Optimizing Supply Chain Using Shipment Pricing Data

Introduction

In the modern global economy, supply chain efficiency plays a critical role in ensuring timely delivery and cost control—especially when it comes to health commodities. For this project, I analyzed the SCMS (Supply Chain Management System) Delivery History Dataset, which contains over 10,000 records of international shipments. My objective was to uncover insights related to pricing, shipment modes, country-level performance, and vendor contribution—ultimately to support smarter decision-making in supply chain logistics.

About the Dataset

The dataset used in this analysis is titled `SCMS_Delivery_History_Dataset.csv`. It includes 10,324 records of shipment transactions and contains details such as:

- Country of delivery
- Shipment mode (Air, Sea, etc.)
- Pack price and unit costs
- Vendor and manufacturing site
- Product descriptions and delivery dates

This data represents real-world scenarios involving global shipments of health-related commodities across multiple countries.

Project Objectives

The main goals I set for this project were:

- To identify which countries account for the highest volume and cost of shipments.
- To evaluate the efficiency and usage frequency of different shipment modes.
- To find out which manufacturers are most active and reliable.
- To derive business-level insights from the trends I observed.

Approach and Tools Used

The analysis was performed using **Python** in a **Jupyter Notebook** environment. I used libraries such as:

- **Pandas** for data handling and cleaning
- **Seaborn**, **Matplotlib**, and **Plotly** for visualization
- **NumPy** for statistical calculations

Here's a summary of my workflow:

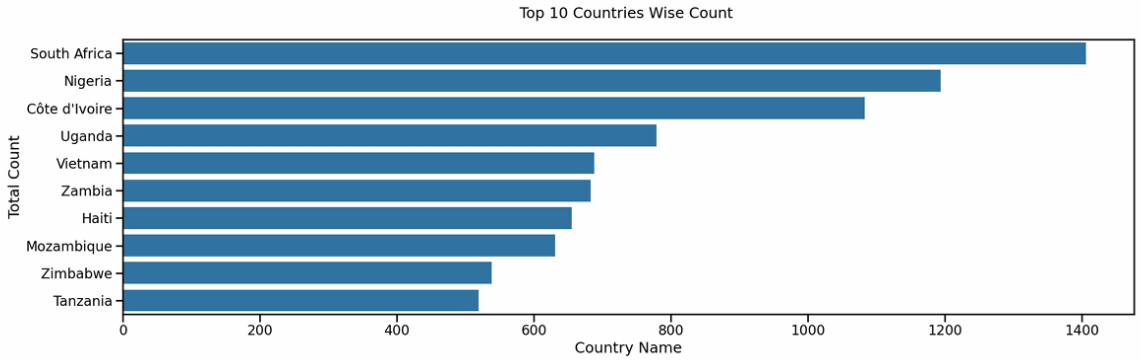
1. Loaded and cleaned the dataset, filling or removing missing values.
2. Performed exploratory data analysis (EDA) to understand distributions and trends.

3. Generated visualizations to represent country-wise shipment counts, pricing patterns, and manufacturer performance.
4. Interpreted results to draw meaningful business insights.

Key Findings

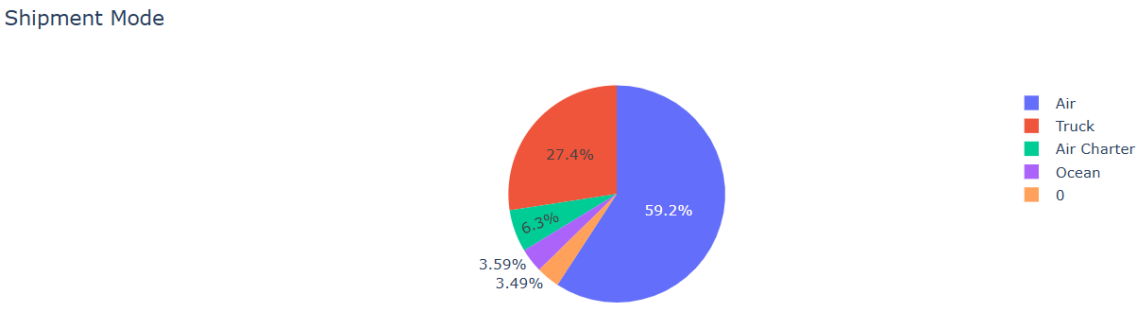
1. Top Countries by Shipment Volume and Cost

