The PI business model: Commercial and legal aspects of ever-increasing collaboration

Physical internet conference| Groningen | 20 June 2018

Frans Cruijssen, PhD

argus I
Your Supply Chain Analyst

argus I

Your Supply Chain Analyst

- Logistics advisory, specializing in:
  1. Tactical and strategic network design and optimization
  2. Horizontal collaboration
  3. Humanitarian Aid and Logistics Optimization

- Office in old Brewery in Breda, the Netherlands
- 16 professionals, all with technical academic background
- Projects for 90% in business environment and for 10% governments and institutions

Does the PI need a business model?

PI will be an open network, with very low barriers to entry

Once mature, prices of transport via the PI will approach marginal cost (commoditization)

Then, profits can only be made by offering add-on services

The PI, like the digital internet, will be a channel rather than a product

How do we transition into the PI?

Horizontal Collaboration is an intermediary step towards the PI

Logistics decision makers still have other (classical) options open

Therefore, for this phase, good business models are definitely needed

We need probably need a crisis (or a disrupting provider) before we fully focus on transport efficiency….

Horizontal collaboration: barriers to entry

Legal

- Contract templates
- Competition law

Commercial

- Matchmaking
- Gain sharing

Legal

Contract templates are available, though not very widely tested

- CO3 legal framework, Nextrust project
- Will be replaced by the genenal terms and conditions of the PI

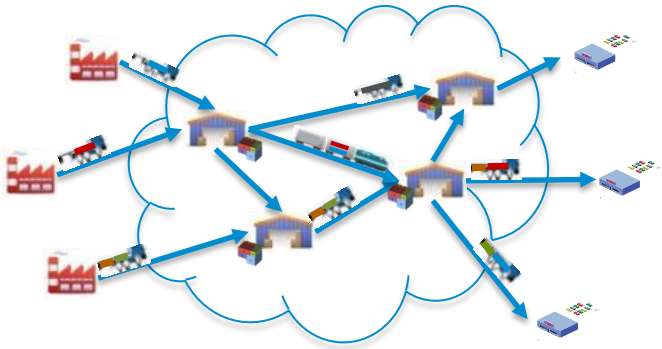
Competition law: ‘Agreements that directly reduce competition are forbidden’

UNLESS the following is true:

- The agreements result in better products or services
- The competition reduction is necessary
- Benefits are being passed to consumers
- There is enough remaining competition

