

# Supply Chain Analytics Project

## Complete Documentation

**Project Title:** Supply Chain Data Analytics

**Industry:** Beauty & Personal Care

**Market:** India

**Tool Used:** Microsoft Power BI

**Date:** November 2025

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## Table of Contents

1. Project Introduction
  2. Scope of Work
  3. Analysis Methodology
  4. Analysis Results
  5. Challenges and Solutions
  6. Future of the Project
  7. Appendices and References
  8. Conclusion
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## 1. Project Introduction

### 1.1 Project Overview

This project focuses on analyzing supply chain data for Velora, a beauty and personal care company operating in the Indian market. The analysis encompasses product performance, supplier efficiency, logistics optimization, and quality control monitoring using Microsoft Power BI as the primary analytical tool.

The company manages a diverse portfolio of 100 Stock Keeping Units (SKUs) across three main product categories: Skincare, Haircare, and Cosmetics. Operations span five major Indian cities (Mumbai, Delhi, Bangalore, Chennai, and Kolkata) with five primary suppliers supporting the supply chain.

## 1.2 About Company

Velora is a modern beauty and personal care company that specializes in high-quality skincare and

haircare products. The company focuses on blending innovation, sustainability, and efficiency across its entire supply chain — from sourcing raw materials to delivering finished products to customers.

## 1.3 Problem Overview & Stakeholders

- **Main Problem**

Velora is facing increasing operational challenges as it expands its product distribution across India. Despite strong demand for its haircare and skincare products, the company struggles with inconsistent stock availability, fluctuating supplier lead times, and a lack of unified visibility across sales, inventory, and production data.

- **Stakeholders**

Supply Chain Manager, Procurement Team, Manufacturing Department, Quality Control Team

- **Key Performance Indicators (KPIs)**

Total Revenue, Units Sold, Average Lead Time, Out-of-Stock Rate

## 1.4 Business Objectives

- Understand sales performance across SKU categories.
- Evaluate stock availability and identify risk of stockouts.
- Analyze supplier lead times and their impact on inventory planning.
- Identify customer demographic patterns that influence product demand.
- Provide management with clear dashboards for weekly and monthly monitoring.

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## 2. Scope of Work

### 2.1 Data Sources

#### Primary Data Source:

- File Name: `supply_chain_data.csv`

**Data Collection Method:**

- Exported from company's supply chain management system
- Single flat file containing all operational data

The analysis is based on an internal dataset containing:

- Product information (SKU, price, product type)
- Sales data (units sold, revenue)
- Inventory data (stock levels, availability, Order Lead times, Order quantities)
- shipping data(Shipping times, Shipping carriers, Shipping costs)
- Transportation (Transportation modes, Routes, Costs)
- Supplier-related data (Supplier name, Location, Lead time, Production volumes, Manufacturing lead time, Manufacturing costs, Inspection results, Defect rates)
- Customer demographics

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## **3. Analysis Methodology**

### **3.1 Tools and Technologies**

**Primary Tool:****Microsoft Power BI Desktop**

- Used for: Data modeling, visualization, dashboard creation

**Supporting Tools:****Power Query (M Language):**

- Data extraction from CSV
- Data transformation and cleaning
- Creating calculated columns
- Merging and appending queries

**DAX (Data Analysis Expressions):**

- Creating calculated measures
- Defining KPIs

### **3.2 Data Cleaning Process**

During the data cleaning phase, all datasets were thoroughly checked for accuracy, consistency, and completeness. Key tasks included:

- Removing duplicates
- Handling missing values
- Standardizing formats (numeric, categories, etc.)
- Verifying logical relationships between variables

All data points were accurate and well-structured, with no major issues found — except one:

#### Incorrect Revenue Calculation

The revenue was initially calculated incorrectly. After review, we corrected the formula to:

Revenue = Number of Products Sold × Price per Unit

calculated columns:

1. Total Cost = Manufacturing costs + Shipping costs + costs
2. Cost Per Unit = Total Cost / Production Volumes
3. Cost of unit sold = Cost Per Unit \* Number of products sold
4. Total Profit = Revenue - Cost of unit Sold

#### Data Adjustments - Lead Time Terminology

The previously ambiguous lead times were renamed to better reflect their specific purposes:

- Order Lead Time: The time required to order or receive products from suppliers.
- Material Lead Time: The time required to obtain products or materials from a particular supplier.

