PROMIT

TREN/06/FP6TR/S07.55976/019851

Promoting Innovative Intermodal Freight Transport

Co-ordination Action

Priority 1.6.2 Sustainable Surface Transport

WP 5 / D5.3: Strategy and Recommendations

Due Date of deliverable: February 2009

Actual submission date: March 20th 2009 cor1

Start date of the project: March 2006 Duration: 36 months

Main Authors: Antti Permala, Jarkko Lehtinen, Jenni Eckhardt VTT

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Abstract

PROMIT is the European Coordination Action (CA) for intermodal freight transport initiating, facilitating and supporting the coordination and cooperation of national and European initiatives, projects, promotion centres, technology providers, research institutes and user groups related to this complex transport mode. WP5, intermodal strategies and recommendations aims to develop a vision to stimulate the attractiveness, efficiency and quality of intermodal transport. In this context, a strategy is a long-term plan of action designed to achieve a particular goal.

Intermodality is of fundamental importance for developing competitive alternatives to road transport. As roads are being increasingly overloaded, intermodal transport can offer reliable, cost-effective delivery in an environmentally conscious manner. Developing freight transport logistics is primarily a business-related activity and a task for industry. Nevertheless, the authorities have a clear role to play in creating the appropriate framework conditions and keeping logistics on the political agenda.

Main objectives of this WP are to describe and provide a comprehensive inventory of intermodal strategies on European level and to assess market developments in terms of their strategic relevance from an industrial and policy point of view.

64 PROMIT Best Practice cases are described shortly. Rail operations cover some new intermodal connections and several types of development of existing services, based on block and shuttle trains. Information platforms base on quite different approaches, e.g. regional, mode such as rail or port based solutions. Some platforms serve both stakeholders in intermodal business as well as authorities. Some have more informative nature. Terminal cases cover actions directed to operations efficiency, in many cases based on software development and handling technology development. Tracking cases include satellite positioning of equipment and track and trace services in intermodal rail transport.

14 business cases were analysed in detail from strategy point of view: Cargo Domino, Stora Enso base port system / Netts, Rail4Chem, Distrivaart, D2D, GITS, HUPAC, CORY, VOLVO, Reorient, Interface. Viking train, Eurewa and Terminal management Interporto Bologna.

Intermodal transport service consists of a network of different companies, and not all of them can be the actual leader of the network. Strategic leadership of intermodal service were analysed with three different types of cases Volvo, Hupac and Kuehne+Nagel. These companies are leaders of the service but they have a quite different position in the intermodal service network. Volvo is an industrial end customer, HUPAC a railway operator and Kuehne + Nagel a 3 PL logistics service provider.

Consolidated recommendations cover business models, ICT, services and policy.

Contents

1 INTRODUCTION

1.1 PROMIT objectives

PROMIT is the European Coordination Action (CA) for intermodal freight transport initiating, facilitating and supporting the coordination and cooperation of national and European initiatives, projects, promotion centres, technology providers, research institutes and user groups related to this most complex transport form. The strategic PROMIT objective is to contribute to a faster improvement and implementation of intermodal transport technologies and procedures and to help in promoting intermodal logistics and mode shift by creating awareness of innovations, best practices and intermodal transport opportunities for potential users as well as for politicians and for the research community.

Due to the immense size of the intermodality domain PROMIT choose a matrix organisation, where the domain expertise is treated in five parallel clusters: (1) Organisation and Business Models, (2) Intermodal Infrastructure and Equipment, (3) Information and Communication Technologies, (4) Operation and Services and (5) Security, Safety, Legislation and Policy (Fig 1). The work packages ensure that PROMIT will collate, consolidate and disseminate what already exists in terms of best practises, performance indicators and benchmarks, as well as national/European strategies, policies and promotion activities. Addressing in detail the national and European promotion structures as well as strengths, gaps and weaknesses of promotion measures will be a focus of PROMIT, including the implementation of exemplary real life cases of promotion measures in areas presently not addressed.

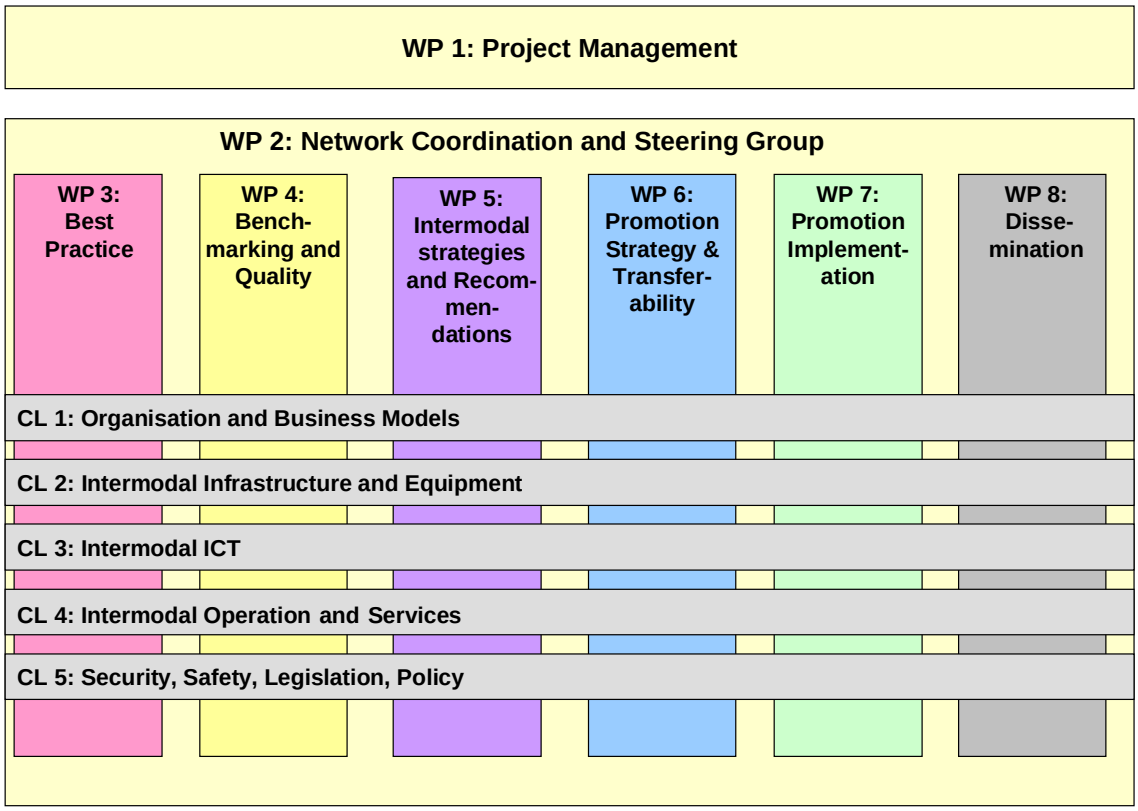


Figure 1. PROMIT project structure

PROMIT Coordination Action lasted for 3 years, during which 3 Intermodal Innovation Day Conferences and nine cluster workshops and seminars were organised in addition to the dissemination via brochures, newsletters and an Internet homepage (http://www.promit-project.net/).

