CO³ Position Paper:

Added Value of ICT in Logistics Horizontal Collaboration:

Identifying the Need for an Integrated Approach

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CO3

*CO*LLABORATION *CO*NCEPTS FOR *CO*-MODALITY

WP4

"THE LOGISTICS LABORATORY"

(Orchestration, application and validation)

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Executive Summary

This position paper describes and evaluates the role and added value of ICT in creating sustainable transport and logistics horizontal collaboration. It is based on the current insights and experience of Giventis and TRI-VIZOR, who together with ITENE, act as neutral trustee and matchmaker within Work Package 4 (also called WP4 or the "logistics laboratory") of the CO3 consortium.

WP4 uses a straightforward, 3-phased methodology to identify, prepare and operate collaborative test cases from scratch with real market actors and logistics flows. Specific ICT tools are being tested and validated in each of the 3 phases.

Phase 1: Identification

In the first phase of the CO3 methodology, the neutral trustee identifies different companies and networks that are open for horizontal collaboration. The structural freight flow data of these companies are collected and analysed. In this phase, the added value of ICT will come from automated freight flow data visualization, "Big Data" analytical capability and matchmaking.

Phase 2: Preparation

In the preparation phase of the CO3 methodology, the neutral trustee will help the candidate partner companies to build profitable business cases and to quantify the benefits of the collaboration scenarios from 3 perspectives: total logistics cost savings (efficiency), reduction in greenhouse gas emissions (sustainability) and service level improvement (effectiveness). In this phase, the added value of ICT can come from various decision support tools that help to evaluate the logistics synergy potential, apply fair gain sharing mechanisms such as the Shapley value, calculate carbon footprint savings, etc.

Phase 3: Operation

In the operational phase of the CO3 methodology, the neutral trustee coordinates and synchronizes the actions and shipments of the collaborating supply chains in real-time. In this phase, the added value of ICT comes in the shape of a "collaborative control tower" and various social network tools that facilitate the community communication processes.

By applying the 3-step methodology and by supporting it with specialized ICT tools, neutral trustees can create from scratch sustainable and scalable horizontal collaboration communities that operate with "fewer and friendlier kilometres", benefiting at the same time shippers, logistics service providers, consumers and the environment.

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1. Introduction

1.1 Background of the CO3 project

The EU-funded project CO3 (**Co**llaboration **Co**ncepts for **Co**-modality) aims to develop, professionalise and disseminate information on the innovative business strategy of horizontal logistics collaboration in Europe. The goal of the project is to deliver a tangible contribution to increasing vehicle load factors, reducing empty movements and stimulate co-modality, through collaboration between industry partners, thereby reducing cost and transport externalities such as congestion and greenhouse gas emissions without compromising the customer service level. The CO3 consortium will coordinate studies and expert group exchanges and build on existing methodologies to develop legal and operational frameworks for collaboration via logistics "bundling", i.e. consolidation and synchronization of freight flows, in Europe. Furthermore, the project consortium of knowledge institutes and specialised industry players will develop new business models for logistics collaboration. The developed tools, technologies and business models will be applied and validated in the market via test cases. Finally, the CO3 consortium will promote and facilitate matchmaking and knowledge-sharing through conferences and practical workshops to transfer knowledge and increase the market acceptance of collaboration.

The core of the CO3 project is what is referred to as the *applied research cycle*. This cycle has been set up as a continuous learning and feedback loop between the models and tools needed for supporting collaborations, the most suitable business models for groups of companies wanting to collaborate and finally the actual test cases for collaboration. These elements are developed under individual work packages as shown below.

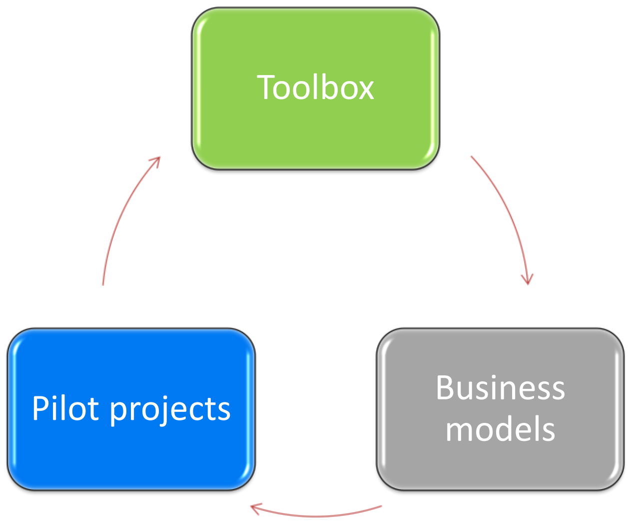


FIGURE 1: The CO3 Applied Research Cycle

1.2 Background of this position paper

The CO3 consortium is developing and testing a number of innovative concepts to organize sustainable freight flow bundling (LTL co-loading, FTL mode conversion) and FTL flow synchronization (backhauls, roundtrips and continuous asset moves) across multiple supply chains or logistics networks.

In order to set up and facilitate practical test cases, CO3 consortium partners TRI-VIZOR/Giventis/ITENE have been assigned to operate as neutral matchmakers and trustees. Together they proactively identify, prepare, facilitate and operate horizontal partnerships and collaborative test communities with active participation from shippers, carriers and logistics service providers. By bundling and synchronizing freight flows across different supply chains, the WP4 test cases must demonstrate significant simultaneous improvements in logistics cost, customer service and sustainability. Ideally, these WP4 test cases should at the same time also be scalable and repeatable.

The experience of WP4 to date has shown that effective use of specialized information and communications technology (ICT) is a major critical success factor in achieving repeatable and scalable success in horizontal collaboration. The aim of this position paper is to demonstrate, based on factual WP4 experience and market feedback, how ICT can add value as catalyst and enabler of horizontal collaboration.

As such, this position paper is also intended to support one of the main goals of the CO3 consortium, namely to contribute to a "mental shift" towards sustainable horizontal collaboration in the European transport and logistics market.

