



Summary of Rail Transportation Study

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Executive Summary

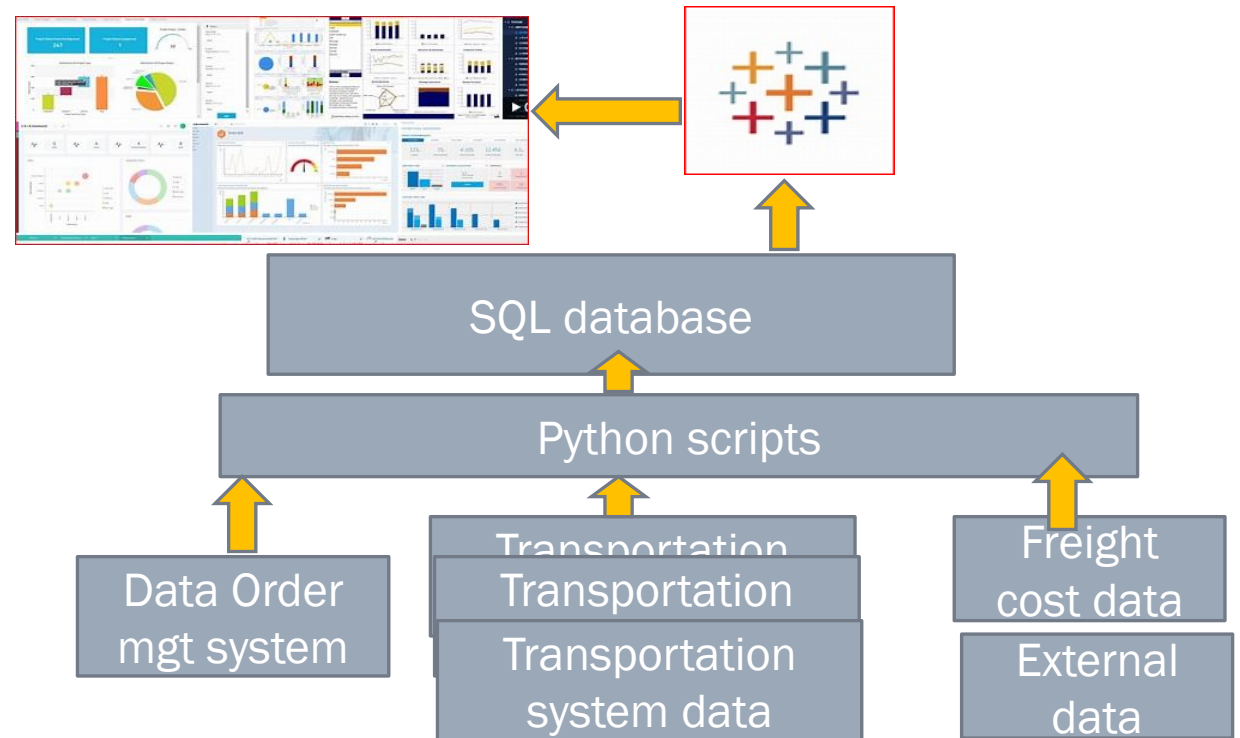
1. Transportation costs account for \$10M of annual costs for Supply chain Management. While this is certainly not as large as the spend on natural gas which is the primary raw material for making NH₃, supply chain management still would like to optimize the spend on transportation costs. What are the performance drivers for transportation business process?
2. The study identified the performance drivers to be a function of the distance, seasonality, origin plant, inventory availability and product. The study showed a shift of a share of shipments between modes which is driven by product availability at different locations.
3. Rates for truck and rail were seen to be consistent across various locations.
4. Some products like NH₃ across certain plants were heavy users of Rail transportation, where-as some locations were clearly dependent on truck. Why is that? This was attributed to carrier behavior, yard availability and distance of the destination locations.
5. Pricing patterns by some Rail carriers have changed the dependency.
6. The strategy of the company directs that preserving manufacturing margin and keeping plants running is more important than creating an optimal shipping pattern

Data and Technology

From Data

To the Story!

1. Shipment transactions by product and mode from 2014- YTD
2. Shipment cost per transaction for the above transactions.
3. Shipment spend analysis for various components of the cost such as mileage, fuel and tariff.
4. External Data for benchmarking



Challenges with data

1. Disparate data in multiple systems with different granularity.
2. Missing data due to manual processing on some weekends.
3. There are multiple units of measure across products and countries (US and CAN).
4. Focused only on required data elements and on the problem at hand.

Exploratory data analyses and the story behind the data

1. Create pie-chart of shipment volume by plant and by mode. Break down by where customer pays freight or CF pays freight. This is to answer the question about the distribution pattern of the modes by product.
2. Plot rate per mile by origin by mode and by product. This is to show the average distance the product travels from a specific origin and the corresponding cost based on the freight paid. This illustrates the inefficiencies of using a particular mode for longer distances than is optimal.
 - Allowed for management to explain anomalies due to product shortages and unplanned tank outages.
 - Showed seasonal weightages for certain locations
3. Correlate rates with mileage.
4. Compare rate patterns with industry benchmarks
5. Compare rates per ton for different modes. And drilling down by the top 5 carriers.
6. Created various map views to show mileage and destinations from the origins.

Conclusion

1. This educated senior management about the transportation process.
2. Identified several opportunities for further analysis such as-
 - What are the optimal origin-destination patterns by carrier?
 - What are the areas where CF has most leverage?
 - Where does CF need to depend most on a carrier and how to mitigate this dependency?
 - Placement of leased locations to alleviate the rates.
 - Use CF fleet and pipeline and marine fleet competitively.

This study identified opportunities worth \$500K

Next Steps

1. Compare carrier rates and efficiency for better transportation performance.
2. Is there a way to create dashboards to identify delayed shipments based on past performance?
3. Create partnerships with data providers for predictive modelling based on customer take patterns?
4. Is there a way to create an alert when a rate changes for a specific Origin-Destination pair?
5. Are some carriers deliberately gouging us for certain routes? How can we prove that?
6. Is there an external party we can partner with for more real-time data needs on the industry?