PROMIT was raising synergies in the European intermodal community and contributed to policy initiatives at national and European levels supporting the shift of transport from road to intermodal transport modes.

1.2 PROMIT WP5 objectives

WP5, Intermodal Strategies and Recommendations, aim at developing a vision to stimulate the attractiveness, efficiency and quality of intermodal transport. Main objectives of this work package are to:

- Establish a framework for the collection of intermodal strategies over the different clusters
- Describe and provide a comprehensive inventory of intermodal strategies on European level
- Assess market developments on their strategic relevance from an industrial and policy point of view
- Provide recommendations on strategies and further activities.

Task 5.1 contained the working instructions for clusters. Task 5.2 collated cluster input from cluster leaders. The collection provides a comprehensive overview of the different strategies adopted and planned at the company, national and EU level. As experiences from previous projects showed, it is difficult to obtain wide coverage of different European countries in a seminar or a clustering meeting. Accordingly, the collection is completed by input from contractors and subcontractors. Task 5.3 includes consolidation and integration results from WP 3 and WP 4 as well as findings from the different clusters. The results are consolidated for the analysis in terms of market and policy strategies.

Task 5.4 includes recommendations. Recommendations (and guidelines) are derived for shippers, intermodal transport operators, terminal operators, logistics service providers, systems suppliers, and policy makers at European, national and regional levels. Recommendations and guidelines give advice to the relevant actors in intermodal transport to develop successful strategies and to realize the potential for modal shift. Evaluation and selection criteria were discussed in the Steering Committee meetings 28-29 June 2007 in Helsinki and 11-12 August 2008 in Oslo and are presented in the next chapter 2 Approach.

This final WP5 report contains a comprehensive overview on the different strategies on intermodal transport and consolidated recommendations.

The results have been reported annually in the following deliverables:

- D 5.1 PROMIT Recommendations on strategies and further activities I - delivered May 4th 2007

- D 5.2 PROMIT Recommendations on strategies and further activities II - delivered June 23th 2007
- D 5.3 PROMIT Consolidated recommendations on strategies and further activities III 28.2.2009 – this report.

1.3 Authors

This report is worked up by Antti Permala from VTT. Jenni Eckhardt has worked out the case studies from PROMIT cluster inputs. Jarkko Lehtinen has analysed the three in-depth cases Hupac, Volvo and Kuehne+Nagel. Ákos Radóczy from KTI has provided input 4.4 European transport policy. Cluster leaders have commented the recommendations in chapter 5.3.

2 APPROACH

2.1 Workshop and conference input

PROMIT was collecting information in five clusters:

1. Organisation and business models
2. Intermodal Infrastructure
3. ICT
4. Operations and Services
5. Security, Safety, Legislation, Policy

Seven dedicated PROMIT cluster workshops were held during the PROMIT project lifetime.

1. The 1st Workshop took place in Basel on 13-14 November 2006 concerning "Intermodal Door-to-Door Services", a combination of the clusters "Organisation and business models", "Intermodal infrastructure and equipment" and "Intermodal operations and services".
2. The 2nd Workshop was held in Thessaloniki on 8-9th February 2007 which addressed the following topic: "Technologies to Enhance Intermodal Transport Chains". This workshop was a joint event of the clusters "Intermodal ICT" and "Security, Safety, Legislations, Policy".
3. The 3rd PROMIT Cluster Workshop took place in Gothenburg, Sweden on June 4th and 5th, 2007. The topic for the workshop was "Intermodal Infrastructure and Equipment", and the focus was on rail and waterborne transport. The rail and waterborne topics were mingled in the program to motivate transfer of knowledge between the representatives for the two modes
4. The 4th PROMIT Workshop on Innovative co-operation models for efficient and high quality intermodal services and operation took place in Gdynia, Poland on the 25th and 26th of September 2007. The workshop addressed on successful business models related to services and operation of intermodal transport using short-sea shipping, inland waterways and rail.
5. The 5th PROMIT Workshop "Intermodal Transport Across Borders" took place on November 20th and 21st, 2007 in Bologna, Italy. This workshop was jointly organised by Cluster 3 (Information and Communication Technologies) and Cluster 5 (Security, Safety, Legislation and Policy).
6. The 6th PROMIT Workshop on Successful Cooperative Intermodal Transport Strategies and ICT Systems took place on May 15th and 16th, 2008 in Southampton, UK. The workshop was jointly organised by Cluster 1 (Organisation and business models), Cluster 3 (Information and Communication Technologies), and Cluster 5 (Security, Safety, Legislation and Policy).
7. The final 7th PROMIT Cluster Workshop on High Quality Intermodal Terminal Infrastructure and Operation addressed advanced intermodal seaport, inland port and

rail/road terminal infrastructure design, operation and service concepts. Terminals play a crucial role in intermodal transport chains relating to quality, efficiency and capacity of the whole intermodal chain. The workshop took place on the 16-17th October 2008 in Lisbon, Portugal. As the workshop was organized in cooperation with the MarNIS project (http://www.marnis.org,), PROMIT participated in the technical on-site MarNIS demonstrations onboard the vessel OPERA, sailing in the Port of Lisbon.

Other meetings covered one workshop, one seminar and three innovation day conferences.

The PROMIT project organized a Workshop in the framework of the Balkans Intermodal & Logistics Conference 2007, in Sofia, Bulgaria on the 9th of November 2007. This event addressed the topic "Promotion measures on intermodal transport and their impact". Balkans Intermodal and Logistics (BIL) Conference 2007 was a regional conference, supported by the European Commission-DG TREN, and the main associations EIA, UIRR, ECSA, EFIP, ESN, AMRIE and others, as well as the national organizations – founders of the SPC Bulgaria.

The PROMIT Seminar "Connecting Europe and Asia with Trans-Siberian Rail (TSR)" took place 14 February 2008 at VR-Group Ltd in Helsinki. Intermodal Trans-Siberian corridor is a rail link between Europe and Asia. The idea of the seminar was to promote the Trans-Siberian corridor as an alternative to the sea route.

The first PROMIT Innovation Day Conference on "Promoting Intermodal Freight Transport in Europe: Innovation and best practice examples" was organized in Antwerp, Belgium, on March 15-16, 2007. The conference was jointly organized by the PROMIT Project Consortium and the European Intermodal Association (EIA), and supported by the Institute of Transport and Maritime Management Antwerp (ITMMA) and the Port of Antwerp.

PROMIT, in cooperation with EUROPLATFORMS, ITENE and EIA, organized a high-level Conference on "Co-modality; an intermodal key to sustain green logistics" in March 6-7, 2008 in Valencia. The programme covered intermodality and interoperability as key words in the green logistics process, green logistics' effects on business models, the role of technology in green logistics, training and research programmes in green logistics and best practice cases. European Member States need to be able to secure their future transport flows and cater to energy supply & demand trends, while at the same time striving to reduce CO2 emissions through energy efficiency, renewable fuels and transport demand control. They will be looking to systems of taxation that foster energy efficiency, and will be pushing intelligent speed adaptations and considering forcibly curbing maximum truck speeds.