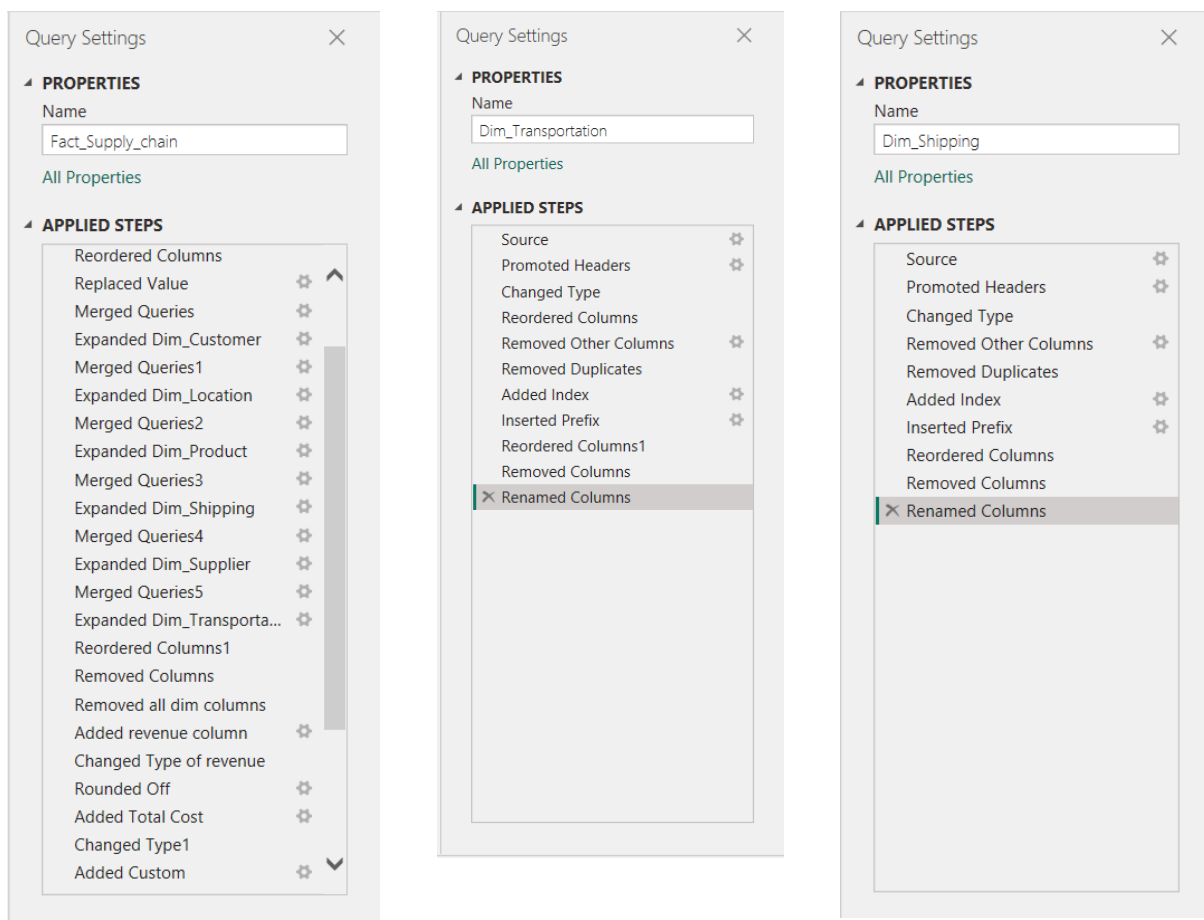
## 3.3 Data Modeling

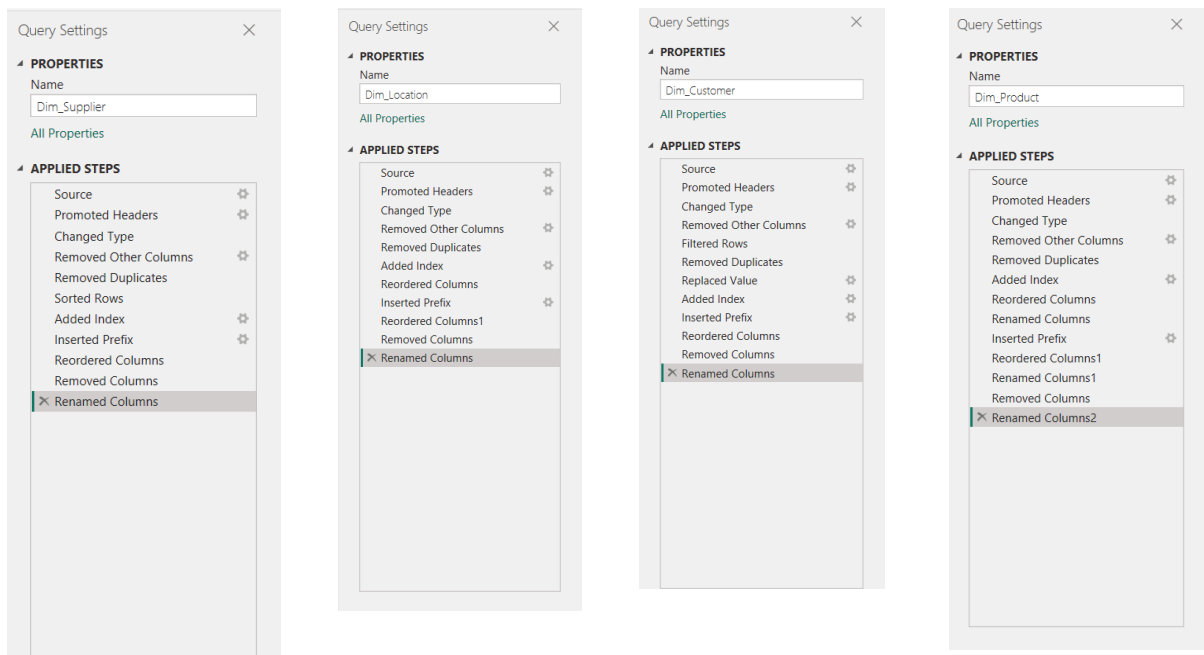
Tables Overview:

1. Dim\_Products Table
  - o Key Columns: Product Key (PK), Product Type
2. Dim\_Customer Table:
  - o Key Columns: Customer Key (PK), Customer demographics