2 WP4 methodology and technology

2.1 Introduction

WP4 follows a straightforward but effective methodology to identify and create horizontal collaboration test cases from scratch. This methodology looks at horizontal collaboration as a structured and controllable process. In summary, this process is broken down into 3 chronological steps:

1) *Identification*
2) *Preparation*
3) *Operation*

This 3-step methodology is roughly the same for all types of horizontal collaboration. It is followed by all participants in WP4 test cases and facilitated by the neutral trustee. In addition to this methodology, specialized technological building blocks or ICT tools are being applied in every phase to maximize the success rate of the horizontal collaboration test cases. The following figure illustrates the 3-step methodology, with ICT components and their specific place in the methodology indicated in orange:

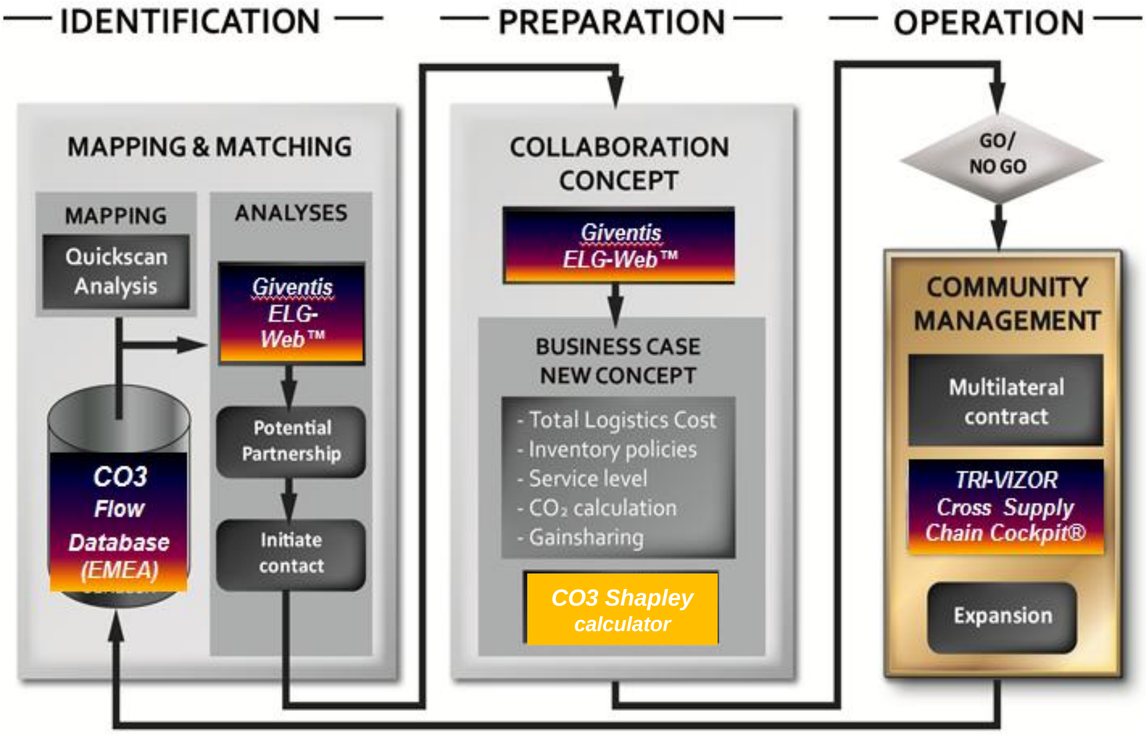


FIGURE 2: The CO3 three-step methodology

2.2 Phase 1: Identification

The first logical step to create horizontal collaboration is to detect and identify synergy opportunities. This critical step requires visibility of as many transport flows as possible, in order to single out the most interesting LTL/FTL combinations, co-loads, roundtrips or FTL synchronization "matches". It is as if an impartial observer would take a helicopter view to look for bundling chances across the millions of structural freight flows and transport asset movements that exist everywhere in the European transport market.

As said earlier, it is the aim of CO3 to develop horizontal collaborations test projects that are structural, stable and scalable. Therefore, it makes no sense to try and organize bundling across non-recurring or low-frequency transport movements. On the contrary, collaboration will deliver the strongest benefits if it is applied on structural freight flows, i.e. flows with a repetitive pattern and a significant amount of transport volume.

In transport and logistics jargon, such a structural freight flow between 2 geographical points is called a "tradelane" or "lane". Logistics tradelanes are often the reflection of the physical and geographical footprint of a manufacturing or distribution network. As such, they tend to be relatively stable over time and make good candidates for logistics bundling. An example of a tradelane is the replenishment flow between a manufacturing plant of white goods in Poland and its European Distribution Center (EDC) in the Netherlands.

A high concentration of tradelanes between the same 2 geographical regions is called a "corridor". Corridors are ideal environments for leveraging multimodal synergy and bundling opportunities. For example, the many maritime container transport flows between Rotterdam and Duisburg together form a corridor.

In concrete terms, a tradelane can be described by simple characteristics such as:

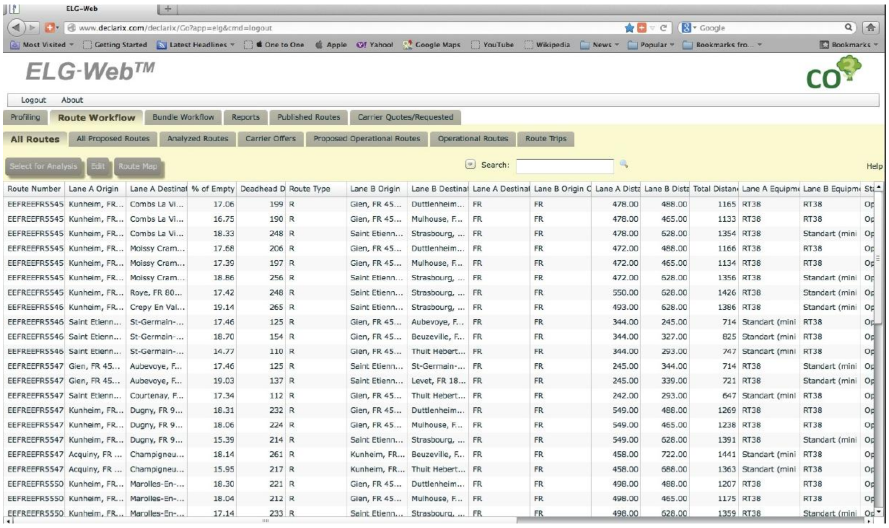
- origin (postal code, city and country)
- destination (postal code, city and country)
- aggregated annual volume (e.g. in FTL loads, pallets or TEU)
- average delivery frequency (daily, weekly, monthly)
- product type and conditioning (e.g. CPG; ambient, frozen, dangerous)
- asset type needed to transport the goods (e.g. standard truck, reefer container, road train)

Most large companies these days have a good overview of their structural tradelanes and historic network volumes, based on data contained or reported in their internal ERP or TMS systems.

At first sight, to create horizontal collaboration test cases, it does not appear difficult for a neutral facilitator or trustee to collect tradelane data from multiple supply networks on a macro (EMEA), mid (national) or micro (regional) level and then to analyse these lanes for synergy and bundling potential.

However, given the volume and scale of the data available (i.e. high number of lanes and accompanying properties), it will soon become very difficult for a human matchmaker or trustee to accomplish this analysis manually. Even the application of standard spreadsheets and database tools (e.g. Microsoft Excel, Access) will only help so much. Instead, analysing freight flows for synergy and bundling potential soon becomes a specialized "Big Data" challenge.

