### Requirements-

=>Supplier Performance

=>logistic costs

=>delivery times

=>inventory levels

key features -

-supplier performance matrics =>on timme deleivery , quality things

-logistics and transportation cost analysis`

-Delivery time trends and analysis

-Inventory levels and reorder points

-Interactive filters for suppliers, products, and regions

**Information about dataset-**

Dataset is divided into 7 tables, one table for all orders that needs to be assigned a route – OrderList table, and 6 additional files specifying the problem and restrictions. For instance, the FreightRates table describes all available couriers, the weight gaps for each individual lane and rates associated. The PlantPorts table describes the allowed links between the warehouses and shipping ports in real world. Furthermore, the ProductsPerPlant table lists all supported warehouse-product combinations. The VmiCustomers lists all special cases, where warehouse is only allowed to support specific customer, while any other non-listed warehouse can supply any customer. Moreover, the WhCapacities lists warehouse capacities measured in number of orders per day and the WhCosts specifies the cost associated in storing the products in given warehouse measured in dollars per unit.

Order ID is ID of the order made by the customer, product ID is the specific product ID customer ordered.

"tpt\_day\_cnt" in the FrieghtRates table means transportation day count, i.e. estimated shipping time.

WhCapacities correspond to the number of orders. For example, let's say Customer 1 requests 10 units of X, Customer 2 requests 20 units of Y. The total number of orders is 2, thus total capacity in "whCapacity" is 2.

WhCapacities table is the maximum number of orders that can be processed per each plant, it is not dependant on specific products.

The OrderList contains historical records of how the orders were routed and demand satisfied. The whCapacities and rest of the tables are the current state constraints of the network. Thus, we can calculate the costs of historical network and also optimize for the new constraints.

In order to build Linear Programming (LP) model, you would take the following from the OrderList: the product ID that needs to be shipped, the destination port, unit quantity (for cost) and unit weight (for weight constraints). And then use the limits of those constraints from other tables.

Questions: There is a Carrier V44\_3 in OrderList table, but it is missing in the FreightRates table? V44\_3 is a carrier that was historically used for supplying given demand, but since it has been discontinued and therefore do not appear in the Freight Rates List. Also, all of the V44\_3 instances are CRF - i.e. customer arranges their own shipping and hence cost is not calculated either way.

**Meaning of some phrases**

Ship ahead day count=>the no of days before the schedule sheep date that a customer accepts early shipments

Ship late day count=>A shipment that has been delivered on or before the expected delivery date

Plant

Definition: A plant is a manufacturing facility where raw materials are transformed into finished products. It may also include processing, assembly, or packaging operations.

Function:

Production: Plants are primarily focused on the production of goods.

Operations: Involves manufacturing processes, quality control, and labor management.

Inventory Management: Plants manage raw materials and finished goods inventories.

Location: Usually situated near suppliers or markets for logistical efficiency.

Example: A factory that produces electronics, such as smartphones or computers.

Port

Definition: A port is a location where ships dock to load and unload cargo. It serves as a transportation hub for the transfer of goods between different transport modes (e.g., ship, truck, rail).

Function:

Logistics: Facilitates the import and export of goods across international borders.

Customs Clearance: Handles regulatory checks and documentation for international shipments.

Transshipment: Often serves as a point for transferring cargo between vessels or other transport modes.

Location: Typically located along coastlines or rivers to provide access for maritime transport.

Example: The Port of Los Angeles, where goods are imported from ships and then distributed to warehouses or manufacturing facilities

=>Fright Rates- Transportation rate/ costs

-minimum costs- optimal expenditure (खर्च) required to move goods from one to another location while maintaining efficiency and effectiveness

- max costs- highest possible expenditure (खर्च) required to move goods from one to another location while maintaining efficiency and effectiveness

**Insights-**

Dropdown – suppliers (Origin port Code)

Checkbox/dropdown – mode\_dsc

**1)supplier performance matrics =>on timme deleivery , quality things**

+Suppliler plants by count of early, late and on time delivery

**2) logistics and transportation cost analysis**

+ max\_wgh\_qty by minimum cost (pie chart)

