Project Report :Logistics & Supply Chain Optimization

1. Executive Summary

This report outlines a comprehensive data analysis project focused on a logistics network. The project demonstrated a full data science lifecycle, from data preparation and advanced modeling using **SQL** to dynamic visualization and strategic storytelling with **Power BI** and **Tableau**. The primary goal was to uncover key factors impacting delivery performance, costs, and risks to provide actionable insights for process optimization and a more resilient supply chain.

2. Methodology and Skills Demonstrated

The project was executed in distinct phases, showcasing a wide range of skills.

Data Preparation & Advanced Analysis (SQL)

- **Data Cleaning and Manipulation:** Used **SQL** to load and clean a raw logistics dataset, addressing data type and formatting issues.
- **Data Modeling:** Designed a **star schema** by creating Fact and Dimension tables to structure the data for efficient analysis.
- **Feature Engineering:** Engineered new columns like Is_Weekend and Time_of_Day_Category to enrich the dataset for predictive insights.
- **Window Functions:** Applied advanced functions like LAG() and a rolling AVG() to perform time-series analysis and track performance trends.

Data Visualization & Reporting (Power BI & Tableau)

- **Power BI:** Built a comprehensive, multi-page dashboard. Visuals included a map to identify high-congestion areas, a clustered bar chart to analyze costs by delay category, and a treemap to assess the impact of risk classification on delivery deviation.
- **Tableau:** Created a visually engaging dashboard with a focus on storytelling. Visuals included a packed bubble chart to analyze the distribution of shipping costs by risk level and a line chart to track average delivery deviation over time.
- **Dashboard Refinement:** Implemented interactive slicers, KPI cards, and clear titles to make the dashboards professional and easy for a business audience to understand.

3. Key Insights and Recommendations

The analysis revealed several key findings and led to the following actionable recommendations:

- **Cost and Efficiency:** A strong correlation was found between major delivery delays and higher average shipping costs and fuel consumption.
- **Risk Mitigation:** The analysis demonstrated that high-risk routes are directly linked to higher delivery deviations. The dashboards visually identified geographic hotspots of congestion that are a primary cause of these delays.
- **Strategic Planning:** The predictive analysis showed that while Delay Probability exists, it is not a strong predictor of ETA Variation. This insight suggests that a more robust predictive model or a focus on real-time monitoring of external factors is needed.
- **Process Optimization:** The findings indicate that issues with order fulfillment are not solely tied to inventory levels, suggesting a need to investigate other internal bottlenecks (e.g., loading/unloading processes).