For this reason, WP4 partner Giventis is using ELG-Web, an industrial scale network analysis and optimization software, to identify, filter out and further examine potential bundles, co-loading routes, FTL roundtrips, etc. based on automated freight flow data analysis. The following screenshots give an impression:



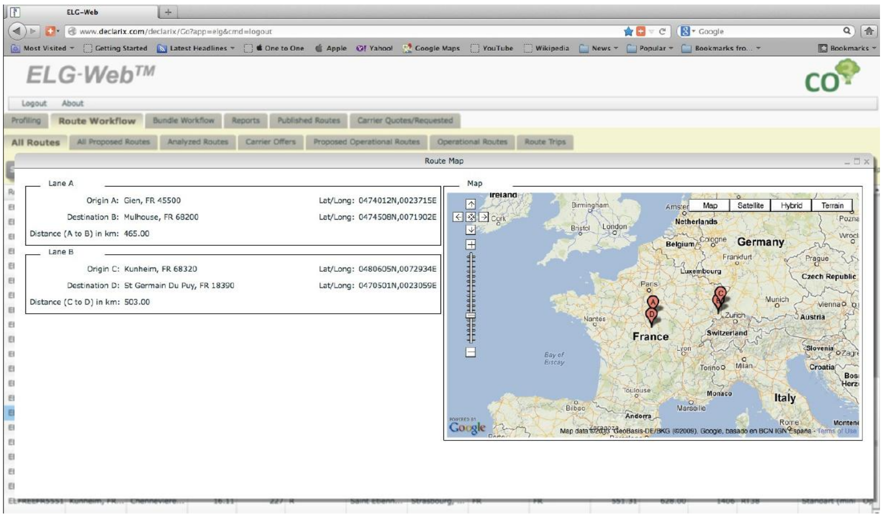


FIGURE 3: Data analysis to find potential roundtrips and co-loadings (ELG-Web)

In addition, WP4 partner TRI-VIZOR is using a Geographical Information System or GIS called ARCView (www.esri.com) to visualize individual transport networks and validate collaborative opportunities across different tradelanes or networks. This visualization is useful to single out network nodes or tradelanes that are missing or obsolete in the provided dataset, and facilitates the discussion with collaboration stakeholders in the relevant companies. The following screenshot shows what this GIS analysis looks like for an industrial company with several manufacturing and distribution locations across Europe:

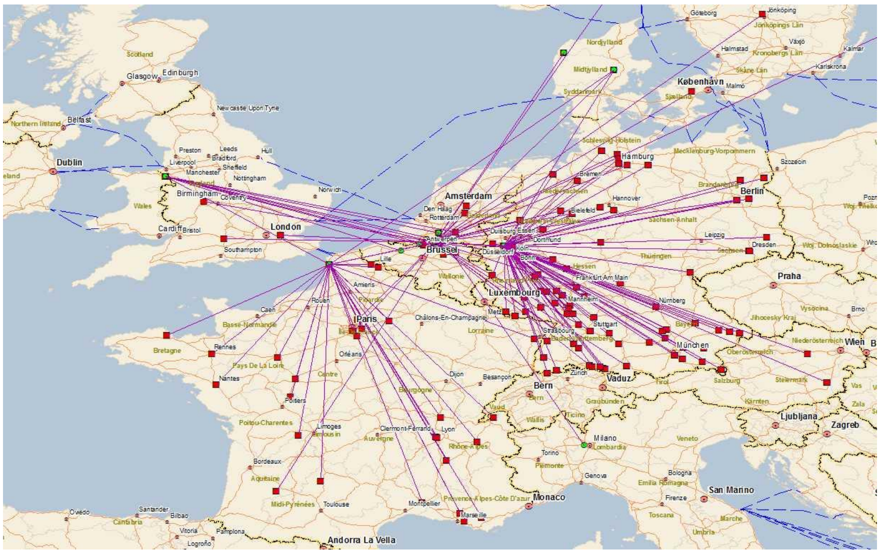


FIGURE 4: Mapping and visualization of European supply networks (TRI-VIZOR/ArcGIS)

For semi-automated queries into the CO3 freight flow database, TRI-VIZOR also uses "Flowmatcher", a self-developed Visual Basic application that is integrated with Microsoft MapPoint. The visual aspect makes it easier for a human analyst to detect and evaluate collaboration opportunities, and to discuss these opportunities in real-time in a meeting or workshop with the candidate collaborating parties. The following screenshot gives an example of a retail supplier network, visualized in MapPoint. This visualization will help the suppliers of the retail network to identify regional bundling opportunities in a hand-on workshop, more easily than if they would have to use tables and spreadsheets with orderline data:

FIGURE 5: Mapping and visualization of a retail distribution network (TRI-VIZOR/MapPoint)

2.3 Phase 2: Preparation

In phases 1 and 2 of the WP4 methodology, the neutral matchmaker or trustee will support the candidate collaborating companies and advise them on possible opportunities and risks, i.e. play an "offline" role.

Once the neutral trustee identifies a number of bilateral or multilateral horizontal collaboration opportunities (transport matches), WP4 follows a multi-step process of qualifying and ranking them, before calculating in a structured way the business case for each opportunity. This will often be a dynamic, iterative process, requiring increasing levels of detailed case information and commitment from the candidate partners.

The goal of this business case calculation is always the same: to make transparent the bundling synergies in terms of efficiency (cost), effectiveness (service level) and sustainability (carbon footprint) for all participating companies in a test case. These parties do not only include the shippers, but also the logistics service provider(s).

A constructive dialogue between shippers and carriers/3PL's during this preparation stage is therefore critical, in order to test and validate whether the theoretically assumed synergy savings can also be realized in practice, given the market conditions and constraints for the collaborating parties. Also this interaction will typically be facilitated by the neutral trustee and can be supported by ICT tools.

The interaction process to explore the various collaboration scenarios and their respective business cases can happen manually and offline by phone or email, or in an automated and online way using the sourcing functionality provided to shippers and carriers in the Giventis ELG-Web platform.

In addition, TRI-VIZOR has developed several simulation models to calculate the "total logistics cost" (incl. transport and transhipment cost, inventory rotation, service levels,…) implications of collaborative logistics, as well as a carbon footprint calculator to evaluate carbon footprint reduction effects of different collaboration scenarios in a multimodal setting.

