Consolidation for Import Distribution Optimization

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Motivation / Background

Retail markets are evolving – customers are demanding ever Lower costs, faster response to order and starting to consider environmental impact of their buying decisions. Retailers are looking for solutions to navigate the changes.

In this project, we worked with Maersk Logistics and Services, one of the top service providers in logistics industry, to develop transactional route and load planning model, as proof of concept for new product development

Key Question / Hypothesis

The objective of the model is to optimize total cost, including transportation cost and cost of delay which is defined as a quantified factor for late deliveries. The use case is export consolidation for DC by-pass decision as an option in import distribution for retailers.

Q1: Does by-passing RDCs reduce the total cost?

Q2: Does by-passing RDCs improve on-time delivery compliance?

Q3: Does by-passing RDCs reduce the distance and carbon emissions for line-haul movements?

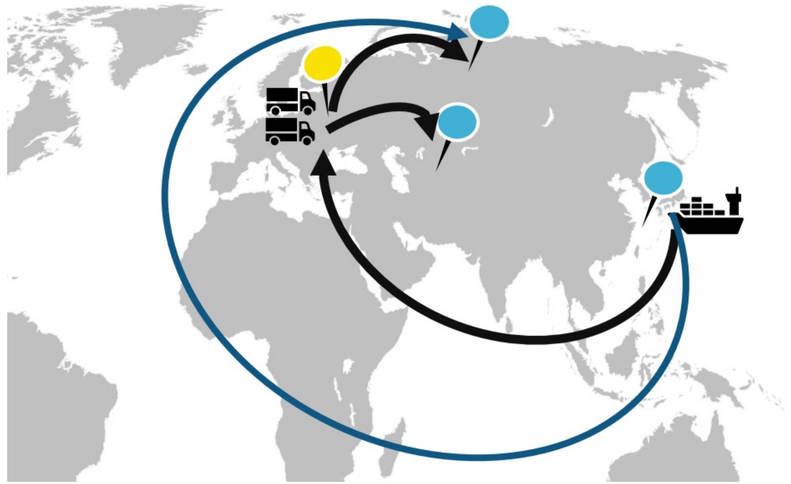
*RDC – Regional Distribution Center

Relevant Literature

Pan, S., Ballot, E., & Fontane, F. (2013b). The reduction of greenhouse gas emissions from freight transport by pooling supply chains. *International Journal of Production Economics, 143*(1), 86–94. https://doi.org/10.1016/j.ijpe.2010.10.023

Frota Neto, J. Q., Bloemhof-Ruwaard, J. M., van Nunen, J. A. E. E., & van Heck, E. (2008). Designing and evaluating sustainable logistics networks. *International Journal of Production Economics, 111*(2), 195–208. https://doi.org/10.1016/j.ijpe.2006.10.014

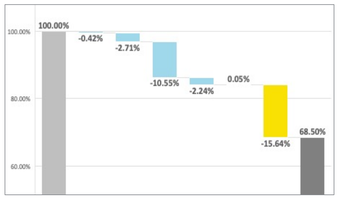
Cóccola, M. E., Dondo, R., & Méndez, C. A. (2015). A MILP-based column generation strategy for managing large-scale maritime distribution problems. *Computers & Chemical Engineering*, *72*, 350–362. https://doi.org/10.1016/j.compchemeng.2014.04.008

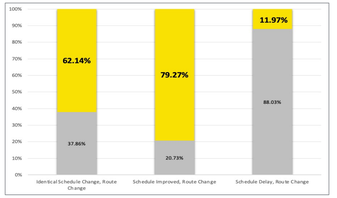


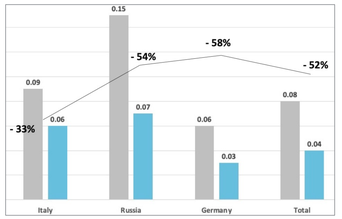
Methodology

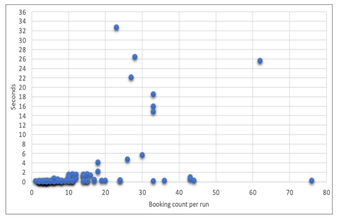
Problem Descriptioon			Modeling	Data Analysis	Sensitivity Testing
			Assumptions		Cost of Delay Variance
		Cost Simulation	Objective Function	Cost Comparison	
	Data Source	Cost Simulation	Decision Variables	Delivery Performance	Transportation Cost Variance
Problem Setting	Data Description	Descriptive Analysis	Constraints	Carbon Emissions	
Possible Routes			MILP Model	Business Implications	

Results









- 30% of total cost reduction
- 13% volume improved on delivery performance
- 52% carbon emissions reduction
- 80% of transactions finished within 1 second

Expected Contribution

- Deliver a route and load optimization model for transactional transportation planning which is practical and scalable
- Validate the hypothesis of cost and emission reduction, and the delivery performance through analysis of results from the existing policies and the new model

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