776.00	21048642725168644.00	361634339258977020.00
7	SKU93	453140213369190950.00	70064320590043945.00	35633652343343876.00	347442240435803129.00
8	SKU82	294338186760945150.00	470818187354193.00	446527843494324.00	293420840730096633.00
9	SKU55	292567517030381260.00	5014364955030907.00	303235452566165.00	287249916622784188.00
10	SKU12	287374144602144130.00	1325274010184522.00	3232128621342403.00	282816741970617205.00

2. Product with Loss:

Certain products were revealed to have manufacturing costs significantly exceeding revenue. These products are financially underperforming and require review.

	Product	Revenue	manufacturing_costs	Cost_Exceeding_Revenue
1	SKU30	276634236686660890.00	516348934001109334.00	239714697731448444.00
2	SKU17	26293964348452620.00	476796803683555335.00	213857160199027155.00
3	SKU2	9577749625868730.00	30688019348284204.00	21110269722415474.00
4	SKU91	193520679350075990.00	397728825023399975.00	204208145672263985.00
5	SKU48	7397071004587180.00	23126363582464776.00	15729292577877596.00

3. Cost Efficiency:

Products with the highest profitability relative to total costs **(manufacturing_costs + shipping_costs)** were identified, showcasing those generating the most profit per unit of cost.

	Product	Revenue	Total_Costs	Profit_Margin	Efficiency_Ratio
1	SKU82	294338186760945150.00	917346030848517.00	293420840730096633.00	319.858407
2	SKU41	552120525901097150.00	6726584389254379.00	545393941511842771.00	81.080368
3	SKU1	746090006544584900.00	975019154038504.00	736339815004199860.00	75.520548
4	SKU12	287374144602144130.00	4557402631526925.00	282816741970617205.00	62.056562
5	SKU55	292567517030381260.00	5317600407597072.00	287249916622784188.00	54.018710
6	SKU22	239080786655617340.00	5968848853390039.00	233111937802227301.00	39.054756
7	SKU58	202114981033710770.00	6998585365940355.00	195116395667770415.00	27.879404
8	SKU44	715228604943551450.00	30131556278264437.00	685097048665287013.00	22.736862
9	SKU77	248376017754279470.00	11076191100517079.00	237299826653762391.00	21.424316
10	SKU46	255676736063359570.00	11803191158189245.00	243873544905170325.00	20.661661

4. Cost Distribution:

Shipping costs represent approximately **9.9%** and manufacturing costs **10.77%** of total expenses, highlighting areas where operational costs may be optimized

Analysis Results

1. Key Metrics:

Highest Profit Margin Product: **SKU44** with a margin of $**685097048665287013.00**

Lowest Profit Margin Product: **SKU48** with a margin of **$-86687624143428981.00**

Most Cost-Efficient Product: **SKU82** with an efficiency Ratio of **319.858407**

2. Recommendations:

- Optimize Shipping Costs: Evaluate logistical strategies to reduce shipping expenses, as they form a significant share of total costs.
- Revise Manufacturing Strategies: Review production costs for products with negative profit margins to identify inefficiencies.
- Pricing Alignment: Consider aligning product pricing better with associated costs, particularly for less profitable SKUs.