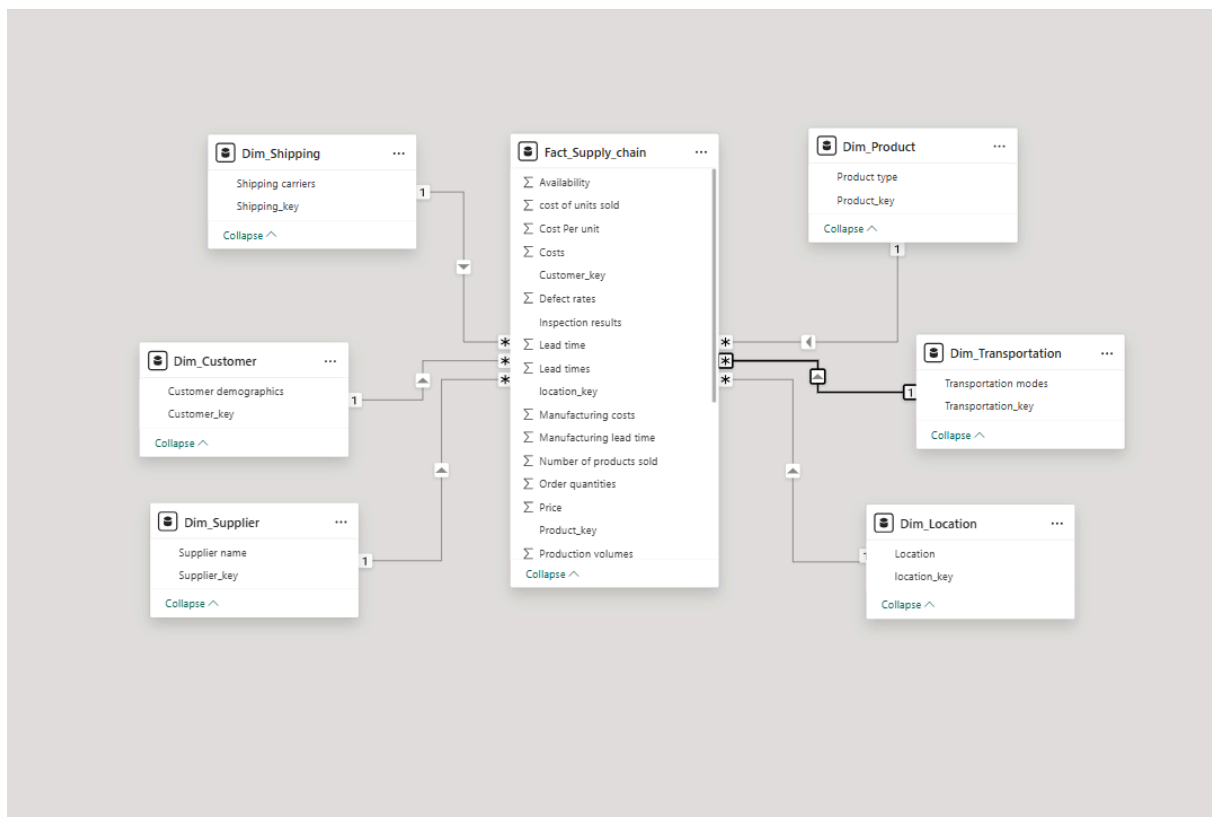
3. Dim\_Suppliers Table
  - o Key Columns: Supplier Key (PK), Supplier Name
4. Dim\_Location Table
  - o Key Columns: Location Key (PK), Location
5. Dim\_Shipping Table
  - o Key Columns: Shipping Key (PK), Shipping carriers
6. Dim\_Transportation Table:
  - o Key Columns: Transportation key (PK), Transportation modes
7. Fact Supply Chain Table:
  - o Key Columns: Customer\_key, location\_key, Product\_key, Shipping\_key, Supplier\_key, Tarnsportation\_key, SKU (PK), Price, Availability, Number of products sold, Revenue generated, Stock levels, Lead times, Order quantities, Shipping times, Shipping carriers, Shipping costs, Location, Lead time, Production volumes, Manufacturing lead time, Manufacturing costs, Inspection results, Defect rates, Routes, Costs, Total Cost, Cost Per Unit, Cost of unit sold, Total Profit