**3) Delivery time trends and analysis**

Power Bi- From Chat Gpt

**Dashboard Insights for Supplier Performance**

**1. On-Time Delivery Metrics**

* **Metric: Delivery Frequency**
  + **Visual**: Bar chart showing the number of deliveries per day.
  + **Insight**: Indicates the supplier's operational capacity and consistency. For instance, if most records are on a single day, it shows high activity on that date.
* **Metric: Average Delivery Time**
  + **Calculation**: Calculate the average time taken for deliveries based on the provided transportation day count.
  + **Visual**: Gauge or KPI card displaying the average delivery time (e.g., 2 days).
  + **Insight**: Highlights how well the supplier meets expected delivery timelines.
* **Metric: On-Time Delivery Rate**
  + **Visual**: Pie chart showing the percentage of on-time deliveries versus late deliveries (if you have additional data to compare).
  + **Insight**: A high percentage reflects reliability, while a lower percentage indicates areas needing improvement.

**2. Quality Metrics**

* **Metric: Cost Efficiency by Weight**
  + **Calculation**: Average rate per weight category (e.g., average rate for minimum and maximum weights).
  + **Visual**: Line chart showing rate trends by weight range.
  + **Insight**: This illustrates how costs vary with weight and can indicate potential areas for better pricing strategies.
* **Metric: Value Distribution**
  + **Visual**: Box plot showing the distribution of values associated with deliveries.
  + **Insight**: This can help assess quality by visualizing the range and median of value per delivery. Outliers could indicate exceptional quality.
* **Metric: Shipment Quality Ratings**
  + **Visual**: If available, a scorecard or bar chart displaying customer feedback ratings or quality assessments per delivery.
  + **Insight**: Direct customer feedback can provide qualitative insight into the supplier's performance.

**3. Overall Performance Summary**

* **KPI Dashboard Cards**
  + **On-Time Delivery Rate**: Displays the percentage of deliveries completed on time.
  + **Average Delivery Cost**: Shows average cost per shipment based on the provided rates.
  + **Overall Quality Score**: An aggregated score based on customer feedback (if available) or calculated from value metrics.
* **Performance Trend Analysis**
  + **Visual**: Line graph showing the trend of on-time deliveries and average quality scores over time.
  + **Insight**: This can highlight improvements or declines in performance, allowing for trend analysis over a specific period.

**Additional Considerations for Power BI**

* **Filters**: Implement filters for date ranges, specific carriers, or weight categories to allow users to drill down into specific data points.
* **Data Sources**: Ensure that your Power BI dashboard can connect to and refresh from the datasets you have, maintaining accuracy.
* **Data Quality**: Validate the data for completeness, especially regarding on-time delivery and quality ratings.

**Dashboard Insights for Logistics and Transportation Cost Analysis**

**1. Cost Metrics Overview**

* **Metric: Average Transportation Cost**
  + **Calculation**: Average cost per delivery based on the rates provided in the second table.
  + **Visual**: KPI card displaying the average cost (e.g., "Average Cost per Delivery: $X").
  + **Insight**: Provides a quick view of the general cost level for shipments.
* **Metric: Total Transportation Cost**
  + **Calculation**: Sum of all minimum costs from the second table.
  + **Visual**: Card or bar chart showing total cost.
  + **Insight**: Indicates the overall expenditure on logistics for the recorded period.

**2. Cost Breakdown by Weight**

* **Metric: Cost by Weight Range**
  + **Calculation**: Create categories for weight ranges (e.g., <100 lbs, 100-500 lbs, 500+ lbs) and calculate average costs for each range.
  + **Visual**: Stacked bar chart or column chart displaying average cost by weight category.
  + **Insight**: Helps identify how costs change with shipment size.

**3. Cost vs. Quality Analysis**

* **Metric: Value vs. Cost Analysis**
  + **Visual**: Scatter plot showing the relationship between shipment value (from the first dataset) and transportation cost (from the second dataset).
  + **Insight**: This visual can indicate whether higher costs correspond to higher quality/value, helping assess cost-effectiveness.

**4. Trend Analysis**

* **Metric: Cost Trend Over Time**
  + **Calculation**: If you can aggregate data over time (e.g., by week or month), calculate the total costs and average costs over those periods.
  + **Visual**: Line graph showing trends in total and average costs over time.
  + **Insight**: Highlights any increasing or decreasing trends in logistics costs, providing valuable insight into budget management.