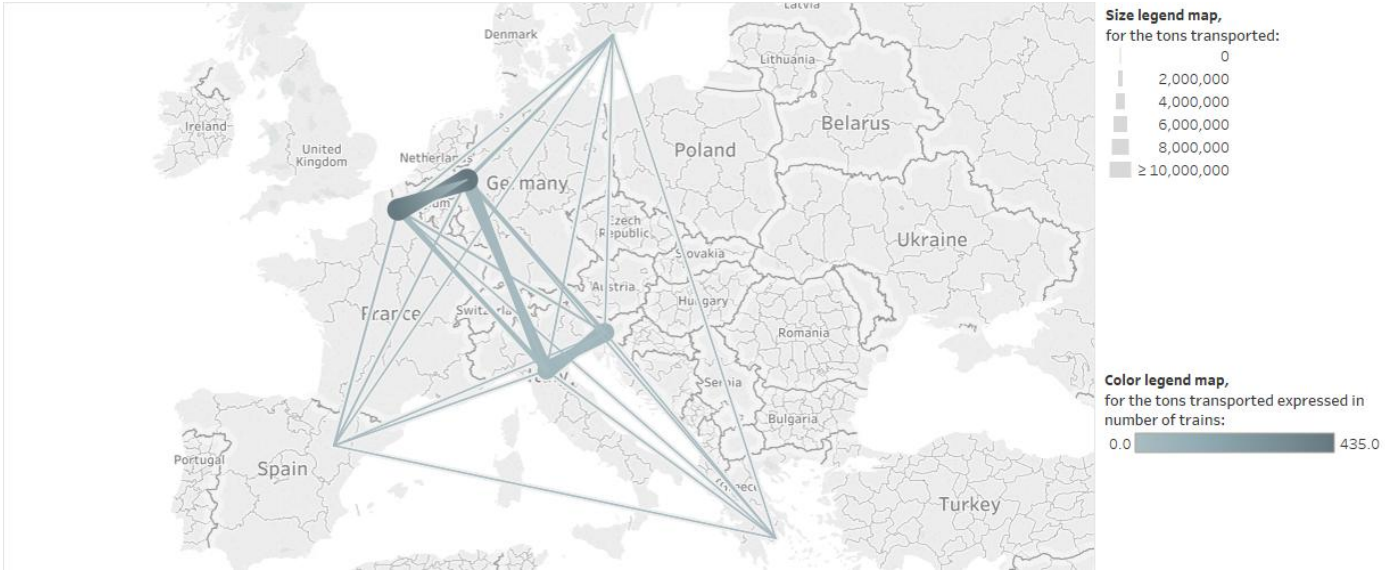
Commercial barriers

- Prepare an initial PI for rail
- Develop new algorithms for network flow optimisation in collaborative networks
- European macro network modelling
- Cluster collaboration for new train services
- Collaborative cluster development: Proximity Terminal Concept
  - Freight Planning within Community
  - Cluster Community System
- Modular Loading Systems to optimise transport planning and operation
- **And: Viable Business Models**



Clusters 2.0

A macro view: transported tons between selected terminals



Tons transported between terminals are the tons transported between NUTS2 regions within 2 hours of a terminal

How can we make this collaboration work?

