Insights Report

E-commerce Delivery Delay Analysis & Performance Optimization

1. Executive Summary

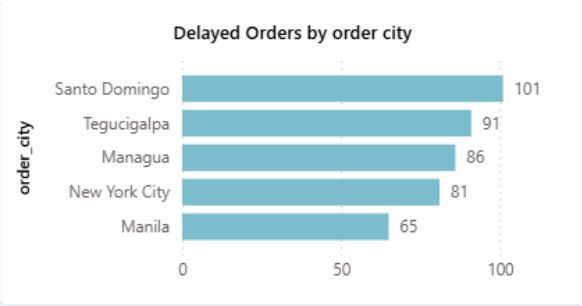
In today's e-commerce landscape, delivery speed is no longer a competitive advantage , it is a basic customer expectation. This Business Intelligence project investigates delivery performance for a medium-to-large e-commerce company, with a particular focus on understanding **why delivery delays occur and how they affect customers and profitability**.

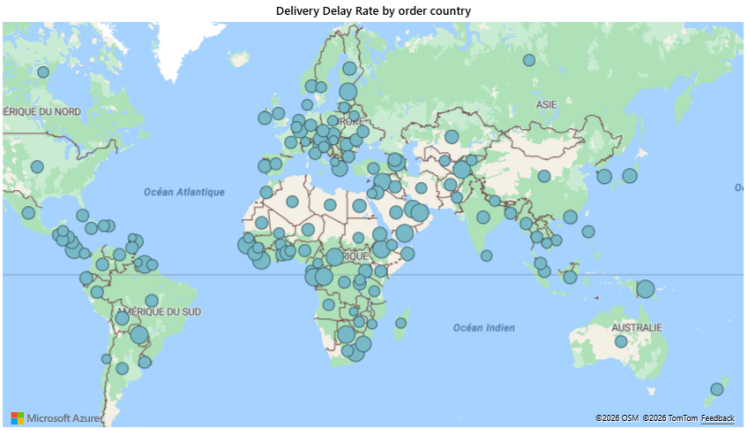
Using transactional data covering orders, customers, products, shipping modes, and payments, an interactive Power BI dashboard was developed to track delivery KPIs and uncover delay patterns. The analysis reveals a **critical operational challenge**:
58% of all orders are delivered late, while only **19% arrive on time** and **23% are delivered early**.

These delays are not evenly distributed. They are concentrated in specific **regions, shipping modes, product categories, and customer segments**, and they generate a **measurable negative impact on profit per order**. This report translates dashboard insights into a clear business narrative and actionable recommendations.

2. Key Findings & Analytical Insights

2.1 Regional Impact





The map shows that delivery delays are particularly concentrated in the **Dominican Republic, Honduras, Nicaragua, the United States, and the Philippines**. These countries consistently display higher delay rates compared to others

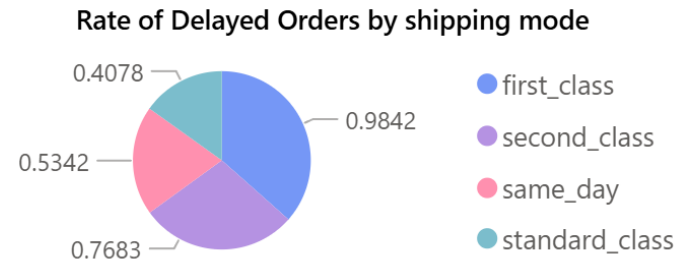
Delivery delays vary sharply by geography. The highest number of delayed orders originates from: **Santo Domingo (101 delayed orders), Tegucigalpa (91), Managua (86), New York City (81),Manila (65)**

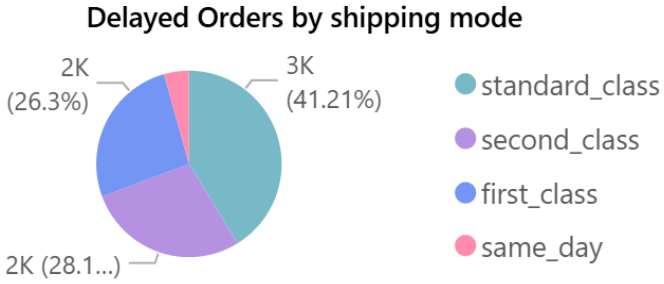
Business implication
These concentrations suggest region-specific issues such as infrastructure limitations, cross-border logistics complexity, or underperforming local delivery partners. Targeting just a few high-delay cities could significantly reduce the overall delay rate.