PROMIT organised the final Intermodal Innovation Day Conference, in cooperation with EIA, with subject "Sustainability and efficiency through intermodal best practices". The conference took place in Chamber of Shipping in Istanbul, Turkey, on February 12-13, 2009. Industrial and R&D innovations were presented, while particular emphasis on the efficiency and sustainability gains through a truly paperless European e-freight strategy.

Dedicated material collections carried out by the PROMIT cluster working groups to screen various sources of information are used to extract relevant information. Information

is extracted by means of publications, interviews, websites, personal contacts and outputs of other EU funded projects.

2.2 Definition of target – intermodal freight transport

EU gives the following definitions that supply all or a considerable number of its logistical activities:

- 'Freight Transport Logistics' covers the planning, organisation, management, control and execution of freight transport operations in the supply chain.
- 'Co-modality' means the efficient use of transport modes operating on their own or in multimodal integration in the European transport system to reach an optimal and sustainable utilisation of resources.
- 'Multimodality' is the carriage of goods by two or more modes of transport, irrespective of the types of freight, within a single transport chain.
- 'Third-party logistics' means that an organisation uses external logistics providers

Freight intermodality is the door-to-door carriage of freight by two or more modes of transport with a high level of interoperability and integration. Intermodal logistics concentrates on the transport part of the whole supply chain (i.e. transport logistics) in favour of intermodal solutions and covers the planning, organisation, management, control and execution (implementation) of intermodal freight transport door to door.

The concepts include, in addition to transport operations where the same loading unit is moved from a point of departure to a point of destination using more than one mode without handling the goods themselves, also general cargo and dry and liquid bulk and any other commodities transported. There does not seem to be any justified reason to exclude any type of cargo, because most of it is or can be transported using more than one mode. (Consultation paper on logistics for promoting freight Intermodality).

2.3 Logistics

Logistics is the planning, organisation, management, execution and control of freight transport operations. It integrates individual transport acts to door-to-door supply chains, determining the efficiency of freight transport.

Logistics has also become an industry in its own right, enjoying sustained growth over the past years. Several of the leading companies world-wide are European. With ever increasing volumes in freight transport, logistics needs to find solutions to the emerging consequences of this growth. In economic terms, these relate to the costs incurred through congestion, labour shortages and to the dependency on fossil fuels. Regarding the environmental and social dimensions the challenge lies in reducing freight transport's negative impacts on the natural and social habitats. Logistics service providers need to help develop solutions to these issues.

Developing freight transport logistics is primarily a business-related activity and a task for industry. Nevertheless, the authorities have a clear role to play in creating the appropriate

framework conditions and keeping logistics on the political agenda. This framework approach concentrates on improving the preconditions that Europe can offer for logistics innovation and leaves the internal running of company logistics to the companies themselves (Communication – Freight Transport Logistics in Europe).

Supply / Demand Chain Management (SDCM) extends the view of operations from a single business unit or a company to the whole supply chain and as part of a network focuses on developing individual supply chains. SDCM consists of strategic and operative management practices and information and production infrastructure. The challenge is to manage and coordinate the entire chain from raw material suppliers to the ultimate customers. The objective is to improve the entire process rather than focusing on local optimization (Heikkilä 2004).

Main competitive factors are the management of costs, service quality and lead time. As almost all actors can manage these criteria, the competitive position demand new elements such as leanness, agility and responsiveness (ELA 1999). These elements set up demands also for multimodal or intermodal services. Boundary conditions such as long distance, volumes, some specific success factor or public subsidy are needed to launch the service. The ELA / AT Kearney study 2004 demonstrates the effects of increasing complexity of supply chains:

- Larger share of purchases and sales outside Western Europe leading to longer and more complex supply chains that are less failure tolerant
- Ever increasing customer requirements regarding service levels, especially with respect to lead times and delivery reliability
- Increasing amount of value added service, shifting activities that traditionally belong to manufacturing into the distribution centres
- Higher product complexity, manifested in shorter product life cycles and arising number of stock keeping units

Key areas of supply chain development are collaboration - sharing and utilization information along the entire supply chain, value chain management (organization of the entire supply chain by integrating partners according to their qualifications and capacities in such a way that total supply chain performance reaches its optimum) and finally differentiation of supply chains, recognising that “one size does not fit all”.

One of the most important areas is the ICT for intermodal transport. E-freight ICT and ITS aim at Internet solutions, robust data architecture primarily for business-to-administration and administration-to-administration data flows, standardisation of electronic description of services offered by freight transport operators and a standard for in-vehicle telematics platform (the On-Board Unit) that facilitates different services on the truck.

2.4 Framework for analysis of strategies

The PROMIT inventory includes best practices and success stories but also several barriers or problems regarding intermodal solutions. Intermodal strategies should provide support in tackling the bottlenecks. The inventory includes:

- Best practice cases and benchmarks
- Barrier analysis which means practice/current status compared to ideal conditions, due to political, technical etc barriers
- Divided by clusters organisation and business models, intermodal infrastructure, ICT, operations and services and security, safety, legislation, policy

2.4.1 Business strategy

Market strategies study concentrates on best practice models of intermodal transport in transport corridors, where two or three different modes of transport are combined: road, maritime, as well as rail transport. All these modes differ greatly from each other, both in operational and organizational aspects. Main areas of interest here are

- To find out what types of business strategies and models are suitable for intermodal corridors and to find out the operation principles
- To look at the roles and operations of the operators
- To assess the types of companies that could be in the transport corridor manager position and to describe the role of the leader

Secondary objectives are:

- To assess the strategic position of the transport operators in the corridor
- To describe the transport operators' policies, and their interfaces
- To assess the competing choices of the intermodal operations
- To find out the challenges the transport corridor will require for the development
- To identify the factors that restrict or prohibit the development of an intermodal transport corridor.

In supply chains business levels are (Fig 2):

1) Supply chain which means viewpoints of consignor and consignee
2) Logistics Service Providers, integrators
3) Operators such as railway undertakings, shipping lines, terminals etc.