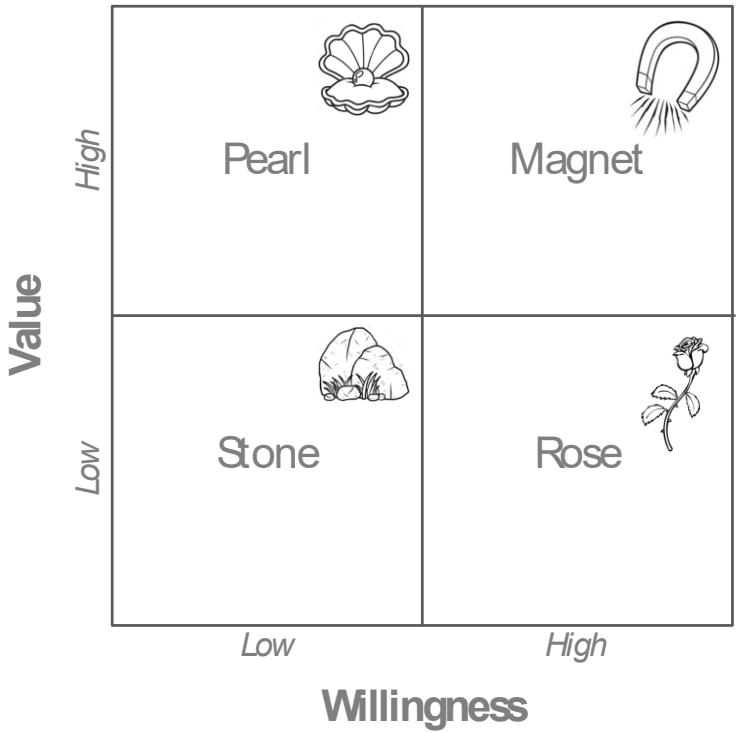
Case Study in the High Tech industry

Towards a viable logistics partnership

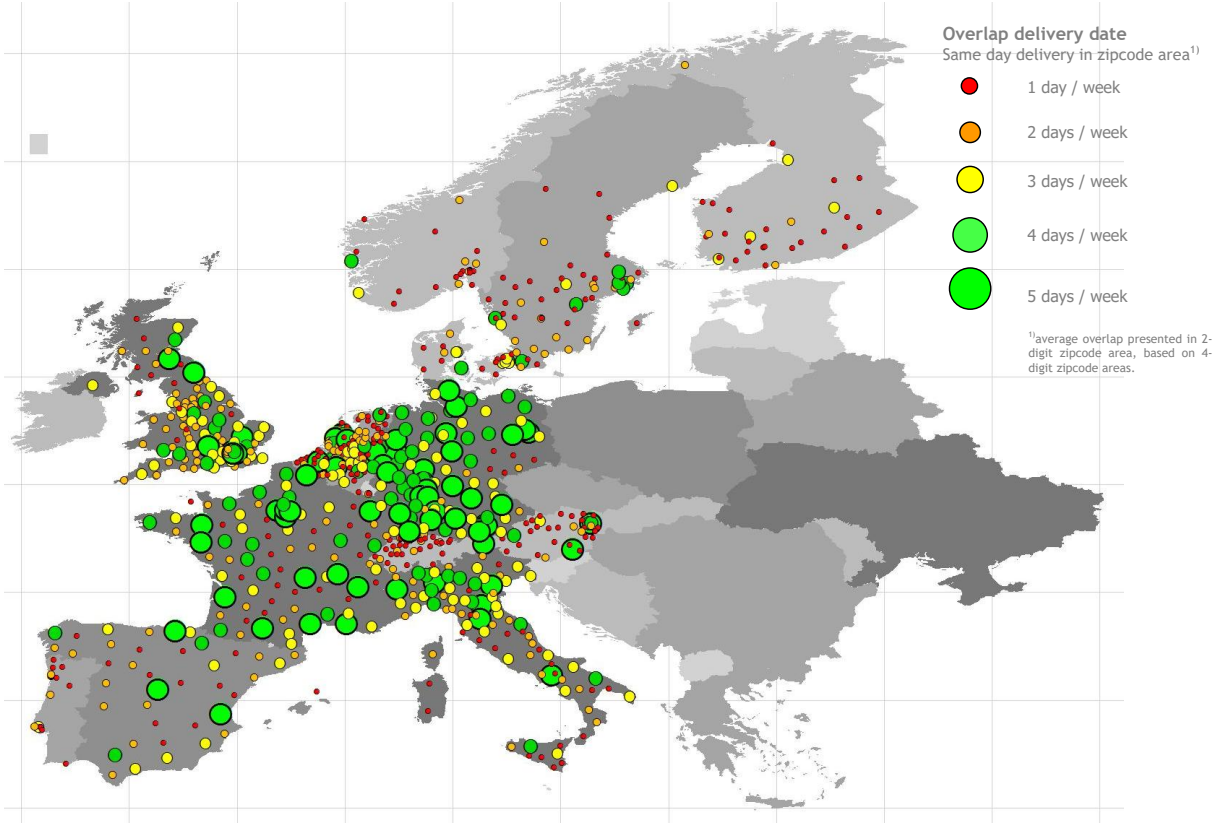
- Among 11 potential partners search for a succesful partnership
- Central warehouses in the Benelux
- High value products in a broad range of SKU’s
- Customer base in Europe overlaps to a large extend

- How is matchmaking done?

Matchmaking: part 1, soft factors



Matchmaking: part 2, detailed flow analysis



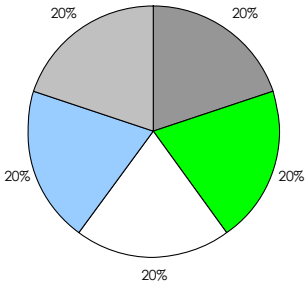
- 5 possible candidates
- Overlap of drops (duplication) of 43%
  Delivery on the same day, same adress, same service level
- Estimated cost reduction based on actual rates 6.4 million
- Resulting in a strong business case

Barrier 2: Gain sharing

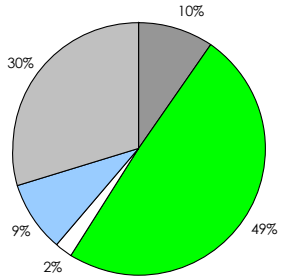
Once the potential gains were known the next hurdle presented itself. How do we slice up the pie into fair pieces? This was the biggest challenge in the project. Do we use rules of thumb, easily explained and implemented?