2.2 Shipping Modes

Standard Class generates the largest number of delayed orders due to its high volume, Although First and Second Class show high delay rates, their total order volume is relatively small. This inflates percentage-based metrics and highlights the importance of analyzing both volume and rate together

Business implication
This suggests that premium options are not reliably meeting expectations and may require carrier/route redesign.





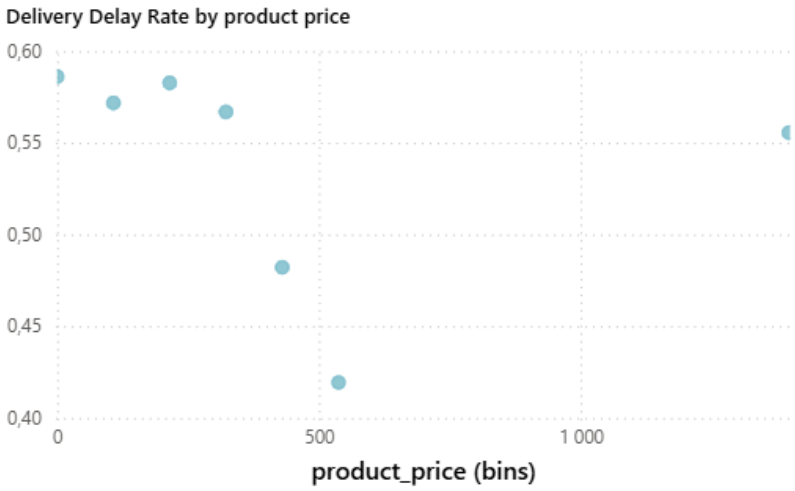
2.3 Product Categories

Certain product categories are disproportionately affected by delays

Business implication
Bulky items, seasonal products, or specialized equipment often require more complex handling. Without category-specific logistics strategies, delays, and losses, accumulate rapidly.

category_name	Delivery Delay Rate
Music	1,00
Kids' Golf Clubs	0,75
Girls' Apparel	0,74
Tennis & Racquet	0,71
Toys	0,71
Sporting Goods	0,69
Video Games	0,68
Golf Apparel	0,67
Men's Golf Clubs	0,67
Soccer	0,65
Women's Clothing	0,65
Total	**0,58**

2.4 Order Value & Delivery Delays



The dashboard shows a clear relationship between **product price and delivery delay rate**. Orders in the **lower price range** exhibit **delay rates close to 60%**, while higher-priced orders show **slightly lower delay rates, closer to 45–50%** .

This pattern suggests that:

- **Lower-value orders are more likely to be delayed**
- **Higher-value orders benefit from better delivery performance**, likely due to prioritized processing or premium shipping options