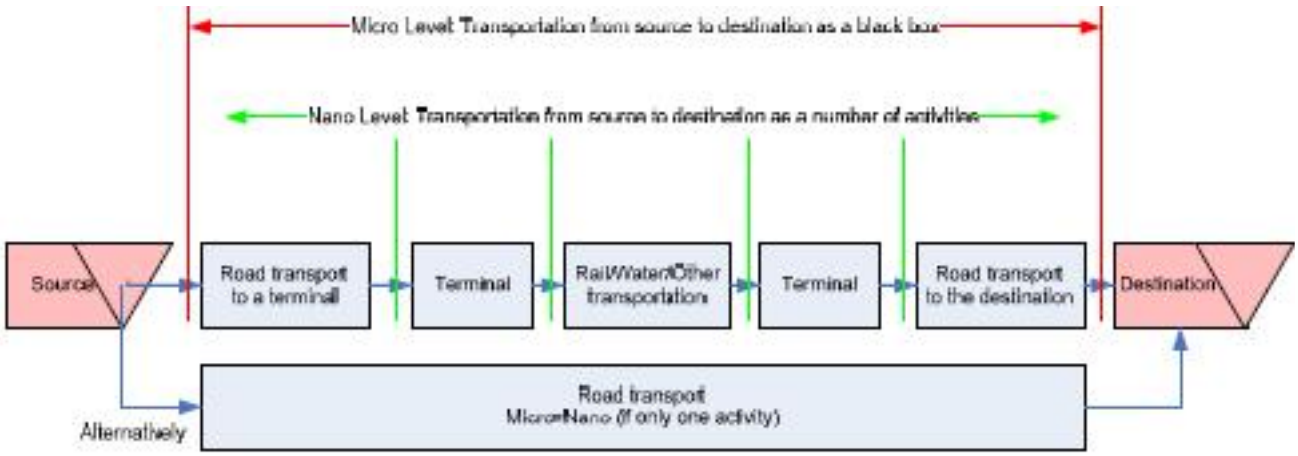


Figure 2. Intermodal transport chain levels. (PROMIT D4.1).

2.4.2 Policy strategy

Policy strategy concentrates on the following topics

- Intermodal state of the art and vision
- EU Policy level; directives, infrastructure investments, financing
- National transport policies
- Corridors, terminals, ICT and security.

Complexity of intermodal service is well analysed by prof. Savy in PROMIT Antwerp workshop (http://www.promit-project.net/). Intermodal transport competitiveness is not only a matter of long distance haulage cost decrease. Local operations matter, sometimes even more:

- Physical (pre and post haulage, transhipments)
- Interface relationships.

Together with technical and economic factors, organisation is a crucial issue:

- IT is a game of numerous actors
- The evolution of growing segments is towards integration (vs. cooperation and market).

Intermodal transport is a complex, costly solution with pre and post haulage, transhipment, organisational and extra costs. It can make progress on all components of cost, not only on long distance haulage (which can be strongly improved, interoperability, seamless networks, etc.). The complexity of intermodal transport organisation is illustrated in figure 3 where is only one border, only two modes and additional elements (energy, signalling, gauge etc.), wagon, container and locomotive renting companies, freight forwarders and 3PL, real estate owners, local and state authorities, infrastructure regulators etc.

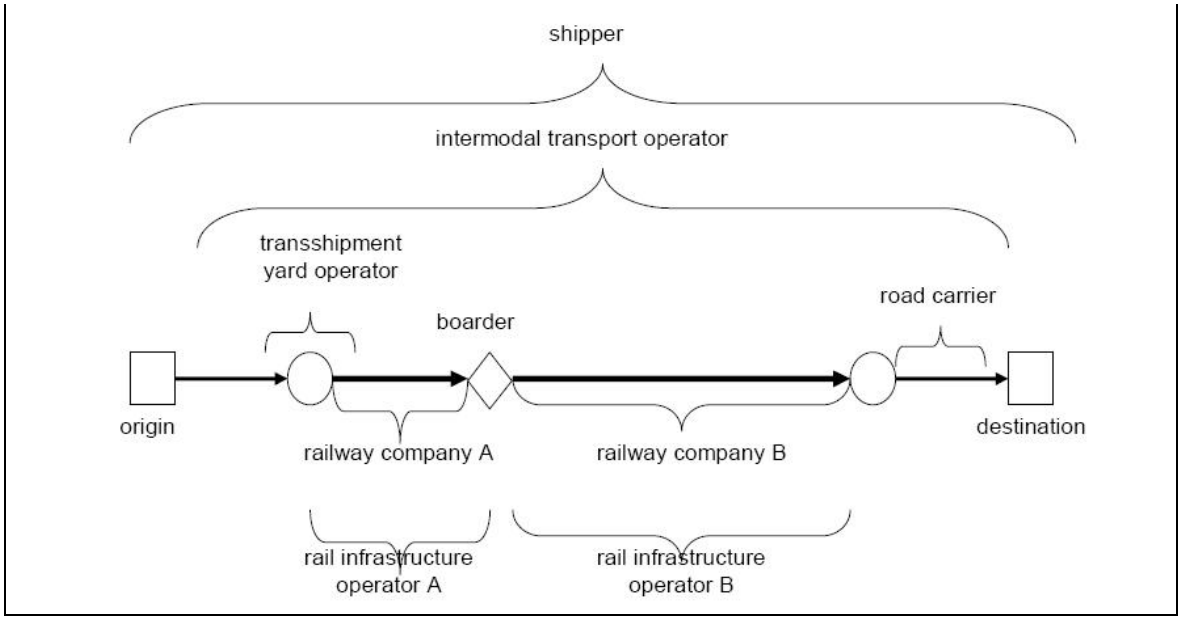


Figure 3. Intermodal transport organisation sketch. Source Michel Savy, Promit Innovation Conference in Antwerb.

2.5 Criteria for recommendations

Criteria for recommendations were discussed in two PROMIT Steering Committee meetings. The discussions lead to the following criteria:

- Efficiency
- Transparency
- Supply chain collaboration models
- Measurability
- Sustainability
- Industrial solutions
- Open architectures, standardisation, interoperability; how to reach these goals?
- SMEs should be included
- Acceptance of all EU members
- EU wide view of national support actions
  - Public subsidies should treat all operators fairly
- The role of Intermodal Promotion Centres; One European voice.

3 MARKET STRATEGIES ANALYSIS

3.1 Case studies

3.1.1 Introduction

The first year analysis cover 28 best practice cases. Six business cases were analysed in detail from strategy point of view: Cargo Domino, Stora Enso base port system / Netts, Rail4Chem, Distrivaart, D2D and GITS. Cargo Domino shows the possibilities of intermodal transport over short distances, StoraEnso and Rail4Chem the possibilities which the freight volumes enable, Distrivaart totally new thinking and innovative technology in delivery of pallets, and D2D and GIFTS the possibilities for the ICT sector. A centralised information hub solution is a prerequisite. GIFTS show different type of solutions for intermodal communication and how to integrate SMEs into ICT networks.

The second year input contained 22 best practice case studies. For the second year, the following in depth best practice cases were selected for strategies analysis: HUPAC, CORY, VOLVO, Reorient and Interface. The HUPAC case shows how to develop co-operation between railway partners and gain competitive advantage. CORY is an example of an intermodal solution for a city centre using inland waterways. The Volvo Logistics solution for transport between peripheral factories and distribution centres is rail operation, managed by Volvo and operated by Green Cargo. REORIENT developed business and management models for service concepts in rail corridors. INTERFACE showed ways to improve borders crossings terminals operations.

The third year input contained 8 best practice cases, 6 EIA award winners cases and 3 in-depth cases Viking train, Eurewa and Terminal management Interporto Bologna. Viking train offers intermodal shuttle rail service between Klaipeda and Odessa. EUREWA is a railroad corridor between Budapest/BILK and industrial centres in Western Europe. Interporto Bologna demonstrates terminal efficiency improvement.

