

The determination and division of benefits among partners of a horizontal cooperation in transportation

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Introduction

To stay competitive, inland Terminal Operating Companies (TOCs) increasingly aim to manage a network of inland terminals (Van Rooy, 2010; Konings, 2009). One of the initiatives in the Dutch hinterland is Brabant Intermodal B.V., an organization based on the cooperation between four inland terminal operating companies¹. Besides the benefits of freight bundling in a hub-and-spoke network, this cooperation results in many more benefits. However in literature as well as in practice, **the determination and division of the benefits** is considered to be one of the main impediments of cooperation (Crujssens *et al.*, 2007). Therefore, this study addresses the **problem**:

"Although this cooperation seems to witness a diversity of collective benefits, these collective benefits are still undefined and not quantified. Besides, the participants have no insights in the individual benefits resulting from these collective benefits. This lack of insights into the collective as well as individual benefits makes Brabant Intermodal B.V. an incomplete and unstable cooperation."



Research Method

- 1) Qualitative analysis of benefits of cooperation.
- 2) Quantitative analysis of benefits (operations research).

Scope of quantified benefits:

- o Bundling in a hub-and-spoke network.
- o Reliability improvement at the port terminals:
 - Volume growth.
 - Reduction in rush orders.
 - Reduction in the waiting time at the port.

Value from these benefits expressed in:

- o Operational Cost Savings: Mixed Integer Linear Programming.
- o Extra Revenues

- 3) Division of benefits (Game Theory).

- o Shapley Value.
- o Combination Shapley Value and the Weighted Shapley Value.

- 4) Scenario Analysis (worst, average, best case).

Tested stochastic parameters (average case setting):

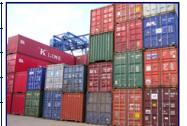
- o Natural demand growth (5%).
- o Reliability demand growth (3%).
- o Percentages rush orders (3% (ITV), 2% (ROCW), 24% (BTT), 2% (OCT))
- o Waiting times at port terminal (0.5 hours).

Results

Value of cooperation (Grand Coalition): 1,484,101 euro/year.

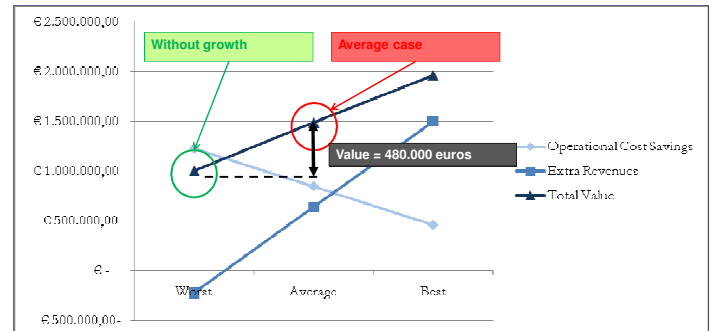
Division of value:

	ITV	ROCW	BTT	OCT
<i>Shapley Value</i>				
Average case	298,077	386,836	371,228	427,960
<i>Shapley/Weighted Shapley Value</i>				
Average case	260,087	363,353	372,948	487,713



Scenarios:

The result of the scenario analysis for the reliability demand growth is illustrated in *Figure 1*. In this figure the value for the grand coalition is compared for the various scenarios (worst: 0%, average: 3 %, best: 6%).



Conclusion

- ✓ This cooperation has a variety of benefits which are classified in three categories; optimizing inland transport, improving service and quality, and improving the market position.
- ✓ Cooperation in the grand coalition delivers the highest value, hence it is worthwhile to cooperate in the grand coalition.
- ✓ From the scenario analysis can be concluded that the expected reliability benefits all have a positive effect on the value of cooperation and that the allocation of the value among the partners is rather robust for the various scenarios.
- ✓ Both allocation methods are applicable in this setting, since they result in a theoretical fair and stable allocation for all scenarios. Based on the perceived fairness regarding the division of the waiting time reduction benefit, a method can be chosen to allocate the value as studied in this project.

Notes

¹ Four inland terminal operating companies: ITV: Inland Terminal Veghel BV – ROCW: Regionaal Overslag Centrum Waalwijk BV – BTT: Barge Terminal Tilburg BV – OCT: Oosterhout Container Terminal BV.

References

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