**5. Cost Comparison**

* **Metric: Cost Comparison by Service Type**
  + **Visual**: Bar chart comparing costs for different service codes (in this case, all are "DTD," but if expanded data becomes available, it can show variations).
  + **Insight**: This helps evaluate if alternative services could provide cost savings.

**6. Supplier Performance Metrics**

* **Metric: Cost Efficiency per Supplier/Carrier**
  + **Calculation**: Average cost per carrier based on the data provided.
  + **Visual**: Bar chart comparing costs across different carriers (if data for multiple carriers is available).
  + **Insight**: This can indicate which carriers offer the best cost-to-service ratio.

**Additional Considerations for Power BI**

* **Filters**: Include filters for date ranges, weight categories, or specific service types to allow users to drill down into relevant data.
* **Dynamic Visuals**: Use slicers to enable users to segment data by weight range, carrier, or service type for deeper insights.
* **Data Refresh**: Ensure that your Power BI model can refresh data from the source tables to keep the analysis current.

**Dashboard Insights for Delivery Time Trends and Analysis**

**1. Delivery Time Overview**

* **Metric: Average Delivery Time**
  + **Calculation**: Based on the transportation day count from the second dataset, calculate the average delivery time.
  + **Visual**: KPI card displaying the average delivery time (e.g., "Average Delivery Time: 2 Days").
  + **Insight**: Provides a quick reference for how long deliveries typically take.

**2. Delivery Time Distribution**

* **Metric: Delivery Time Range**
  + **Calculation**: Create bins for delivery times (e.g., 1 day, 2 days, 3 days).
  + **Visual**: Histogram showing the frequency of deliveries in each time bin.
  + **Insight**: Highlights how delivery times are distributed, indicating any delays or consistent performance.

**3. Trends Over Time**

* **Metric: Delivery Time Trend Analysis**
  + **Calculation**: If you have historical data, calculate average delivery times over weeks or months.
  + **Visual**: Line graph showing average delivery times over the selected period.
  + **Insight**: This visual helps identify trends, such as improvements or declines in delivery performance over time.

**4. On-Time Delivery Rate**

* **Metric: On-Time Delivery Percentage**
  + **Calculation**: If you have data on actual versus promised delivery times, calculate the percentage of deliveries completed on time.
  + **Visual**: Pie chart showing on-time vs. late deliveries.
  + **Insight**: A high on-time delivery rate reflects reliability, while a lower rate highlights areas for improvement.

**5. Delivery Time by Weight Category**

* **Metric: Average Delivery Time by Weight**
  + **Calculation**: Group data by weight categories (e.g., <100 lbs, 100-500 lbs) and calculate the average delivery time for each.
  + **Visual**: Bar chart showing average delivery times across different weight categories.
  + **Insight**: This can indicate if heavier shipments tend to take longer, helping to assess operational efficiency.

**6. Delivery Time vs. Cost Analysis**

* **Metric: Delivery Time vs. Cost Correlation**
  + **Visual**: Scatter plot comparing delivery time (from the second dataset) and transportation cost (from the first dataset).
  + **Insight**: Helps determine if there is a correlation between delivery times and costs, which could inform pricing and service decisions.

**. Current Inventory Levels**

* **Metric: Inventory Levels Overview**
  + **Calculation**: If the first dataset represents shipments or deliveries, you may calculate current inventory levels based on incoming and outgoing shipments. For example, if the dataset indicates deliveries, subtract delivered quantities from the total inventory.
  + **Visual**: KPI card showing current inventory levels (e.g., "Current Inventory: X Units").
  + **Insight**: Provides a snapshot of current stock status.

**2. Reorder Points**

* **Metric: Reorder Point Calculation**
  + **Definition**: Reorder point is typically calculated using the formula: Reorder Point=Lead Time Demand\text{Reorder Point} = \text{Lead Time Demand}Reorder Point=Lead Time Demand where Lead Time Demand = Average Daily Usage × Lead Time in Days.
  + **Visual**: Table displaying reorder points for different items (if item-specific data is available).
  + **Insight**: This highlights when to reorder based on inventory levels and average usage.