Short description of all cases is presented in annex 1. These 64 PROMIT Best Practice cases can be clustered into the following subgroups. The boundaries of these subgroups are not strict and some of the cases could be put as well into some other subgroup.

- Rail operations 19 cases
- Regional / mode based information platforms 10 cases
- Terminal related development 8 cases
- Tracking and tracing 6 cases
- Barge operations 5 cases
- Industrial or logistics service provider managed services 4 cases
- Others 14 cases.

Rail operations cover some new intermodal connections and several types of further developments of existing services, based on block and shuttle trains. Information platforms base on quite different approaches, e.g. regional, mode such as rail or port based solutions. Some platforms serve both stakeholders in intermodal business as well as authorities. Some have more informative nature. Terminal cases cover actions directed to operations

efficiency, in many cases based on software development and handling technology development. Tracking cases include satellite positioning of equipment and track and trace services in intermodal rail transport.

3.2 In-depth cases

3.2.1 Cargo Domino

Cargo Domino is a product of SBB Cargo AB. SBB Cargo is a subsidiary company of SBB, the Swiss Railways, for freight transport. SBB Cargo is the market leader in Switzerland for rail freight. The customers are mainly large scale Swiss distributors such as Coop, Usego, Manor and Migros. Cargo Domino transports freight door-to-door in Switzerland. It uses interchangeable containers and the focus is on consumer goods, raw materials and bulk ware. Collection and/or delivery service between client and railway is by road while long distance transport is by rail (Fig 4). Total transport distances are relatively short varying from 80 to 300 kilometres.

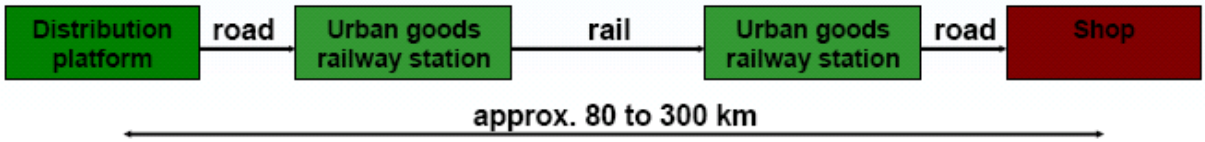


Figure 4. Cargo Domino system.

There are different reasons to increase rail transport. The use of rail transport and combining it to road transport is a clear policy goal. However, it can be difficult to switch from one mode to another, depending on particularity of each terminal. Customers are focusing on ecological reasons, safe transport, price and delivery delays. In addition companies do not want to be road-dependant when road-traffic, congestion and road-taxes are increasing.

In order to be economic on short distances the combined transport of Cargo Domino required:

- a new transhipment solution,
- a dense network of handling points, and
- subvention.

The transport system is based on vehicle integrated horizontal transhipment equipment (Fig 5). The core of the system is the “Mobiler”, an innovative transhipment device which simplifies transhipment from road lorry to railway wagon and vice-versa. Mobiler was developed in cooperation with the Siemens Cargo-Mover Project, and produced by the Austrian company Palfinger.

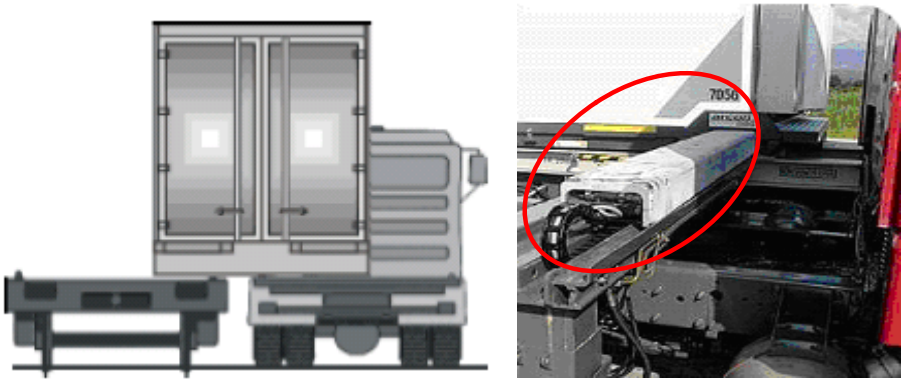
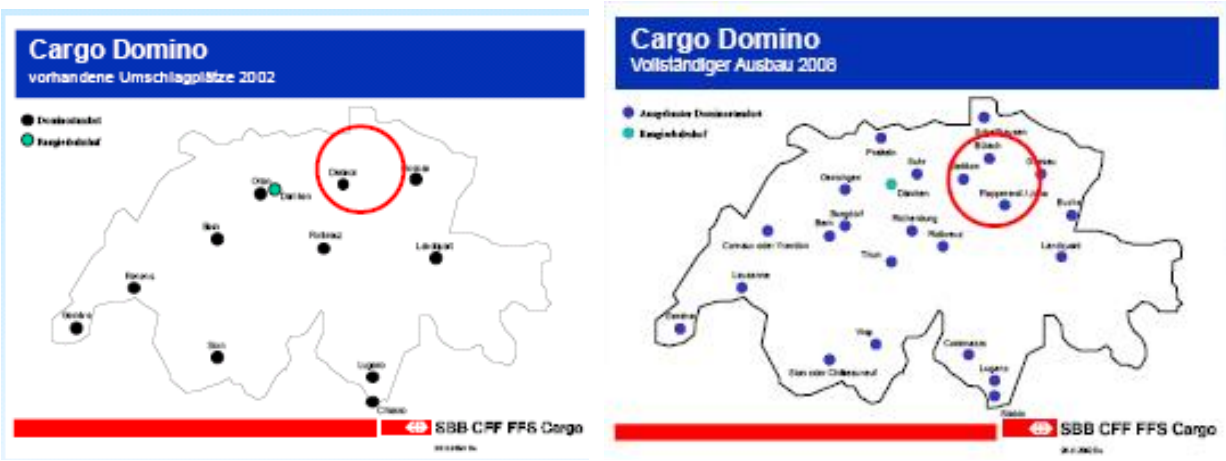


Figure 5. Cargo Domino technology.

A nationwide network (Fig 6) needs a carefully managed number of handling points to achieve high utilisation and low trucking costs. A large number of handling points increases the supplier base for trucking services while reducing km-costs and reduces the probability of reload that increases scheduling costs.



2002 2006

Figure 6. Cargo Domino network.

Use of existing infrastructure at urban goods stations is possible. The minimum requirements are: at least 80 to 100 m long tracks (for about 3 to 4 wagons); about 6 m wide loading/unloading lanes; space for manoeuvring the trucks, and short pre and end haulages of 4 to a max of 60 km.

Cargo Domino's financial advantage is due to a subvention from SBB. If this subvention would disappear the use of Cargo Domino would no longer be economically viable.

3.2.2 Stora Enso Baseport System

Stora Enso produces approximately 20 million tons of paper products in European plants, of which approximately 17 million tons are sold to European customers. Stora Enso wanted to become independent of the conventional road transport and searched for a new system that is cost efficient on long term and sustainable (environment) and that gives high

service (frequency, visibility), high quality (reliability above speed) and high flexibility (capacity). Stora Enso started Baseport system in 2000 and it was fully operational year 2001.

