Managing disruptions due to time delays in Line-haul Freight Transport Networks: a case study from a Danish logistics company

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***Abstract*:**

Unexpected disruptions in road freight transport caused by poor weather conditions, traffic accidents, etc., are quite frequent and have negative effects on the whole supply chain. Therefore, an intelligent disruption management system is necessary to revise the transport plan directly after disruptions have occurred. The literature presents several approaches for managing disruptions in road freight transport. However, most of them focus on urban freight distributions where disruptions are often handled by vehicle rerouting. The current work, in contrast, addresses disruption management in a line-haul freight transport network that connects urban distribution systems. We present a novel hybrid approach combining a simulation model, optimization algorithms, and a cost-effectiveness analysis. When a disruption occurs, the proposed approach can be used to analyze the impacts of the disruption, identify the affected trips, and revise their plan quickly in real time. Six re-planning strategies are proposed to handle the disruptions and are evaluated in terms of cost, reliability (expressed in time delays), and CO2 emissions. Cost-effectiveness analyses are conducted to rank the obtained solutions and identify the best strategy. Moreover, we suggest a decision support system architecture, based on the proposed approach, to enable disruption management in real-time settings. Real data is used to evaluate the proposed approach in different disruption scenarios. The results provide transport planners with useful insights into possible re-planning strategies and how to identify the best cost-effective strategy to minimize the disruptions' effects and be more economically sustainable. This work also supports carriers in the transition towards intelligent disruption management.

Keywords: Disruption; Freight; Emissions, Time delays, Line-haul; Real-time.