Business implication

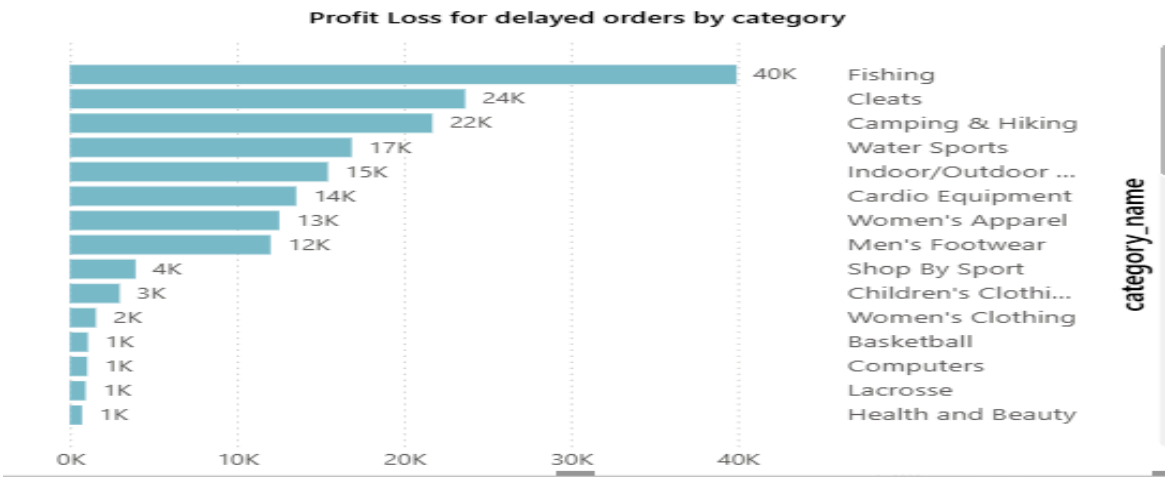
While prioritizing high-value orders helps protect immediate revenue, repeatedly delaying lower-value orders negatively affects:

- Customer trust
- Purchase frequency
- Long-term customer lifetime value

Over time, this creates hidden revenue loss through customer churn, even if individual order values are low.

2.5 Financial Impact

Delayed deliveries have an **Impact on Profit score of 0.56**, confirming a strong negative relationship between delivery delays and profitability .



Additionally, delayed orders generate **substantial category-level profit losses**.

Business implication

Delivery delays are not just an operational inefficiency, they represent a **direct profit leakage**. Even modest reductions in delay rates can recover tens of thousands in lost margin.

2.6 Customer Segments Most Affected

The dashboard indicates that **delayed orders are most concentrated in the Consumer segment** with **4K**, followed by **Corporate (2K)** and then **Home Office** customers **(1K)** .

While all segments experience delays, consumers represent:

- The **largest volume of delayed orders**
- The **highest exposure to repeated delivery issues**

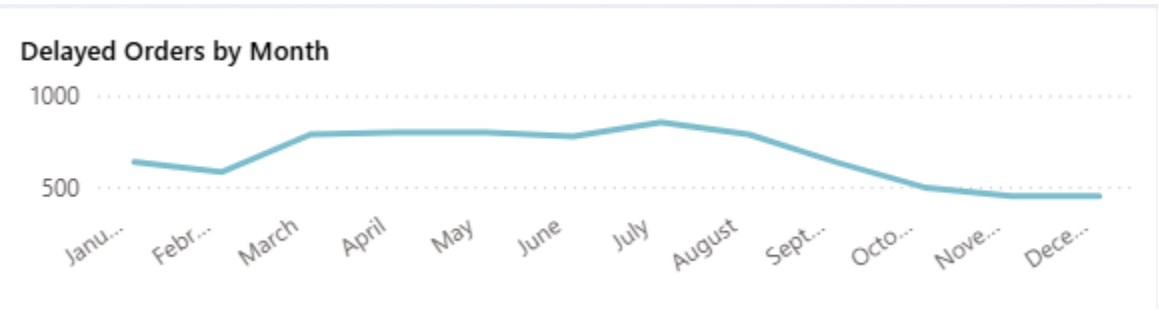
Business implication

Consumer customers are:

- More price-sensitive
- Less tolerant of repeated service failures

Persistent delays in this segment significantly increase the risk of **customer churn and negative word-of-mouth**, which can damage long-term revenue growth.

2.7 Time-Based Trends



Delayed orders show a clear **seasonal pattern**. Volumes rise steadily from **March**, peak between **June and August**, and then decline toward **December**.