To reach the goals, Stora Enso:

- established Local Distribution Centres (LDCs),
- chose waterborne and rail transport,
- introduced Stora Enso Cargo Unit (SECU),
- started to use an info logistics system (INFOLOG), and
- developed loading systems.

In order to achieve a customer demand-driven, quick response logistics operation, Local Distribution Centres (LDCs) have been established close to customers (Fig 4). The LDCs act as buffers in the supply chain such that customers may be served immediately upon request.

Stora Enso has decided to base the logistics operation on a multimodal supply chain, except in the very few situations where direct truck transport from mill to customer is required for satisfying customer demands. Stora Enso has integrated rail and short sea shipping in hubs. The reasons for the transport decisions are related to sustainability and its environmental impact, expensive cost of direct truck transport, and the density of cargo. Density of cargo is one factor in achieving low cost of transport. Use of rail is therefore an attractive alternative for Stora Enso. To achieve the desired density of cargo, and to automate a number of the handling operations in the supply chain, the Stora Enso Cargo Unit (SECU) was introduced (Fig 7). The SECU is not easily transported on the rail network in continental Europe. As a consequence, a waterborne alternative between the Nordic countries and Europe was required (Fig 8). In Baseport, three vessels operate with six sailings per week in both directions.

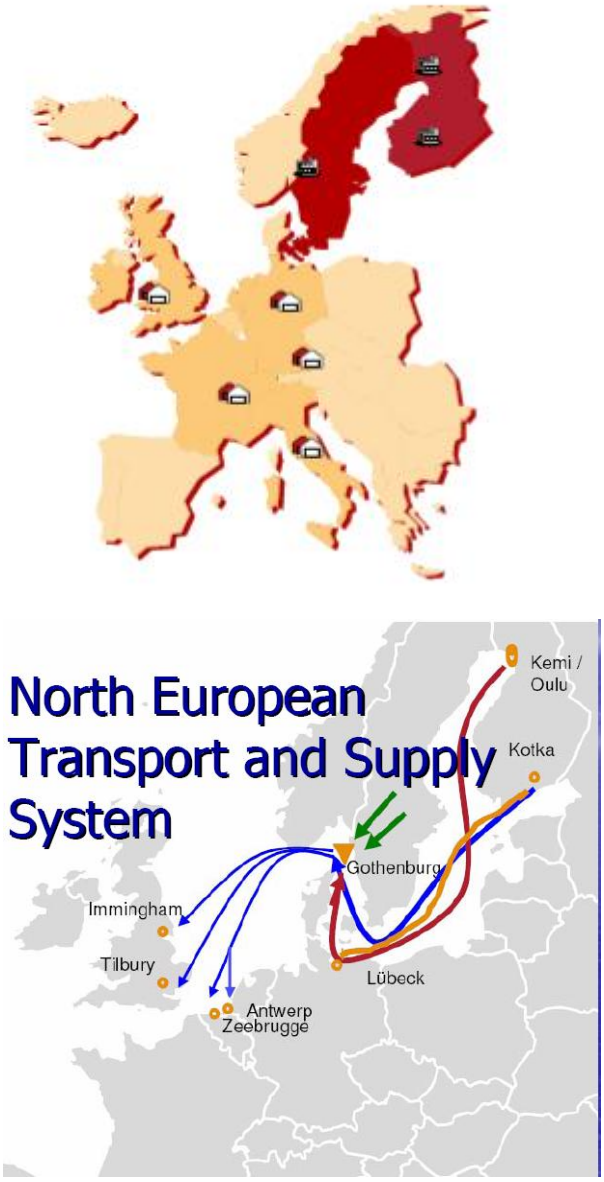


Figure 7. Local Distribution Centres and Transport Network of StoraEnso.

The SECU is a weather protected cassette ISO certified for 93.5 gross tonnes. It has the ability to accommodate more cargo than a conventional rail car, handling a 40 foot ISO container. The dimensions of the SECUS are 3.6x3.6x13.8 m, and are thus adapted to Sweden's new and larger rail profile "C" with a maximum permitted axle weight of 25 tonnes. A new type of railway bogey has also been developed to accommodate the SECU.

Figure 8. SECU box with standard containers.

The supply chain is supported by the management information system INFOLOG (Fig 9). Visibility in a long and complicated supply chain is based on goods ID, box ID and an integrated IT system. The entire operation is designed to provide the required frequency and reliability in order to ensure the appropriate level of customer service.

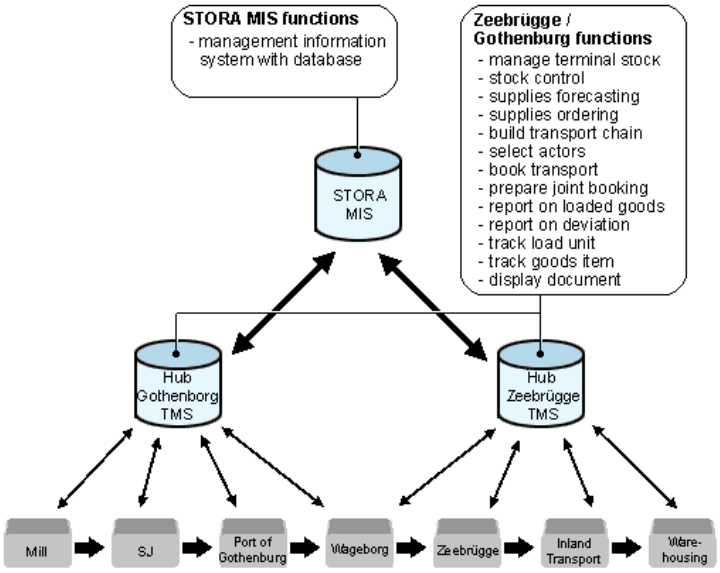


Figure 9.The INFOLOG system

A challenge in any transport chain involving waterborne transport is to compete with road despite the fact that cargo need to be moved between transport modes at least twice. The new cargo handling technique is based on the SECU and horizontal handling of cargo. Stora Enso has automated loading of boxes at mills, in case a 25 ton axle load and 3.6 wide rail connection is available. The special design of the vessels allows the SECUs to be transferred directly form the rail link to the SECU parking place in Gothenburg and then to the cargo decks of the vessels. The conceptual design of the vessels that are being used by Stora Enso was produced in the EU project IPSI. The project concentrated on flexible port/ship interfaces, and methods and equipment for effective transfer of cargo and information about cargo.

In addition, loading quay and rail link has been invested in Gothenburg and double ramps, parking areas, a transit shed and warehouses in Zeebrügge. Also necessary handling equipment and ICT support systems have been provided.

3.2.3 Rail4Chem

Rail4chem is a private German rail transport company which was founded in 2000 and started operation in March 2001. It was created because BASF needed an absolutely reliable means of transport for its chemical material between its locations of Ludwigshafen, Antwerp and Schwarzheide. As the Deutsche Bahn could not offer punctual and reliable delivery, BASF founded its own rail company, which was operated by an internal department, BASF Verkehr. This department owned the equipment. Rail4Chem started business by taking over the volumes of BASF.