Rules of thumb don’t work

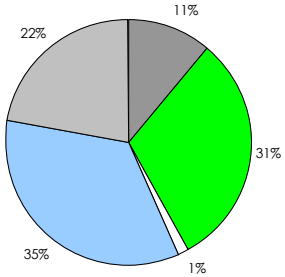
Equal share



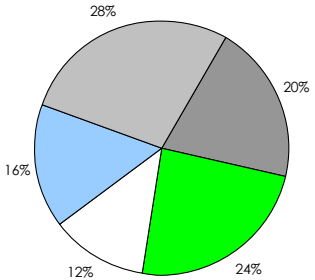
Shipments



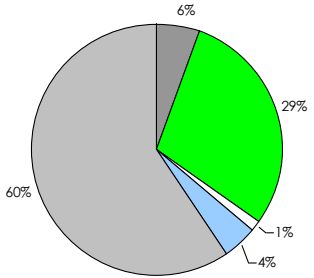
Payweight



Addresses



Turnover



To prevent the project from failing we introduced **cooperative game theory**. Sharing the benefits and investments based on a fair and robust methodology.

Based on the value a potential participant brings to the group.

Stability and fairness

Stability can be objectively determined:

- *All possible subcoalitions should be better off in the consortium collaboration than they would be in a smaller group*

Fairness is more subjective. However, game theory provides some well-defined fairness properties:

Cooperative game theory (for example the Shapley value) conceptualizes fairness and we strongly advise it over rules of thumb. It looks at the actual value a company brings to a collaboration.

Some more details on how this works

		Number of pallets											
		1	2	3	4	5	...	10	15	20	25	30	33
Destination		€ 70	€ 135	€ 195	€ 250	€ 295	...	€ 500	€ 710	€ 890	€ 1,060	€ 1,190	€ 1,240
		€ 84	€ 162	€ 234	€ 300	€ 354	...	€ 600	€ 852	€ 1,086	€ 1,272	€ 1,428	€ 1,488
		€ 49	€ 95	€ 137	€ 175	€ 207	...	€ 350	€ 497	€ 623	€ 742	€ 833	€ 868

Subcoalition	# Pallets	Costs
M	15	€ 710
S	10	€ 500
M,S	25	€ 1,060

Synergy / Efficiency gains:

€ 710 + € 500 - € 1,060 = € 150

But, how to allocate these efficiency gains in a fair and stable way...?

Let’s get back to our example:

Subcoalition	# Pallets	Costs
M	15	€ 710

Subcoalition	# Pallets	Costs
S	10	€ 500

Subcoalition	# Pallets	Costs
M, S	25	€ 1,060

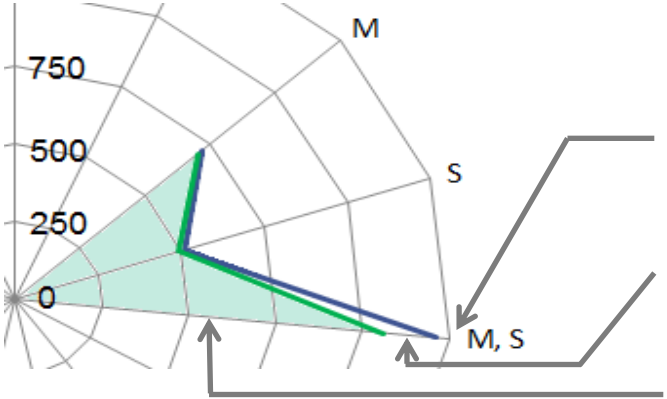
Hence, in any stable gain sharing rule for this situation:

- Company M never pays more than € 710;
- Company S never pays more than € 500;
- Company M and S together not more than € 1,060.

Otherwise, they would just split off from the consortium and start their own (smaller) collaboration, as this will save money.

