Project Report: Supply Chain Resilience & Risk Analytics

Project Title: Global Supply Chain Logistics & Risk Control Tower

Dataset: 180,000+ Records from Kaggle (DataCo Smart Supply Chain)

Tech Stack: Python (Pandas), PostgreSQL, Tableau Desktop

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1. Executive Summary

This project focuses on identifying logistical inefficiencies and financial risks within a global supply chain. By analyzing 180,519 records, I developed a high-performance dashboard that provides visibility into shipping delays, fraud exposure, and operational bottlenecks. The project demonstrates a full-stack data approach, utilizing **Python** for data orchestration, **PostgreSQL** for complex transactional analysis, and **Tableau** for executive-level storytelling.

2. Core Business Problems & Questions

The analysis was guided by five critical business inquiries designed to uncover operational failures:

- **Regional Liability:** Which global regions drive the highest late delivery rates, and what is the total revenue currently threatened by these delays?
- **Logistics Bottlenecks:** What are the specific "Critical Routes" (City-to-City) where shipments are consistently delayed by 2 or more days beyond the schedule?
- **Transactional Risk:** Which product categories offer high profit margins but suffer from disproportionately high rates of suspected fraud and cancellations?
- **Service Inconsistency:** Are high-value Corporate and Home Office segments receiving a poorer delivery experience compared to general Consumers?
- **Operational Capacity:** Do peak order volumes correlate with warehouse delays, indicating potential staffing or infrastructure gaps?

3. Data Methodology

- **Orchestration:** Cleaned raw **Kaggle** data in Python, standardizing column names and engineering a delay_days metric.
- **Aggregation:** To handle the 180k row volume, I used SQL CTEs to pre-calculate KPIs, ensuring the Tableau dashboard remained responsive and accurate.
- **Visualization:** Built a "Control Tower" dashboard featuring a Global Risk Map, Route Bottleneck Chart, and a 24-hour Operational Heatmap.

4. Key Findings & Mitigation Strategies

Identified Problem	Strategic Mitigation Strategy
High Revenue at Risk: Over **$20.1M** in sales are currently impacted by late delivery risk.	**Mitigation:** Implement a "Red-Flag" monitoring system for regions with delay rates exceeding 55%, such as Western Europe, to trigger automated carrier alerts.
Route Bottlenecks: Specific corridors like **Velsen to Caguas** consistently show delays of 2+ days.	**Mitigation:** Conduct a carrier audit for the Top 20 bottleneck routes and renegotiate SLAs (Service Level Agreements) or diversify shipping partners for those lanes.
Fraud Exposure: Categories like **Computers** show high profit per unit but elevated "risky order" percentages.	**Mitigation:** Deploy enhanced authentication and manual review protocols for "High-Reward, High-Risk" categories to reduce revenue loss from cancellations.
Operational Spikes: Peak demand occurs between **10:00 AM and 4:00 PM**, often correlating with delivery delays.	**Mitigation:** Optimize warehouse shift scheduling to increase manpower during identified peak windows, reducing the processing backlog.

Business Problem Statement (Case Study)

The Challenge

A global distributor is operating with a critically low **OTIF (On-Time In-Full) rate of 45.17%**. This lack of reliability has resulted in **$20,125,635 of revenue at risk**, primarily driven by logistical failures and transactional fraud. Without a centralized analytical view, the organization cannot distinguish between minor delays and systemic regional collapses.

The Solution

By leveraging a 180,000-row dataset from **Kaggle**, I built a multi-dimensional risk framework:

1. **Geographic Mapping:** Identified that regional delays are not just a matter of distance, but carrier performance.
2. **Product Risk Profiling:** Ranked categories by their "Risk-to-Reward" ratio to protect high-margin items from fraud.
3. **Route Isolation:** Created a prioritized list of the absolute worst-performing shipping

lanes for immediate management intervention.

Expected Business Impact

- **Revenue Protection:** By addressing the Top 20 bottleneck routes, the company can potentially recover a significant portion of the $20M at-risk revenue.
- **Operational Efficiency:** Aligning warehouse labor with the 24-hour load heatmap reduces overtime costs and processing bottlenecks.