**And these are the steps in power query**





Connect Dim\_Tables with Fact\_Table to create **Star Schema**



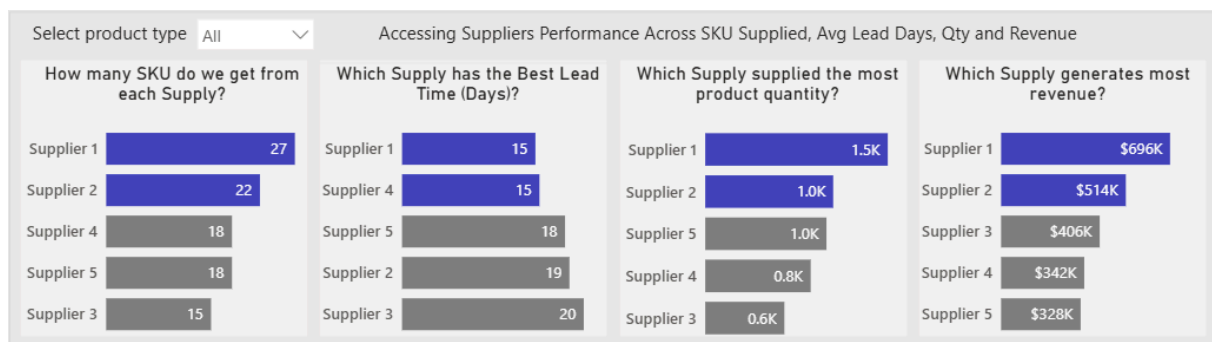
## 4. Analysis Results

## Key Visualizations and Dashboards

### Dashboard 1: Supply Operations Overview

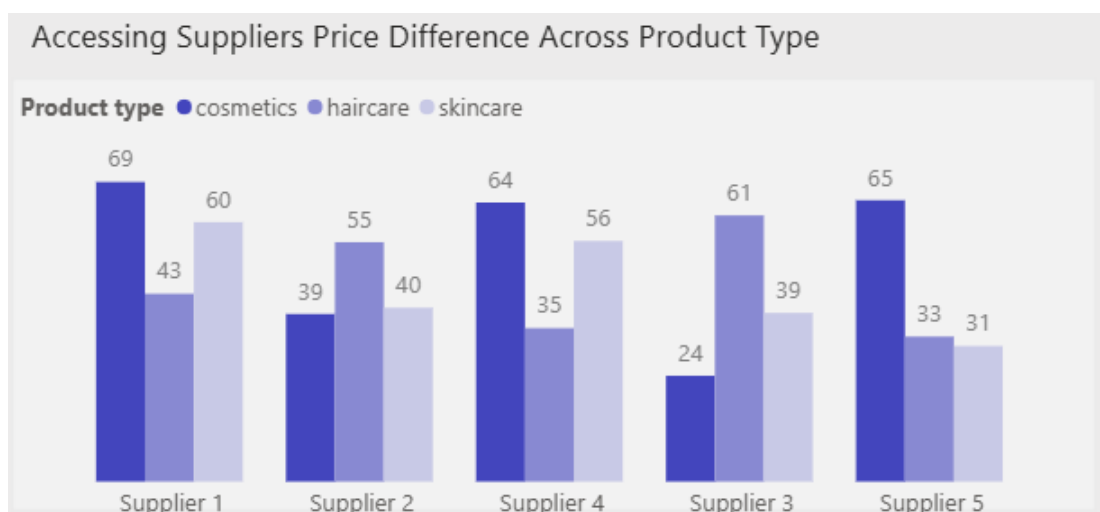
#### Key Performance Indicators (KPIs)

- **Ordered Quantity:** 4,922 units
- **Total Cost:** \$58.21K
- **Average Material Lead Time:** 17.08 days
- **Average Manufacturing Lead Time:** 14.77 days
- **Average Defect Rates:** 2.28%



#### Key Findings:

- Supplier 1 is the primary vendor with the broadest product range (27 SKUs), indicating strong dependency and potential single-point-of-failure risk.



