FACTORY-TO-CUSTOMER SHIPPING ROUTE EFFICIENCY ANALYSIS

A Logistics Intelligence and Decision Support System for Nassau Candy Distributor

Submitted By

Ritesh Patial
Data Analyst

Under the Guidance of

Unified Mentor
(Project / Internship Program)

Organization Context

Nassau Candy Distributor

Technologies Used

Python, Pandas, NumPy, Streamlit, SQL, Power BI, Plotly, Jupyter Notebook

Submitted On

January 2026

Executive Summary

Nassau Candy Distributor operates a nationwide distribution network shipping products from multiple factories to customers across the United States. Although large volumes of order and shipment data are available, logistics decisions have lacked route-level performance intelligence, resulting in reactive delay handling and limited operational visibility.

This project establishes a data-driven logistics intelligence framework to analyze factory-to-customer shipping routes, measure delivery efficiency, identify bottlenecks, and support proactive logistics optimization.

Shipment data was cleaned, structured, and enriched with factory mappings. Factory-to-state and factory-to-region routes were engineered, and key logistics KPIs were developed, including average shipping lead time, delay frequency, route volume, and route efficiency score. An interactive Streamlit dashboard was built to support real-time monitoring and performance comparison.

The analysis reveals significant variation in shipping performance across routes, widespread exposure to delivery delays, regional bottlenecks, and factory-level impact on downstream delivery timelines. Comparative ship mode analysis indicates that operational routing and dispatch planning influence delivery speed more than service labels alone.

This DPR presents findings and recommendations to enable Nassau Candy Distributor to shift from reactive logistics management to proactive, route-level optimization.

---

1. Introduction and Business Context

Nassau Candy Distributor functions as a national distributor supplying products from multiple manufacturing facilities to customers across diverse U.S. regions. In large-scale logistics operations, shipping efficiency directly affects customer satisfaction, operational cost, and long-term scalability.

Despite the availability of rich shipment data, the organization lacked structured insight into route-level performance. This project aims to transform raw order and shipment data into actionable logistics intelligence.

---

2. Problem Statement

The organization currently lacks clarity on:

- Which factory-to-customer routes are consistently efficient
- Which routes are most delay-prone
- How shipping performance varies by region and ship mode
- Where geographic bottlenecks exist

Without this visibility, logistics optimization remains reactive rather than data-driven.

---

3. Dataset Description

The dataset consists of shipment-level transactional records containing:

- Order and shipping dates
- Shipping method
- Customer location attributes
- Product and sales information
- Cost and profit measures

A product-to-factory mapping table was used to associate products with their originating factories, enabling factory-to-customer route evaluation.

---

4. Data Cleaning and Validation

The following steps were performed:

- Converted date fields into datetime format
- Standardized geographic and categorical fields
- Handled formatting inconsistencies
- Integrated factory mapping
- Engineered operationally realistic shipping lead time

Due to operational inconsistencies in raw timestamps, shipping lead times were normalized into realistic delivery windows to enable meaningful logistics efficiency modeling.

---

5. Feature Engineering

Key features included:

- Shipping lead time
- Delay flag (lead time greater than seven days)
- Factory-to-state routes
- Factory-to-region routes
- Route efficiency score

These features formed the foundation of route-level analytics.

---

6. Analytical Methodology

The analytical framework included:

- Route aggregation and KPI calculation

- Route efficiency benchmarking
- Geographic bottleneck analysis
- Ship mode performance comparison
- Factory contribution evaluation

KPIs included average lead time, shipment volume, delay percentage, and route efficiency score.

---

7. Dashboard and System Implementation

A Streamlit-based interactive dashboard was developed providing:

- Route efficiency leaderboard
- KPI overview
- Ship mode performance comparison
- Geographic bottleneck visualization
- Dynamic filters for date, region, and ship mode

This system enables real-time logistics performance monitoring.

---

8. Key Findings

- Over half of shipments exceeded defined service thresholds
- Significant performance variation exists across routes
- Certain regions show concentrated delay clusters
- Ship modes demonstrate overlapping delivery ranges
- Factory origin influences downstream delivery timelines

---

9. Business Recommendations

1. Prioritize improvement initiatives on worst-performing routes
2. Establish region-specific logistics strategies
3. Implement route-level SLA benchmarks
4. Optimize factory dispatch workflows
5. Use performance data to guide carrier and ship mode selection

---

10. Conclusion

This project delivers a structured logistics intelligence framework that converts shipment data into actionable route-level insights. By implementing the proposed recommendations, Nassau Candy Distributor can improve delivery reliability, reduce operational inefficiencies, and strengthen nationwide logistics performance.