Furthermore, a big critical success factor for reaching a stable business case, especially in multilateral horizontal collaboration with 3 or more partners, is the selection of an appropriate gain sharing mechanism. In CO3, the game theoretical "Shapley Value" is used as the standard solution for fair allocation of gains and losses among the different coalition partners. Since calculating and interpreting the Shapley Value requires significant computation power and specific knowledge, WP4 has identified a growing need to embed the Shapley value into a user-friendly ICT instrument that hides its intrinsic complexity from the logistics professional. CO3 consortium partners Argusi and d'Appolonia are currently working on a web-based tool that will facilitate Shapley gain sharing simulations and discussions in WP4 test projects. The following screenshot illustrates the "plug and play" functionality:

GAIN SHARING CALCULATION

Number of shippers 3 Change number of shippers

PLEASE INSERT COSTS FOR EACH COALITION

Number	Composition	Cost
1	S1	5
2	S2	3
3	S1, S2	8
4	S3	7
5	S1, S3	8
6	S2, S3	7
7	S1, S2, S3	9

Perform Calculations

RESULTS

	S1		S2		S3	
	cost	saving	cost	saving	cost	saving
S1	5.00					
S2			3.00			
S1, S2	5.00 62.5% (coalition)	0.00 0.0% (actual) NaN (savings)	3.00 37.5% (coalition)	0.00 0.0% (actual) NaN (savings)		
S3					7.00	
S1, S3	3.00 37.5% (coalition)	2.00 40.0% (actual) 50.0% (savings)			5.00 62.5% (coalition)	2.00 28.6% (actual) 50.0% (savings)
S2, S3			1.50 21.4% (coalition)	1.50 50.0% (actual) 50.0% (savings)	5.50 78.6% (coalition)	1.50 21.4% (actual) 50.0% (savings)
S1, S2, S3	3.33 37.0% (coalition)	1.67 33.3% (actual) 27.8% (savings)	1.83 20.4% (coalition)	1.17 38.9% (actual) 19.4% (savings)	3.83 42.6% (coalition)	3.17 45.2% (actual) 52.8% (savings)

FIGURE 6: Prototype of online tool for calculating Shapley value (Argusi/d'Appolonia)

As part of the business case preparation and evaluation, WP4 identifies and deals with the possible financial, legal and operational barriers for every bundling scenario that is retained by the collaborating companies. As far as these barriers can be overcome, WP4 further develops, implements and documents the steps necessary for the collaboration test case to proceed.

In short, the WP4 partners make use of TRI-VIZOR's supply network visualization and total logistics cost calculation tools, Giventis' ELG-Web matching-workflow software and other ICT tools. Together the tools form a flexible workbench to facilitate, capture and document the business case and drive the collaboration workflow forward. This includes the Shapley gain/cost sharing, support for the contractual framework or rules of engagement, and the capability to involve and communicate online with carriers and LSP's for sourcing, constraint resolution, etc.

2.4 Phase 3: Operation

Last but not least, in the 3rd and final step of the WP4 methodology, the mutually agreed business case and legal framework (or rules of engagement) need to be operationalized and converted into a test case during a specific amount of time. In this phase, real-time coordination and synchronization of bilateral and multilateral collaboration scenarios becomes a critical success factor. As a facilitator of collaborative, real-time planning, the neutral trustee will have to assume an "online" role as opposed to an "offline" one. While transport operators and logistics service providers are capable of managing traditional, bilateral transport collaboration, they are usually not yet equipped to manage more complex forms of cross enterprise (multilateral) partnerships.

In such WP4 test cases, TRI-VIZOR's self-developed "Cross Supply Chain Cockpit"® is used as an online planning and transport management system that captures and synchronizes in real-time the transport requirements and operations of the shippers and carrier(s) in a collaborative community. The Cross Supply Chain Cockpit is the neutral link and "bundling engine" between the different collaborating partners, in the sense that it constantly tries to synchronize and balance supply and demand of transport capacity. It is customized for every test case according to the agreed business models, cost allocation, legal framework, rules of engagement, gain sharing mechanisms, etc. of every partner. The system is operated by experienced transport planners who constantly try to optimize the KPI's of the community in terms of cost, service and carbon footprint. The Cross Supply Chain Cockpit® software, in combination with the planner(s) who operates it, can also be described as a "collaborative control tower". The following illustrations give an idea of the functionality:

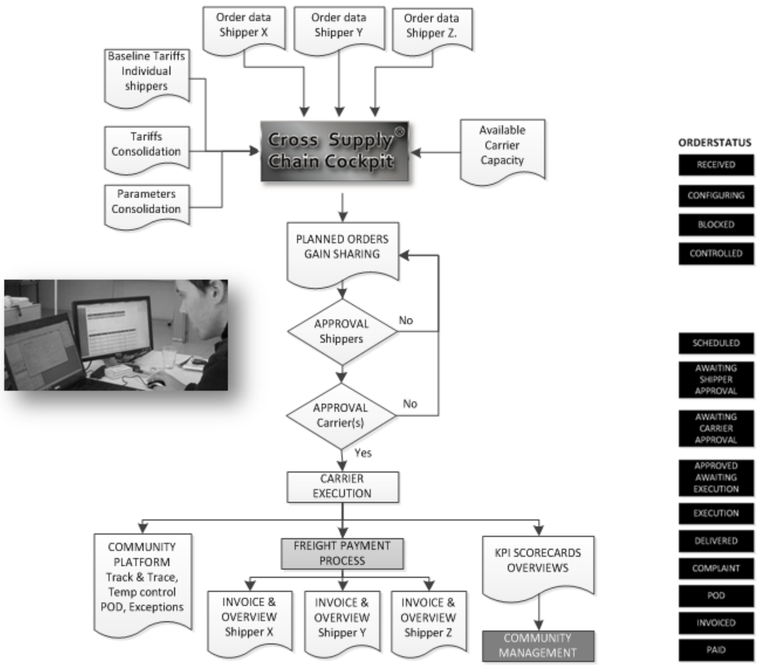


FIGURE 7: The "Cross Supply Chain Cockpit®", a collaborative control tower (TRI-VIZOR)

Critical success factors and added value building blocks of a collaborative (or "cross-chain") control tower in the operational management phase of horizontal collaboration, include:

- Linking the right parties (shippers, carriers/3PLs/4PLs/trustees) together and keeping them focused
- Building offline trust and online interfaces between the partners
- Collaborative planning
- Managing deliverables and performance
- Detecting and resolving issues in real time ("situational awareness")
- Process and workflow management
- KPI reporting to all community stakeholders
- Statistical forecasting
- Providing administrative efficiency
- Providing a "single version of the truth"
- Real-time gain sharing calculation and cost/benefit redistribution through central creation of "net" transport invoices (invoice cost = base cost – realized gains); preventing cumbersome post-hoc processing of credit notes
- Carrier/LSP invoice proposals (self-billing reports) and invoice reconciliation for the shippers

2.5 Social Media and ICT tools for community management

Logistics horizontal collaboration is a people business: it can only work if a large number of people in different locations can communicate easily and point their noses in the same direction. With that social perspective in mind, WP4 has also tried to evaluate the added value of ICT and social media to enable the interaction that is needed to set up collaborative test cases. Because of the ability to share pertinent information and act on it in real-time, the WP4 partners think the logistics industry can be influenced positively by these tools (e.g. Skype, LinkedIn, Facebook, Twitter, WebEx, Google Places, Microsoft Lync,…).