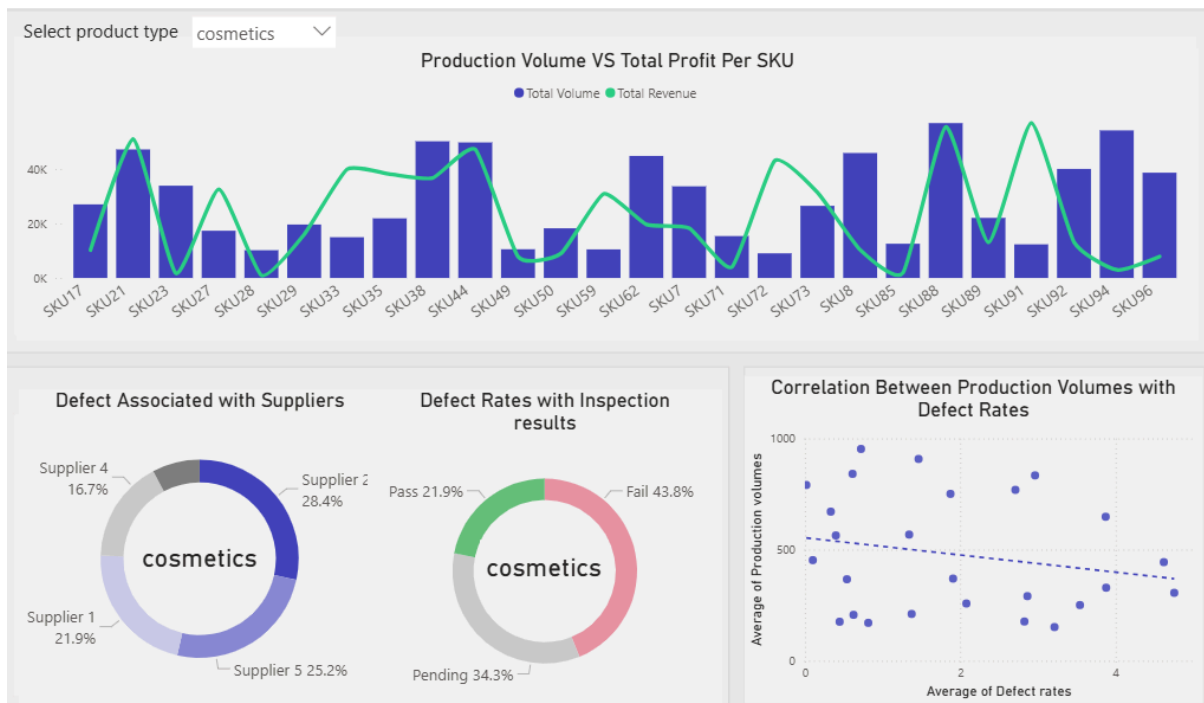
#### Key Findings:

- Supplier 1: The Least avg price in Cosmetic Products

- Supplier 5: The least avg price in Haircare Products
- Supplier 5: The least avg price in Skincare Products

## Dashboard 2: Manufacturing & Quality Control

- **Total SKUs:** 40 products tracked
- **Production Volume:** 24K units
- **Avg Manufacturing Cost:** \$48.99
- **Avg Manufacturing Lead Time:** 13.78 days
- **Average Defect Rates:** 2.33%



### Key Findings:

- SKU47 is the most Production Volume by 964 and highest Revenue Generating by 87k\$
- Supplier 1 The most defect rate percentage by 26.9%
- Defect Rate increase with increasing production volume of Haircare Products

## Dashboard 3: Inventory & Logistics

- **Total Stock Value:** \$244K
- **Turnover Ratio:** 9.65
- **Out of Stock Items:** 1 product