The shareholders who own the company, each with 25% of the shares, are BASF AG (Ludwigshafen, Germany), Bertschi AG (Switzerland), Hoyer GmbH and VTG-Lehnkering AG (both Hamburg, Germany). The headquarters is based in Essen and Rail4Chem has subsidiaries in Ludwigshafen, Nordhausen and Hamburg. Rail4Chem is deeply rooted in the chemical industry, transporting hazardous and classified materials. The field of operation started in Germany to connect the different plants of BASF but meanwhile also European transports have been added, further customers could be acquired and also some container transport is carried out.

Rail4chem offers mainly block trains on long routes and assumes for their customers, responsibility for the transport services that they are commissioned for across all borders. Rail4chem cooperates with a number of third parties to offer cross-border services, and to improve quality and to market the services in a better way. Rail4chem started with transport of chemical material, but extended their market to various other industries such as petroleum, coal, iron and steel as well as the construction industry.

Duisburg Port is the most important hub for Rail4Chem trains. The main north-south and east-west corridors meet here. The reason for Duisport to participate in this cooperation with its railway company, Duisport Rail, was to strengthen railway activities in the Duisburg area. With the establishment of the Rail4Chem hub numerous new national and international traffic relations were established. The system consists of number of satellite connections via Duisburg to Ludwigshafen and to Wurzburg as well as transports to Switzerland, Italy, Austria, Slovakia, Belgium, Luxembourg and the Netherlands (Fig 10). Currently it operates 25 locomotives with a team of 100 employees and various partners. The main corridors are:

- Zeebrugge – Antwerp – Duisburg – Leuna – Schwarzheide – Poland
- Ludwigshafen – Leuna – Hamburg

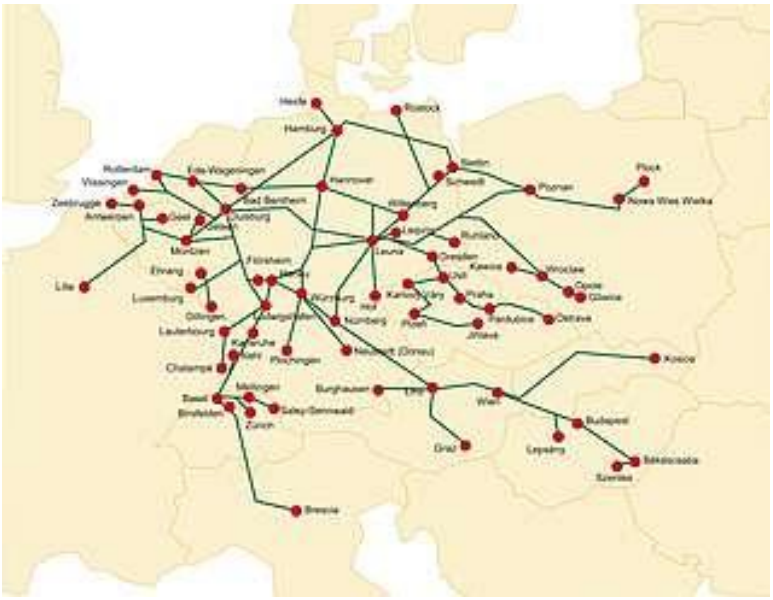


Figure 10. Rail4Chem network.

The targets of Rail4Chem were to create sustainable competition in the European rail freight transport and to realize cost saving of approximately 25% and time savings.

Successful operation reaching the targets was possible due to:

- existing volumes,
- cooperation, and
- policy factors.

By taking over the volumes of the BASF railway company, Rail4chem started with a solid base on which it was able to establish scheduled timetables for block trains. Also the market of bulk material consists of high volumes which can easily be transported by rail.

The cooperation between the four shareholders was extremely important for the success of the company. Each company had his expertise and connections in a certain market which enabled Rail4Chem to open up the European market.

The liberalization of the German railway market enabled Rail4chem to start business as a second railway operator. The German railway market is one of the most liberalized markets in Europe. There exists already noticeable competition and the market is accessible for new operators. The introduction of a distance-related toll for truck transport opens up new market opportunities for private railway operators in Germany. Although currently no fixed date for implementation is set, existing private railway companies have recognized a strong increase in demand for train services within the combined transport. Shippers and forwarders are more interested in creating new services in combined transport together with private railway operators to save costs.

3.2.4 Distrivaart, multimodal distribution network for pallets

Distivaart was a project concentrating on inland waterway transport of Fast Moving Consumer Goods (FMCG). The Distrivaart project aimed at developing an inland waterway network in which relatively small ships sail at a high frequency schedule and which en-

ables cheap and fast transhipment on important traffic junctions that connect inland shipping with road transport. The Distrivaart project aimed also at offering a nation wide transportation network for distribution of consumer goods between manufacturer DCs and supermarket chains. Customers expect higher quality for less cost. This increases the need for a cheaper and more responsive logistics network in which horizontal and vertical consolidation and cooperation along the chain is beneficial.

The first Distivaart ship, River Hopper, started test phase in autumn 2002 and commercial operation in the beginning of 2004. In December 2004 River Hopper ceased service for further development. Number of pallets involved was approx. 43 million (15% of total). The capacity of the River Hopper is max. 520 pallets, which is equal to 20 truck combinations. The pilot phase involved four breweries and four supermarket chains. In 2003 Coca Cola joined the Distrivaart project. Riverhopper initially sailed once a week from Drachten, Zwolle, Den Bosch and Dongen (north-south corridor). After Coca Cola joined, River Hopper expanded service to twice a week. In an optimal network Distrivaart could operate 40 ships, service17 DCs in the Netherlands, Belgium and Germany (Ruhr Area), and could divert about 43 million pallets from the road.

Holland International Distribution Council (HIDC) aims to strengthen the competitive position of the Dutch logistics sector within the international marketplace. Within Distrivaart, HIDC conducted the project management and was responsible for bringing the parties together into a consortium. HIDC also was an important sponsor of the project. Mercurius scheepvaart founded the River Hopper business, and builds and operates the River Hopper ship. Vos Logistics was responsible for logistics planning and arranged the road transport before and after shipment. Ministry of Economic Affairs in the Netherlands was a large investor in the project. Also research institutes participated in the project.

The following factors made Distivaart reach its aims:

- coordination and control of collaborative network, and
- technical innovations.

The first stage was to focus on full truck loads and establish simple, but reliable point-to-point service. In the second stage various part loads were combined and distributed to various clients. The final stage was a collaborative network, which requires an intensive cooperation between manufacturers, retailers, and logistics service providers based on permanent information exchange. The distribution network, in addition, requires a warehouse management system to plan and execute the sorting process in the cross dock function of the ship. This type of system has not yet been applied on a ship. In a collaborative network, an inventory management system must be added in order to control the moving stock. The network is presented in Figure 11.