Collaboration and stability can be illustrated by means of a spider graph.

Subcoalition	Costs (when collaborating)	Costs (without collaboration)
M	€ 710	€ 710
S	€ 500	€ 500
M,S	€ 1,060	€ 1,210

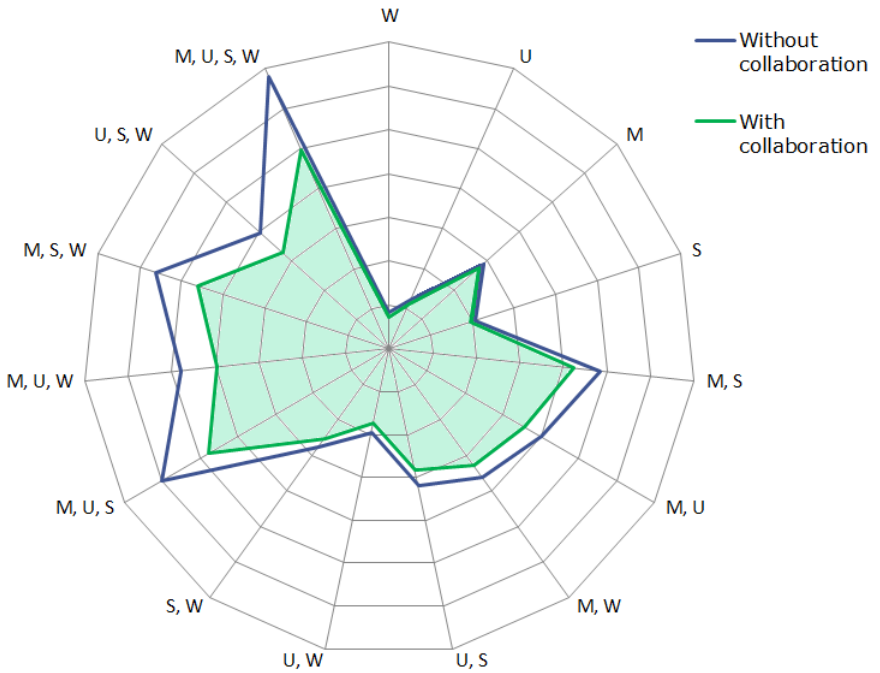


Blue line: Total costs if the subcoalition depicted at the endpoint is not collaborating

Green line: Total costs if the subcoalition depicted is collaborating

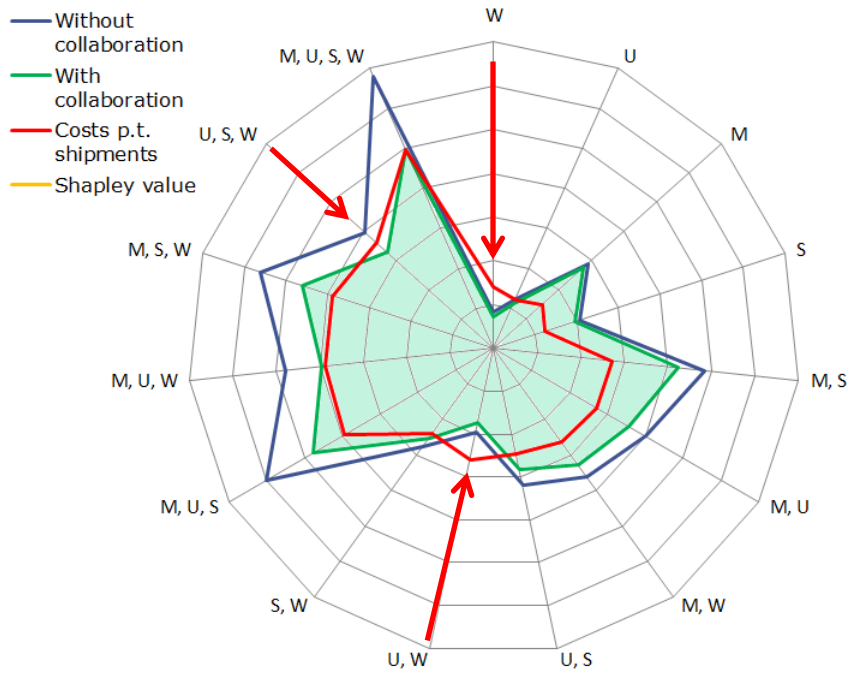
Shaded area: Tolerance area (called the ‘core’) for gain sharing rules that can be called stable