These audio-visual, interactive communication tools have the ability to accelerate the collaboration process while helping to limit the time lags and delays related to travel and expenses for candidate collaborating parties that are sitting at different locations. A lot of the human interaction and preparation work in WP4 that would have otherwise happened via traditional channels, has been obviated with freely available social ICT tools.

2.6 Integrated approach compacts the turnaround time

Without any doubt, the use of specialized ICT instruments has helped to support the WP4 methodology and to improve both the effectiveness and scalability of the test cases. As such, the WP4 partners conclude that there exist a number of benefits for a collaborative community when its neutral trustee would apply a specialized and integrated toolbox or "ICT umbrella" for community management.

The focus of this integrated ICT umbrella should be to improve the reaction speed and operational focus of many different partners in a collaborative community, without losing sight of the social and human aspects – in this sense, for a neutral trustee, managing horizontal collaboration is a bit like "herding cats."

On a high level, this integrated ICT umbrella also helps to provide a controlled and safe meeting place for sharing processes, workflows, resources and best practices throughout the entire collaborative community.

On an operational level, facilitation of bi-lateral and multi-lateral groups in smaller sub-sets can help ensure success with a "captive" environment for real time process management, orchestration and problem resolution between collaborating entities.

Recent experience of WP4 also demonstrates that the integrated use of ICT tools in combination with the appropriate methodology, can significantly accelerate the setup time of test projects and increase the stability of collaborative test communities.

Until recently, the setup time needed to create and implement a new horizontal community from scratch, was easily between 12 and 24 months. A case in point is the famous *"Manufacturers Consolidation Center (MCC)"*, one of the first successful examples of collaborative FMCG retail distribution in the Netherlands. This project was initiated around 1996 by Lever-Fabergé and Kimberly-Clark in the town of Raamsdonksveer. According to Dik Van den Berg, former logistics director of Kimberly-Clark, it took 7 years to develop the MCC from a theoretical concept in 1996 to a fully operational distribution center in 2003. The case was also far more driven by "coincidental" personal contacts and cultural fit between Lever-Fabergé and Kimberly-Clark employees than by a structured collaboration process (source: Verstrepen, S., "Handboek Distributieconsolidatie", Flanders Institute for Logistics, 2008, p. 23).

The WP4 partners now think that, with the right methodology, ICT tools and systems, it should be possible to push test projects through the "pipeline" in a few months or even weeks, as opposed to years. Towards the end of CO3, the WP4 partners think it will become increasingly clear that ICT decision support tools can be utilized in collaborative communities to leverage the necessary freight flow information and support the collaborative methodology. Using the right ICT tools will avoid underutilization of available data and information, or the occurrence of unnecessary time delays in the actions and interactions of community partners.

First feedback from the market indicates that specialized social media platforms can add additional value to horizontal communities. An interesting example of an integrated environment for effective large-scale community management is being offered by www.2degreesnetwork.com. This platform is currently supporting extensive supplier networks for major UK retailers such as Tesco and Asda. This so-called "Supplier Engagement Portal" (SEP) product is envisaged to be a significant accelerator for horizontal collaboration across a broad spectrum of retail suppliers, encompassing hundreds of potential co-load/bundling clusters for inbound transport. It also includes "Facebook-like" social features for easy user interaction:

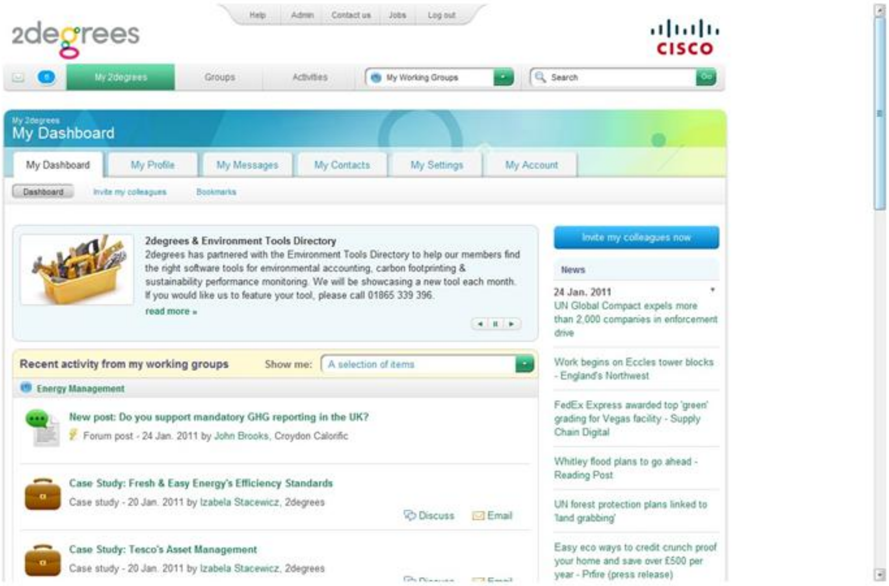


FIGURE 8: Supplier Engagement Platform, a social network for collaborative supply chains (2degrees)

3 Benefits of innovative ICT tools for the logistics market

An integrated ICT toolbox for horizontal collaboration should start with providing the functionality to create "user-friendly freight flow visibility" and the ability to find synergy opportunities in a market with hundreds of thousands of structural transport lanes, i.e. tens of millions of possible combinations. The innovative ICT components of WP4 are being used to transform raw transport data into actionable information and knowledge using a structured and proven methodology. As such, in WP4, ICT is proving its value as enabler of horizontal collaboration and transport efficiency. It can help to manage the collaboration lifecycle from discovery (visibility and identification of opportunities) to implementation and execution of opportunities (collaborative or cross-chain control tower).

The WP4 partners think there would be several key benefits for the market, when neutral trustees and other logistics actors would increasingly start to adopt the type or ICT components that are being used in the CO3 test cases.

3.1 Lower barriers to entry

Innovative ICT tools like "Big Data" matchmaking software, social media and collaborative control towers greatly enhance visibility, access to logistics synergy opportunities and operational execution of sustainable horizontal collaboration. There are numerous market segments and situations that could be positively impacted by their use:

- SME shippers
  - Opportunities to balance lower frequency flows with other SMEs and large shippers
  - Opportunity to identify flow bundling opportunities with other SMEs to common customers (e.g. retailers) or bundle flows to clusters of customers
  - Opportunity to inject smaller LTL flow volumes into large, high frequency (replenishment) tradelanes of large shippers

- Large shippers
  - Opportunities to balance high frequency flows and transport capacity across a wider spectrum of shippers and industry sectors
  - Opportunity to bundle flows with other large shippers to common customers or clusters of customers
  - Opportunities to find sufficient critical mass for modal shift

- Carriers and LSPs
  - Opportunities to create more stable and sustainable operations (round trips/continuous moves with minimal empty kilometers and maximal vehicle fill rate)
  - Asset pooling opportunities to maximize load factors while maintaining flexibility and free competition
  - Stand trailer/drop and hook to increase efficiency

3.2 State-of-the-art technology + methodology = scalability

In the structured "3-step" methodology of WP4, both process and ICT management are two sides of the same coin. The individual ICT components described earlier can act in a stand-alone environment but also as integrated enablers across the entire methodology. This can accelerate and provide scalability for the entire collaboration process, consequently increasing the throughput time and success rate of horizontal collaboration test projects.