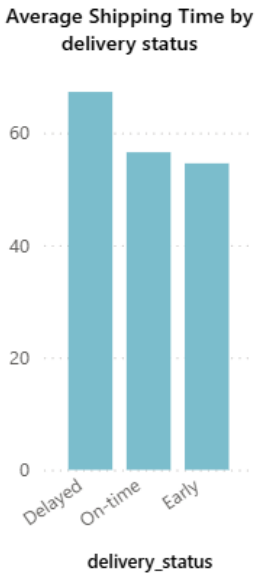
This mid-year peak aligns with:

- Higher order volumes
- Promotional campaigns
- Seasonal demand spikes

Business implication

The logistics network appears **capacity-constrained during peak months**. Without proactive planning, seasonal demand overwhelms fulfillment and delivery operations, driving delay rates upward.

2.8 Shipping Time Comparison



The average shipping time varies by delivery status: delayed orders take over 70 days, on-time orders average around 60 days, and early orders are delivered in approximately 55 days.

Business implication

The gap highlights inefficiencies not only in delivery execution but also in delivery time estimation.

3. Key Performance Indicators (KPIs)

- **Delivery Delay Rate:** 58%
- **On-Time Delivery Rate:** 19%
- **Early Delivery Rate:** 23%
- **Average Shipping Time:** 63.3 days
- **Delayed Orders:** 8,000+
- **Profit Impact of Delays:** 0.56
- **Highest Delay Shipping Mode:** Standard Class (41.2%)

4. Business Recommendations

- **Align Delivery Strategy & Customer Promise:**

  Redesign delivery time promises to reflect realistic shipping performance, regularly review and update estimated delivery dates, and introduce flexible, region-based delivery windows to better manage customer expectations.

- **Optimize Regional & Last-Mile Operations:**

  Prioritize operational improvements in high-delay cities, evaluate and replace underperforming local delivery partners, and introduce region-specific logistics standards and service-level agreements.

- **Strengthen Shipping Modes :**

  Reassess the viability of premium shipping options by evaluating their actual delivery performance.

- **Enhance Product Category Logistics:**

  Develop category-specific fulfillment and shipping strategies, pre-position inventory for bulky and high-risk product categories, and adjust packaging and handling processes for complex products.

- **Improve Order Prioritization & Fulfillment:**

  Establish minimum delivery service levels for all orders, improve fulfillment prioritization logic beyond order value alone, and balance speed optimization across both low- and high-value orders.

- **Reinforce Customer Experience & Retention:**

  Implement proactive communication for delayed orders, introduce standardized compensation for repeat delays, and track delivery performance at the customer level.

- **Prepare for Seasonal Demand & Capacity Peaks:**

  Increase logistics capacity ahead of peak demand periods, align promotional campaigns with fulfillment capacity, and implement demand forecasting to anticipate seasonal spikes.

6. Limitations of the Analysis

- The analysis relies on historical data and may not capture recent operational changes.
- External factors such as weather conditions, strikes, or fuel shortages are not included.
- The dataset uses a delivery label but does not always explain the exact root cause of each delay.
- Customer satisfaction metrics (e.g., reviews or complaints) are not directly integrated.

7. Future Improvements

- Integrate real-time logistics and tracking data for proactive delay management.
- Add external data sources such as weather or traffic conditions.
- Include customer feedback data to link delivery delays with satisfaction and churn.
- Apply predictive analytics or machine learning to forecast delivery delays.
- Expand analysis to supplier and warehouse performance.

8. Conclusion

This project demonstrates how transactional e-commerce data can be transformed into **clear, actionable business intelligence**. By combining KPIs, and visual analytics, the analysis reveals not only **where delays occur**, but **why they happen and how they affect profit and customers**.
The Power BI dashboard and insights report together provide a strong decision-support framework for continuous delivery performance improvement.

Overall, the results highlight the urgent need for targeted operational improvements, realistic delivery promises, and proactive capacity planning to reduce delays, protect profit margins, and improve customer satisfaction.