Suppose that companies W and U enter the consortium:



The same principle holds: to have a stable collaboration, every subcoalition must have a cost level after gain sharing that is lower than before collaboration.

This graph helps to evaluate a gain sharing rule on **stability:** whenever a rule can be depicted completely within the shaded area, it is stable; otherwise not.

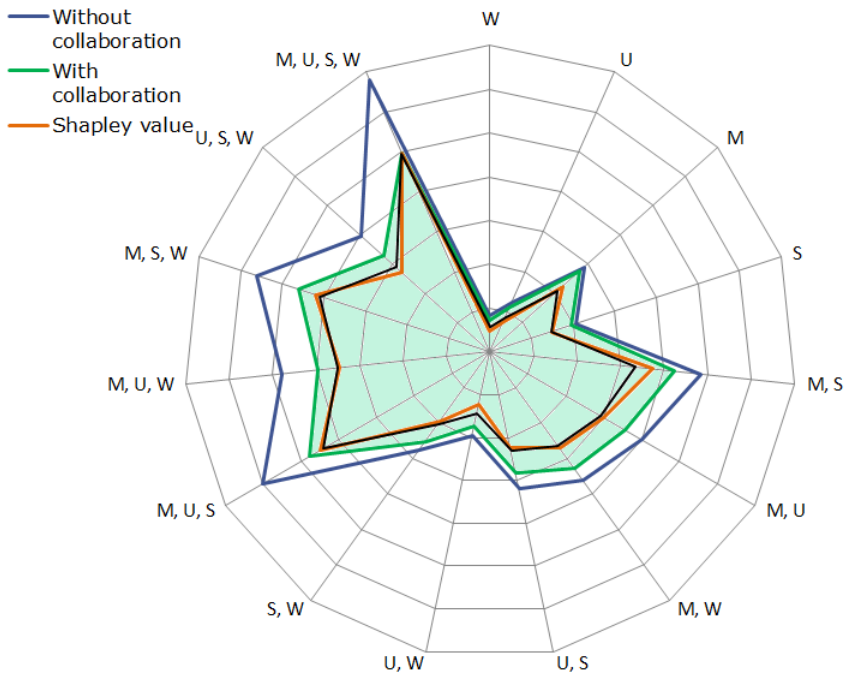


The red line depicts a gain sharing rule. It indicates what part of the total cost **under collaboration** is allocated to the companies in the subcoalition depicted at the endpoint.

Clearly, this gain sharing rule is not stable, as the red line does not lie within the shaded area. The graph shows that gain sharing deserves some good thought, as the simple rule of thumb of cost division based on individual cost per shipment (rule w.r.t. red line), results in an **unstable situation**.

Company W, subcoalitions U, W and U, S, W are not satisfied with the gain sharings and would split off when applying this rule.

Rules of thumb don’t work….



Shapley value results in a collaboration setup in which all partners are better off than without collaboration

PI

When the coalition grows (eventually to the PI) the added value of additional participants reduces to zero and highest possible efficiency is achieved.

Gain sharing and matchmaking is implicit and solved.

‘Ten commandments’ of collaboration

1. **Have measurable goals**
2. Start simple, with a stepwise approach
3. Ensure sufficient capacity
4. Work on behavior, trust and commitment
5. Keep your eyes on the long term
6. Ensure good communication
7. Construct a good governance structure
8. **Agree on the financial model beforehand**
9. Be flexible to change agreements when necessary
10. Determine clear conditions for entry and exit

Prof. A.P. De Man