**3. Inventory Turnover Rate**

* **Metric: Inventory Turnover Ratio**
  + **Calculation**: Calculate how often inventory is sold and replaced over a period: Inventory Turnover Ratio=Cost of Goods SoldAverage Inventory\text{Inventory Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}Inventory Turnover Ratio=Average InventoryCost of Goods Sold​
  + **Visual**: Line graph showing inventory turnover over time.
  + **Insight**: A high turnover ratio indicates effective inventory management.

**4. Stockout Analysis**

* **Metric: Stockout Incidents**
  + **Calculation**: Identify any instances where inventory levels fell below reorder points.
  + **Visual**: Bar chart displaying the number of stockouts over time.
  + **Insight**: This can indicate the effectiveness of current inventory management strategies and highlight areas needing improvement.

**5. Historical Inventory Trends**

* **Metric: Inventory Levels Over Time**
  + **Calculation**: Track inventory levels over time based on incoming shipments and outgoing deliveries.
  + **Visual**: Line graph showing trends in inventory levels over time.
  + **Insight**: This can help identify seasonal patterns or trends in inventory management.

**6. Lead Time Analysis**

* **Metric: Average Lead Time**
  + **Calculation**: If lead times can be estimated based on delivery times or historical data, calculate the average lead time for inventory replenishment.
  + **Visual**: Gauge or KPI card displaying average lead time (e.g., "Average Lead Time: X Days").
  + **Insight**: This can help in planning reorder points more accurately.

**Additional Considerations for Power BI**

* **Filters**: Include filters for specific products or categories to allow users to drill down into inventory management data.
* **Dynamic Interactivity**: Use slicers to let users select time periods, product categories, or inventory status (in-stock, low stock, etc.).
* **Data Refresh**: Ensure the dashboard is set up to refresh with new data on inventory levels and sales.

### Interactive Filters Setup in Power BI Dashboard

#### 1. ****Data Model Preparation****

Before implementing the filters, ensure your data model is structured appropriately:

* **Combine Datasets**: If applicable, join or relate your datasets in Power BI. For example, if you have separate tables for suppliers, products, and regions, link them based on relevant keys.
* **Create Dimension Tables**: Consider creating dimension tables for Suppliers, Products, and Regions if they aren't already included in your datasets.

#### 2. ****Creating Interactive Filters****

##### a. **Supplier Filter**

* **Field**: Use the carrier/supplier identifier (e.g., V444\_0, V444\_6).
* **Visual**: Slicer
  + **Type**: Dropdown or list slicer.
  + **Configuration**: Include all unique suppliers from your datasets.
* **Insight**: Users can filter metrics and visuals based on selected suppliers, allowing for comparison of performance.

##### b. **Product Filter**

* **Field**: If products are identifiable within your datasets (e.g., through product IDs or names), include this.
* **Visual**: Slicer
  + **Type**: Dropdown or multi-select slicer.
  + **Configuration**: Populate with unique product names or IDs.
* **Insight**: Users can view metrics related to specific products, helping analyze performance and trends.

##### c. **Region Filter**

* **Field**: If regions are identifiable (e.g., through port codes or geographic data), include this in your model.
* **Visual**: Slicer
  + **Type**: Dropdown or multi-select slicer.
  + **Configuration**: Populate with unique regions or port codes (e.g., PORT09).
* **Insight**: Users can analyze performance by region, highlighting geographic trends in supplier or product performance.

#### 3. ****Integrating Filters with Visuals****

* **Interaction**: Ensure that all visuals on the dashboard respond to the slicers. This can be configured in Power BI by selecting the visuals and adjusting their interaction settings.
* **Testing**: After setting up the filters, test them to ensure they dynamically update the relevant visuals, such as delivery times, costs, and inventory levels.

#### 4. ****Additional Filter Options****

* **Date Range Filter**: Include a date slicer to allow users to filter metrics by specific time frames.
* **Weight/Cost Filters**: Additional slicers for weight categories or cost ranges could enhance analysis options.

**Dashboard 2**

* + Orders sent by the plant and port
  + Orders sent to the plant and port
  + Product ordered per day