- **Shipment Volume**:
  - South Africa: 1,406 shipments
  - Nigeria: 1,194 shipments
  - Côte d'Ivoire: 1,083 shipments
- **Total Pack Price**:
  - Nigeria: $25,620.72
  - South Africa: $24,318.90
  - Côte d'Ivoire: $22,882.35



2. Shipment Mode Distribution

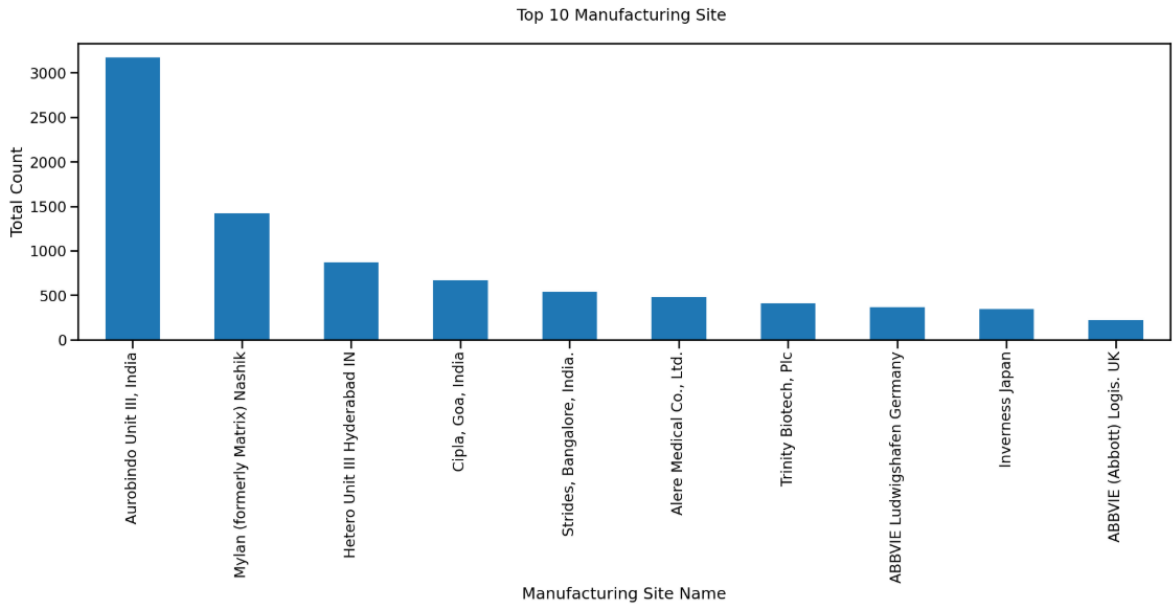
- The most frequently used shipping mode was **Air**, followed by other methods like sea and road.
- For air shipments specifically:
    - **Maximum units per shipment**: 1,000
    - **Minimum**: 1
    - **Average**: 82.35 units



This indicates that Air is heavily used, possibly due to the urgency or sensitivity of products.

3. Manufacturer Analysis

- **Top Manufacturer (Overall and for Air shipments)**:
    - *Aurobindo Unit III, India*
        - Overall shipments: 3,172
        - Air shipments: 1,694



This shows that some vendors consistently fulfill large volumes and could be prioritized in procurement planning.

Business Learnings

Based on the insights gathered, here are some key business-level takeaways:

- **Focus on High-Impact Countries**

  Countries like Nigeria and South Africa not only receive high volumes but also incur significant costs. Strategic focus—like better local partnerships or in-region warehouses—could help reduce expenses and improve delivery times.

- **Evaluate Shipment Mode Policies**

  Air shipments dominate the dataset. While fast, they may not always be cost-efficient. Organizations can explore a hybrid model (air + sea) depending on urgency to optimize both speed and cost.

❖ **Vendor Performance Matters**

Vendors like Aurobindo consistently delivered large volumes, especially via air. Identifying such reliable suppliers helps streamline procurement and reduce delays or shortages.

Conclusion

This project gave me hands-on experience in analyzing real-world supply chain data and applying data visualization techniques to drive actionable insights. It was interesting to see how patterns in pricing, shipment modes, and vendor behavior could influence major business decisions. Overall, the analysis provides a strong foundation for supply chain optimization, particularly for global health organizations looking to deliver commodities efficiently and affordably.

Next Steps

If I were to continue this project, I would explore:

- Cost-benefit analysis between air and sea shipments.
- Shipment delays and their correlation with mode or vendor.
- Machine learning models to predict optimal shipment methods.

Tools Used

- Python 3.10+
- Jupyter Notebook
- pandas, matplotlib, seaborn, plotly
- Dataset: SCMS_Delivery_History_Dataset.csv