Most conceptual building blocks of CO3, including flow visibility, legal framework, gain sharing, etc. can be embedded into or at least coupled with technological tools. Also in this context, proper ICT instruments will become critical in triggering and enabling horizontal logistics collaboration on an industrial scale.

3.3 Big data: dealing with volume and complexity

As stated earlier, it can certainly be argued that "line of sight" horizontal collaboration opportunities, where 2 or more companies share an awareness of each other's logistics operations (they may for example be neighbours in the same industrial park or meet each other at a logistics conference); and simple quick wins across 2 networks or regions can easily be identified manually.

However, the massive number of potential combinations that need to be explored when analysing freight flow synergies on a structural basis, e.g. for roundtrip or synchronization opportunities, continuous triangle moves or modal shift on a specific corridor, etc.,will soon require specialized ICT tools. Especially if a neutral trustee wants to set up horizontal collaborations on a repetitive basis, creating visibility to all opportunities across multiple extensive supply networks, and executing on the results, cannot be done without a specialized, scalable ICT workbench. To illustrate this point, we give some examples from the perspective of the neutral trustees in WP4:

- Offline trustee dealing with matchmaking complexity: detecting overlap and synergy potential between multiple supply networks is not an easy task. At a certain moment, the Giventis ELG-Web platform analysed a limited lane data set for CO3 (approx. 6.900 lanes). The system identified possible combinations that resulted in 7.512 matches for potential synchronized FTL roundtrips and continuous moves, and 6.709 possible co-loading opportunities. The platform looked at over *47 million combinations* to identify these results.

- Online trustee offering real-time services for supply network synchronization ("collaborative control tower"): in a simple WP4 test case, a human logistics planner can coordinate and synchronize the activities of the collaboration parties in a community with a simple spreadsheet as planning tool and telephone, fax and email as communication channels. This was for example the case in the JSP-Hammerwerk co-loading test project. However, in situations where multiple logistics teams and supply chains need to be linked together and synchronized, or where large transport volumes with high order frequencies need to be coordinated, this approach quickly reaches its limitations. In so-called "stress tests", the TRI-VIZOR Cross Supply Chain Cockpit® has proven that it can automatically receive, process, prioritize and execute hundreds of collaborative transport orders in real-time - something a human planner could never manage. Before the end of CO3, the WP4 partners expect to implement a test case whereby the volumes and transport frequencies are sufficiently high for the Cross Supply Chain Cockpit® to prove its added value. This may become the case with rising volumes in the current "Belgium-Spain intermodal closed loop" test project of WP4.

4 Additional background on CO3 technology components and resulting benefits

The innovative ICT building blocks that are being tested in WP4 have a number of other characteristics that are intrinsically beneficial to collaborative communities:

- Open access (standard spreadsheet format) data input and output: this aspect avoids barriers in the detection and dissemination of collaboration opportunities. For example, WP4 uses a simple Excel template to collect and upload flow data from companies that wish to participate in test cases:

CO3 Freight flow mapping

Company name	xxx
Business unit/division	xxx

	1	2	3	4	5	6	7	8	9	10
Freight flow	Origin			Destination			Total Yearly Volume	Flow Type or volume measure if LTL	Equipment type	Mode
Include all 'relevant' freight flows for your company/business unit; all flows on which you have impact (outbound/inbound)	Country Code	City	Zip code/ postal code	Country Code	City	Zip code/ postal code	Most recent full year (2010 or 2011)	FTL/Rail=number of movements; LTL=kgs, tons, pallets	FTL ONLY-See equipment codes below	FTL/LTL/Rail sea/barge/air (default to road if not indicated)
Example 1	BE (Belgium)	Antwerp	B-2000	IT (Italy)	Milan	20133	30.000	ton		LTL
Example 2	SP (Spain)	Valencia	46025	BE (Belgium)	Roeselare	B-8800	1000	pallets		LTL
Example 3	SP (Spain)	Valencia	46025	BE (Belgium)	Roeselare	B-8800	20	FTL	100 M3	FTL
Example 4	BE (Belgium)	Antwerp	B-2000	SP (Spain)	Valencia	46025	100	Rail	Tanker-R	Rail
Example 5	BE (Belgium)	Antwerp	B-2000	SP (Spain)	Valencia	46025	150	FTL	Standard	FTL
4										
5										
6										

FIGURE 9: CO3 data template for collecting freight flow information

- Multilateral combination detection: constraint analysis and search filtering is embedded for matching FTL roundtrips and LTL co-loads.

- Network and community centric/cross enterprise design of the building blocks, as opposed to enterprise centric design (TMS, ERP, etc.), provides a neutral environment necessary for horizontal collaboration. Cross enterprise design is embedded throughout the entire collaboration life cycle, extending from visibility, identifying/matching of compatible flows to operational execution.

- Cloud-based software and Internet browser access models create easy and universal accessibility. Both the Giventis ELG-Web platform and the TRI-VIZOR Cross Supply Chain Cockpit® have been fully designed and developed as cloud software. Cloud technology offers greater deployment speed, lower fixed hardware and software costs, increased data security and elastic access to computing power and storage capacity ("power by the hour").

- Viral capabilities of ICT, distributive across shippers, carriers, 3PLs, make it easy to connect new partners into a community and to support ever increasing horizontal collaboration combinations.

- Secure design of ICT building blocks ensures the protection freight flow data and cost information. This is highly important in terms of anti-trust compliance and to support trustworthy "rules of engagement" between the collaborating parties. Using appropriate ICT tools, a neutral trustee can set up "Chinese Walls" between the collaboration partners.

- Scalable deployment and execution of the ICT components allow accelerated horizontal collaboration confidence and adoption: e.g., a collaborative community can limit the financial risk of a test project by paying for "calculation power by the hour" when ramping up the test volumes, before going to full-fledged daily collaboration.

- Middleware: both Giventis-ELG Web and TRI-VIZOR's Cross Supply Chain Cockpit® provide interoperability to users through the exchange of data by flat files, Excel data, real-time electronic messaging, etc. In addition, specialized middleware or TMS connectivity software can also be plugged in.

