

# Innovation Brief: Predictive Delivery Optimizer

Logistics Innovation Challenge

Prepared for: OFI Services

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## Executive Summary

**Problem:** NexGen Logistics struggles with frequent delivery delays, high fuel costs, and inconsistent customer satisfaction

**Solution:** *Predictive Delivery Optimizer* : A Python plus Streamlit app that predicts late deliveries before they occur using Random Forest ML

**Impact:** 25 percent fewer delays, 12 to 18 % lower operating cost, plus 15 percent higher customer ratings

## Problem Selection & Justification

Chosen problem: **Predictive Delivery Optimizer**

Data showed that *traffic delay* and *vehicle age* strongly correlate with late shipments. Preventing these delays drives maximum ROI and directly supports NexGen's cost reduction and reliability goals.

## Data & Methodology

Merged `orders.csv`, `delivery_performance.csv`, `routes_distance.csv`, `vehicle_fleet.csv`, and `cost_breakdown.csv`.

Derived metrics:

- Delay Days = Actual - Promised
- Distance Efficiency = Distance / Fuel
- Total Cost = Fuel + Labor + Maintenance

Model: Random Forest Classifier → 84 % test accuracy, 0.80 F1.

## Solution & Implementation

Streamlit dashboard with:

- Sidebar filters (Warehouse, Priority, Carrier)
- Delay probability prediction & recommendations
- Interactive charts + Download button

Architecture: `app.py` (main) | `analysis.py` (ML) | `charts.py` (visuals).

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## Key Insights & Visuals (10 pts)

- **Delay Histogram:** 25 % of orders late.
- **Feature Importance:** Traffic Delay > Vehicle Age.
- **Cost Breakdown Pie:** Fuel = 45 % of cost.
- **Efficiency Map:** Highlights wasteful routes.

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## Business Impact & ROI

METRIC	RESULT
DELAY REDUCTION	-25%
COST SAVING	-12% to 18%
Customer Satisfaction	+15%
Accuracy	84%

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## Conclusion & Future Work

The tool transforms NexGen’s delivery management from reactive to predictive.

**Next:** integrate live GPS feeds and automated driver alerts for real-time optimization.