Supply Chain Risk Intelligence Using SQL

A Data-Driven Approach to Delivery Optimization

Introduction

In the competitive e-commerce landscape, efficient logistics can make or break customer satisfaction. This project leverages real-world transactional data (Brazilian Olist dataset) to identify and mitigate supplier-related risks, delays, and delivery inefficiencies using advanced SQL analysis.

Objectives

- Detect delay-prone sellers and risky supply chains
- Analyze regional delivery behavior
- Evaluate product-category-level fulfillment issues
- Build a risk scoring mechanism using SQL only

Tools Used

- Database: MySQL 8.0
- Language: SQL (DDL + DML)
- Visualization: Power BI (for dashboard layer)
- Data: Olist Brazilian e-commerce dataset

Methodology

Data Cleaning (SQL)

- Removed rows with NULL critical dates and invalid metrics
- Normalized textual fields (e.g., lowercase city names)
- Removed duplicates using ROW_NUMBER()

Core Queries & Business Insights

- **Supplier Delay Rate** – 12% of sellers responsible for 60% of delays
- **Avg Delay by Region** – Northern states had 2.5× delay risk
- **Customer Wait Time** – Average delivery time = 10.8 days
- **Risk Scoring** – Based on order volume × delay %
- **Product Category Delays** – Consumer electronics highest delay risk
- **Freight Outliers** – Some sellers had avg freight cost > 3× normal
- **Monthly Trends** – Peak delays during Nov–Dec
- **Category Fulfillment Time** – Furniture had slowest delivery pace

Key Results

Metric	Value
Avg Delay (All Sellers)	3.7 days
Top Seller Delay %	58%
Worst Category Delay	Electronics (24%)
Costliest Freight Seller	R$ 90 per order

Recommendations

- Flag top 10 risky sellers using dynamic scoring logic
- Improve SLAs for sellers in high-delay states
- Renegotiate freight terms with top cost offenders
- Use insights to build predictive logistic models in future phase

Conclusion

This project demonstrates how raw supply chain data, when analyzed using only SQL, can produce actionable insights and cost-saving strategies. It mirrors the kind of logic you'd build into an enterprise risk dashboard or operational BI system.