4.1 ICT components currently in use for WP4 test projects

The Giventis ELG–Web platform for collaboration support is now fully operational in WP4. It offers "smart matchmaking" for offline trustees as well as collaborative workflow and communications between shippers and carriers. ELG-Web uses constraint based algorithms with infinitely adjustable tolerances to identify opportunities for reducing empty kilometres on FTL and improved efficiencies on LTL.

This technology building blocks enables shippers and carriers to identify and act upon opportunities for:

- Flow bundling/co-loading (LTL/FTL/intermodal)
- Backhaul matching (roundtrips)
- Continuous movements (non-stop FTL's)

In addition, TRI-VIZOR's "Cross Supply Chain Cockpit"® is now fully operational in WP4 and ready to process increasing freight volumes. It has been designed as a collaborative control tower to support and automate the "online trustee" functions in horizontal collaboration. These functions can include gain sharing execution rules, administrative workflow (e.g. central transport invoicing) and KPI reporting for all partners in a collaborative community.

Through their participation in in CO3 WP4 test cases, several actors in the logistics market are today already evaluating and enjoying the added value of these technologies and ICT components.

The combination of WP4 methodology and technology has already resulted in several successful test projects for LTL co-loading, FTL round trips and intermodal collaboration. It is expected that new opportunities will be identified as lane data from new shippers continues to be added to the CO3 database.

4.2 Examples

The following WP4 test cases are the direct result of the WP4 methodology and matchmaking technology. They are currently in "Phase 2" (business case preparation) or in "Phase 3" (operational execution) and will be documented and published in detail, as soon as they reach several months of successful running:

- 2 compatible FMCG shippers were identified in France whereby 1 shipper has a single high volume lane, matching against 4 medium volume lanes of the 2nd shipper (all are long distance France domestic lanes). The screenshot below shows the roundtrip opportunity that the ELG-Web matchmaking software came up with:

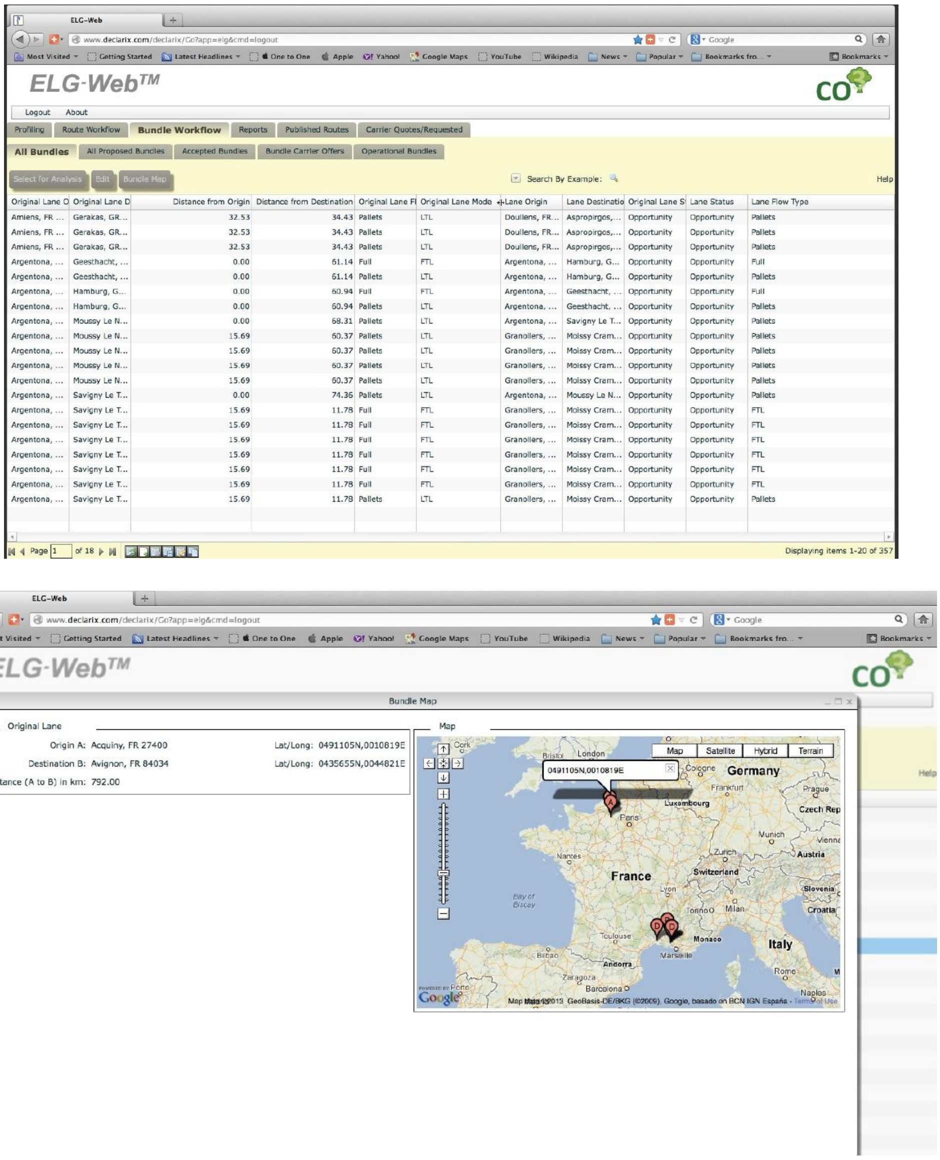
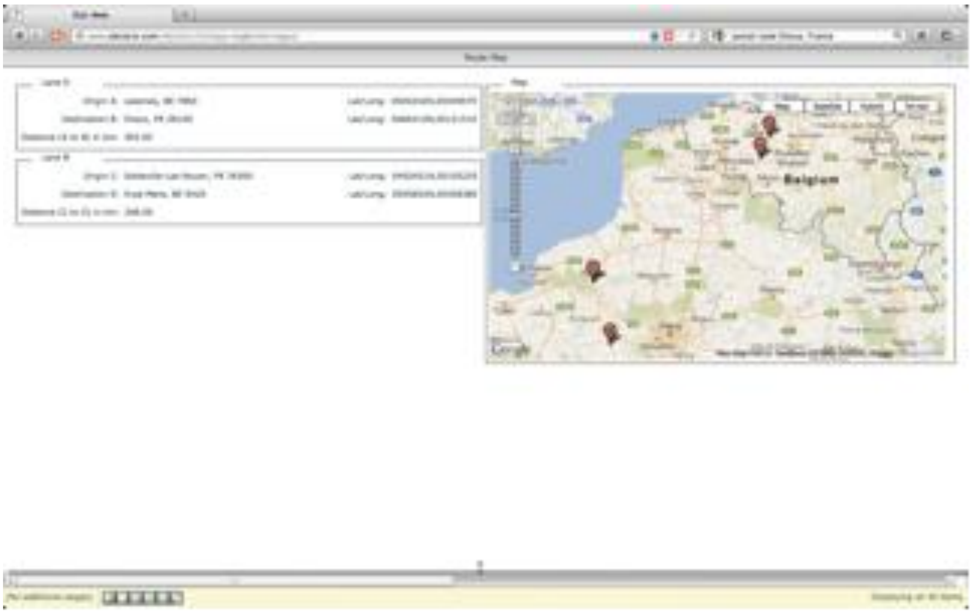


