

# Shareability of Regional Logistics Trips based on Real-World Data Analysis

## Master's Thesis of Sudipta Chowdhury

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### Introduction

With the recent pandemic and advancement of digital technology, consumers are now seeking convenient online shopping and fast delivery from retailers. In order to play an effective roll in competitive market, business practitioners and researchers are increasingly recognizing the need for integration and collaboration in supply chains to reduce total mileage and improve delivery performance. The aim of this research was to evaluate the shareability of pickup-delivery trips by partnering Regiothek enterprises and its impact on delivery performance based on real-world data analysis.

Two research questions were developed:

- **What** kind of supply networks exist among Regiothek enterprises?
- **How** would partnering of Regiothek enterprises change the performance of the baseline scenario?

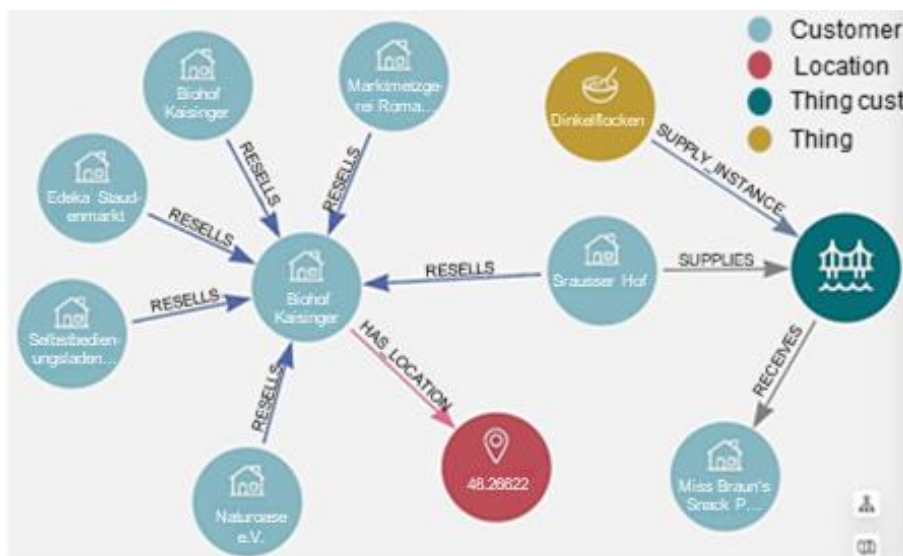


Fig. 2: Overall representation of supply-chain network in dataset

	Whole dataset	Bavaria
Registered companies	194	154
Pickup-delivery trips	2,262	2,005

Tab. 1: Final dataset considered in this research

### Results & Conclusion

In order to survive in this market, that is undergoing rapid changes, SMEs could consider cooperation with each other as a viable strategy to increase profitability. All scenarios were conducted in OR-Tools. With the introduction of a collaboration between the companies, the significant distinction appeared to be not only the great cut in the number of required vehicles, but also the improvement in the total travelled distance, which presented a reduction of overall more than 50 per cent of the total kilometres originally travelled by enterprises individually (Fig. 3). This study offers new perspective of cooperation in logistics and provides a two-stage procedure called 'Cluster first, Route second' to overcome the high computation time requirement for solving collaboration scenarios with large datasets.

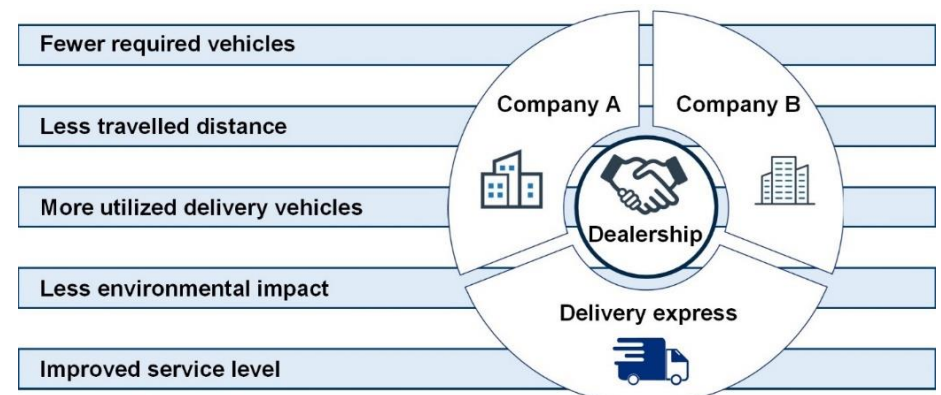


Fig. 1: Collaborative platform and its advantages

### Methodology

The methodology was divided into two parts:

#### 1. Understanding of dataset

The dataset is a graph database in which nodes and relationship are used to store information. Fig. 2 represents the overall picture of supply chain network in the dataset. In supplies-receives relationships, the suppliers provide raw materials to the buyers, and in resell relationships, companies distribute the finished product to another company or points of sale. Entire dataset could not be considered due to the high computation time. So, Bavaria was selected as the study area (Tab. 1).

#### 2. Framework development

- **Base scenario (no collaboration):** Each company is responsible for their own pickups and deliveries without collaboration.

#### Collaborative scenarios:

- **Scenario 1 & 2:** Shared pickups-deliveries are conducted by a delivery company using single depot and multi depot.
- **Scenario 3:** Regiothek enterprises conduct the pickups and deliveries with their own vehicle in a collaborative way.
- **Scenario 4:** Pickups-deliveries are carried out based on the short and long-distance distance of the point in a periodic basis.

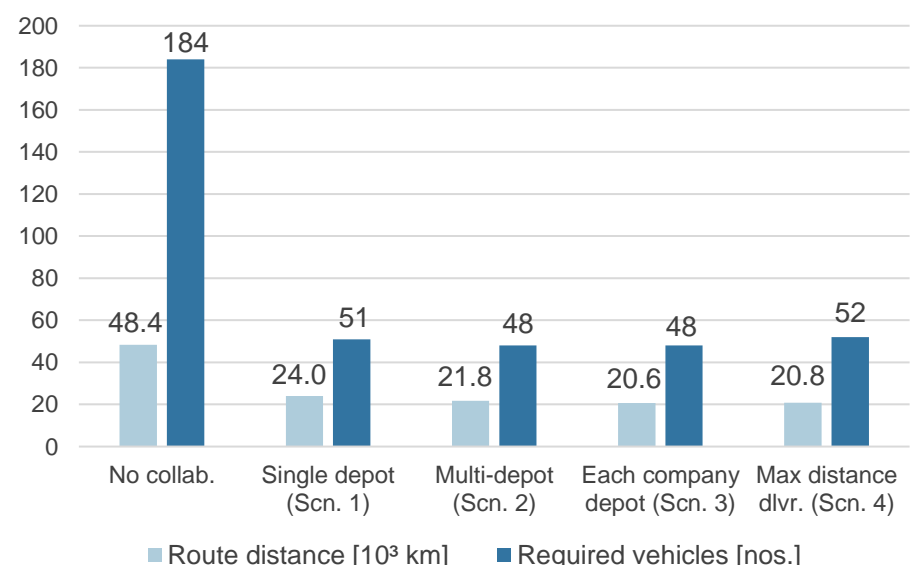


Fig. 3: Comparison of scenarios before and after collaboration