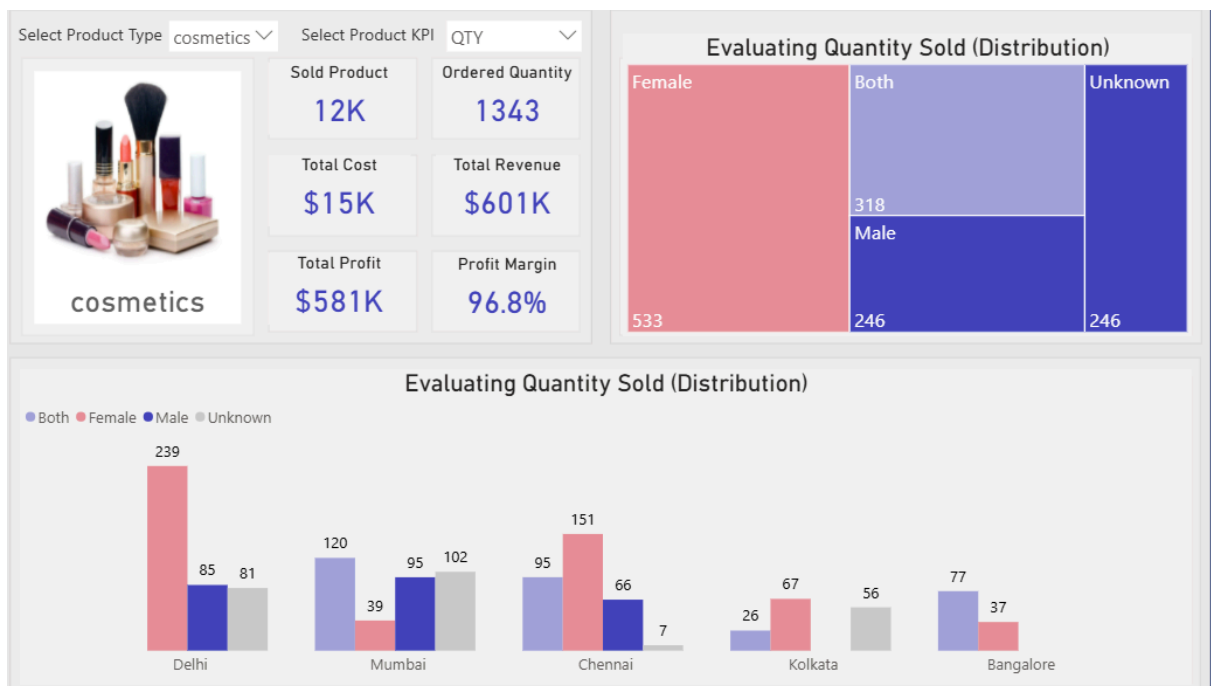
- **Low Stock Products:** 14 items

#### Key Findings:

- Route A delivers 43% of total volume
- Rail transportation handles 28% of shipments
- Carrier B is the most utilized shipping partner
- Top SKUs by order quantities with stock levels and Availability

### Dashboard 4: Sales & Customer Analysis

- **Total Ordered Quantity:** 4,922 units
- **Total Revenue:** \$2.29M
- **Total Profit:** \$2.23M
- **Profit Margin:** 97.4%



#### Key Findings:

- Skin care products generated The highest revenue by 1M\$ with 97.7% margin
- Female Customer achieve the most ordered quantity in Cosmetic Product
- Haircare products have consistent demand across demographics

## 5. Conclusions and Recommendations

### Conclusions

1. The supply chain shows overall healthy performance with high profit margins
2. Supplier quality control presents the biggest improvement opportunity
3. Logistics operations are well-optimized with balanced carrier usage
4. Inventory management maintains good turnover ratios

## **Recommendations**

### **Immediate Actions**

#### **1. Supplier Quality Improvement**

- Implement quality audits for Supplier 1
- Establish defect rate reduction targets
- Create supplier scorecard system

#### **2. Inventory Optimization**

- Address 14 low-stock products
- Implement automated reordering for high-turnover SKUs
- Optimize safety stock levels

### **Strategic Initiatives**

#### **1. Process Improvement**

- Reduce manufacturing lead times from 13.78 days
- Implement lean manufacturing principles
- Standardize quality inspection processes

#### **2. Technology Enhancement**

- Implement real-time inventory tracking
- Develop predictive analytics for demand forecasting
- Create supplier portal for performance transparency

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## **6. Challenges and Solutions**

### **Challenges Faced**

1. **Data Quality:** Inconsistent Revenue generated and Not logical
2. **Integration:** Multiple data sources with different formats

### **Solutions Implemented**

1. **Data Cleaning:** Standardized Revenue calculations
  2. **Data Modeling:** Optimized relationships and calculated columns
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## 7. Future Project Development

### Next Steps

1. **Expand Data Sources**
    - Integrate real-time sales data
    - Add weather and external factor data
    - Include customer feedback and returns data
  2. **Advanced Analytics**
    - Predictive modeling for demand forecasting
    - Machine learning for defect prediction
    - Optimization algorithms for route planning
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## 8. Appendices and References

### Data References

- Primary dataset: `supply_chain_data.csv`
- Dashboard screenshots and configurations
- Power BI report file (.pbix)

### Technical References

- Microsoft Power BI Documentation
  - Industry best practices for supply chain analytics
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## 9. Conclusion

### Summary

This supply chain analysis project successfully transformed raw data into actionable business intelligence. The Power BI dashboards provide comprehensive visibility across manufacturing, logistics, inventory, and sales operations, enabling data-driven decision making and continuous improvement.

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**Prepared By: Mohamed Hesham**

**Contact:** mohishamwork@gmail.com