FIGURE 10: Identifying potential test cases for WP4 (ELG-Web)

- A similar opportunity for Healthcare – FMCG collaboration was identified on opposing flows between France and Belgium. The goal of this test case will be to create an efficient, daily collaborative roundtrip between the 2 shippers with the possibility of adding a third shipper into the mix to maximize the efficiency of the flows and utilization rate of the transport assets. The screenshots below illustrate the potential match:



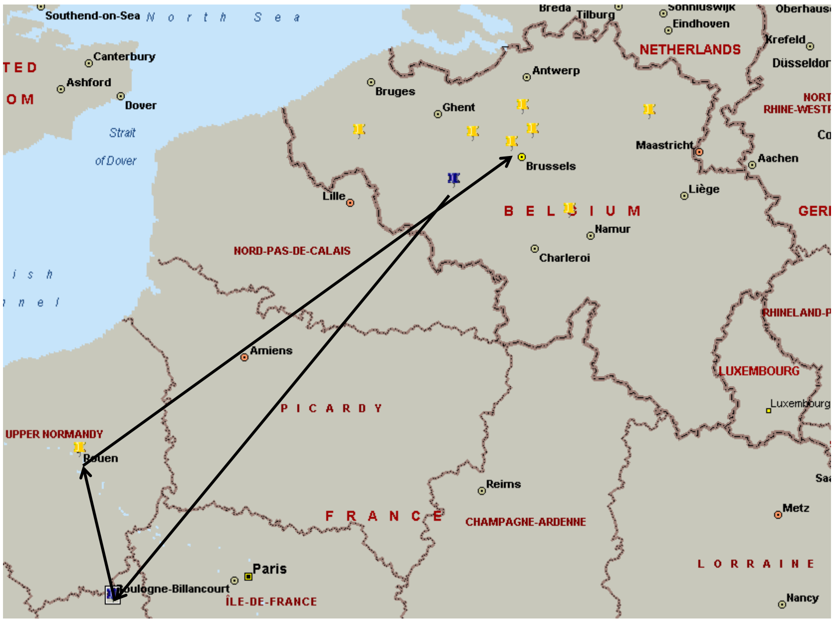


FIGURE 11: Developing potential test cases for WP4 (Giventis/TRI-VIZOR)

In both instances, initial evaluation of the matches by the WP4 partners showed that the flows have different equipment and operational requirements, e.g. pallet swapping, that on the surface would seem to be showstoppers for horizontal collaboration. However, further exploration and facilitation by the neutral trustee resulted in the equipment and process standardization needed to start effective collaboration. The lesson is that, in order to accelerate horizontal collaboration, the ICT environment must be able to identify collaborative partnerships using minimum constraint tolerances across a broad spectrum of transport flows in order to have the opportunity to investigate the scenarios in depth, which more often than not can result in operational collaborative routes.

Another key argument in favour of limiting initial constraints is the fact that in both these cases, the matches identified had stable, plant to DC flows on the one hand matched with more unpredictable, order driven multiple DC to customer flows on the other. By matching a series of unpredictable, in both cases multi-shipper, flows with stable ones, Giventis ELG-Web was able to identify and detect a viable, potential collaboration scenario that expanded on the conventional norm that only stable round trip flows should be considered for collaboration.

In a further paradigm shift, in the Belgium-France case, the potential roundtrips are covering 2 totally different industry sectors (healthcare and FMCG) that on the surface seem incompatible, but in reality present an opportunity to create significant shared efficiencies.

5 Conclusions

The goal of CO3 is to demonstrate that innovative concepts and business models of logistics horizontal collaboration can help to build more efficient, effective and sustainable transport and logistics networks.

The current successful test projects of WP4 have already proven that a straightforward 3-step methodology (identify/prepare/operate) is sufficient to create successful horizontal collaboration projects from scratch.

The addition of a mix of specialized ICT tools to this methodology can help to support and accelerate horizontal collaboration in the market by providing an integrated environment for detecting, exploring and implementing profitable synergy options on a very large scale.

By applying fair and transparent gain sharing mechanisms such as the Shapley value, the synergy benefits of freight flow bundling can be redistributed among all partners in a collaborative logistics community ("win-win"). The process of dynamically calculating the Shapley value can easily be automated, hiding its complexity from the logistics end user.

Neutral trustees, whether operating in an "offline" or "online" role, will prove to be pivotal players in the creation and management of collaborative logistics communities. Ideally, market actors that aspire to become neutral trustees should develop and apply an integrated "technology toolbox" if they want to maximize their success rate and added value in every phase of the collaborative lifecycle.

5.1 Future vision

Sufficient anecdotal evidence exists in WP4 to suggest that the structural deployment of innovative ICT tools and services in an integrated setting would be a game changer in the European transport and logistics marketplace, in the sense that it would trigger large scale collaborative capacity sourcing and utilization:

1. ICT tools like Giventis ELG-Web for mapping and matching large amounts of trade lane data could act as a "dating service" for shippers and carriers. This would allow companies of all sizes and across multiple industries to submit their lane data in a secure environment, with the expectation of identifying compatible matches and partners. Shippers could use the same platform as a collaborative communications tool to move through the required workflow to confirm compatibility, gain sharing rules and operational requirements. Carriers, 3PLs, 4PLs and neutral trustees would be fully integrated into the platform and could use it to detect network synergies. The neutral trustee would facilitate matchmaking and oversee the platform transactions, making sure that the synergy gains would be shared in a fair manner between all coalition partners, including the logistics service provider.
2. An accompanying collaborative transportation management system or control tower, like TRI-VIZOR's Cross Supply Chain Cockpit® would facilitate real-time community transaction management and network synchronization, including fair gain sharing under the supervision of a neutral community planner.
3. Such components could be part of an integrated collaborative logistics platform or "one stop shop", housed under the umbrella of neutral community service provider offering ICT and non-ICT services (e.g. legal advice). This

one stop shop could both be used as a distribution channel to the marketplace as well as a safe environment for implementing collaborative logistics practices.

5.2 Author's remark

The statements and ideas published in this position paper are based on the authors' direct experience in the collaborative logistics market and in WP4 test cases thus far. Some of the ICT tools and technologies discussed here are very new and have only just begun to be commercially applied in large scale operational environments. WP4 will continue to put its ICT building blocks to the test and capture new learnings as the test cases progress and become more complex. Therefore, it is recommended that a reviewed and updated version of this position paper be published at the end of the CO3 project in 2014.