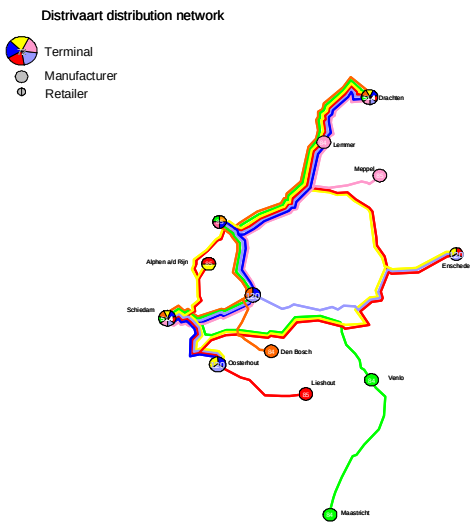


Figure 11. Distrivaart network.

The River Hopper is a completely new type of ship and the first of its kind (Fig 12). It has been equipped with a fully automated loading and unloading system which can handle 120 pallets per hour. An interface has been build with the quay side to facilitate unloading. A next step is to develop a conveyer belt system to automatically sort pallets during the voyage and make it ready for transfer.

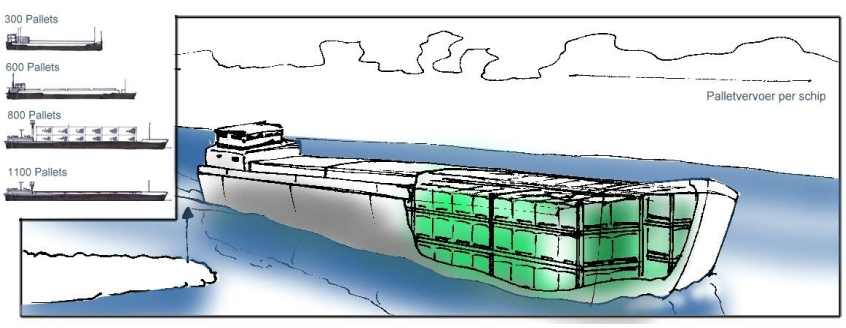


Figure 12. Distrivaart ship and the used pallet technology.

The concept was ceased for improvements of technical installation in order to speed up the transhipment and to reduce the chance of disruptions in the process. Secondly, to exploit an efficient distribution network it is necessary to achieve a level having a national coverage with approx. 7 ships sailing on national and international corridors. This requires large investments in ships and several participants in order to reach the volumes required for economic viability.

3.2.5 D2D

The D2D project demonstrated how to build and use integrated management and communication systems for door-to-door intermodal transport chains. These chains were enhanced with “smart” technologies and equipment for further improvements. The aim was to show solutions that can be used by any operator (shipper/forwarder) responsible for an intermodal chain or parts of it, without having to make major changes to relevant information systems already in use. The goal was to provide a tool for managing intermodal transport

chains on a European as well as on a global level and to design a supporting tracking and tracing system, which could be commercially exploited in different settings.

The developed system included:

- open architecture and standardised interfaces, and
- co-operating applications.

Open architecture and standardised interfaces were used to promote interoperability with legacy systems and with commercial information providers.

The D2D project developed two co-operating applications: TCMS- Transport Chain Management System and FTMS- Freight Transport Monitoring System. A transport chain manager using the D2D solution actually comprised three software solutions which communicated with each other and with the outside world. TCMS manages intermodal door-to-door transport operations by receiving bookings for transport, selecting transport chains, securing space with the individual transport service providers, and managing the transport for door-to-door (Fig 13). FTMS provides an advanced IT tool for Tracking and Tracing (T&T) load units/ transport means along either national or international intermodal transport chains. The T&T portal provided information about transport status to TCMS.

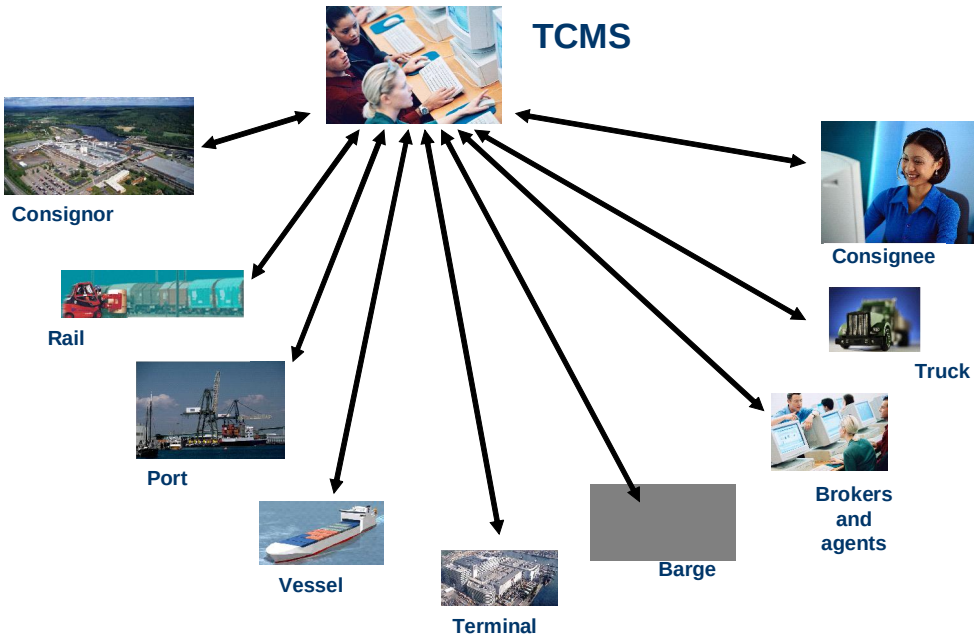


Figure 13. Transport Chain Management System (TCMS) Users

Since the completion of the D2D project, the TCMS has been enhanced and is now a commercial product being marketed by Logit Systems under the name Logit D2D.

3.2.6 GIFTS

GIFTS is a European Community funded project by Information Societies Technologies Programme. The main aim of the GIFTS project was to develop an Intelligent Transport Infrastructure for managing door-to-door freight transport in an intermodal environment accessible to both small- and medium-sized enterprises (SMEs). GIFTS aimed at providing technologies for the three main elements of the supply chain: the door-to-door movement of cargoes, the electronic documentation that identifies the cargo, and the administrative functions that manage the cargo procedures.

The aims were reached by:

- GIP communication systems
- a navigation system, and
- GIFTS Integrated Platform.

The GIP communication systems interfaced the overall GIFTS components. It is based on current terrestrial and satellite mobile systems and emulation of the future UMTS.

GIFT uses a navigation system, involving GPS (Global Positioning System) and EGNOS (European Geostationary Navigation Overlay Satellite system).

The GIFTS Integrated Platform is a distributed IT environment for services-oriented applications (Fig 14). The platform is composed of the GIFTS Service Centre (GSC) and four distributed Service Providers (SP). The platform architecture, based on WEB Services technology, facilitates a high level of automated business process integration where each SP is specialized in offering different service-oriented applications.

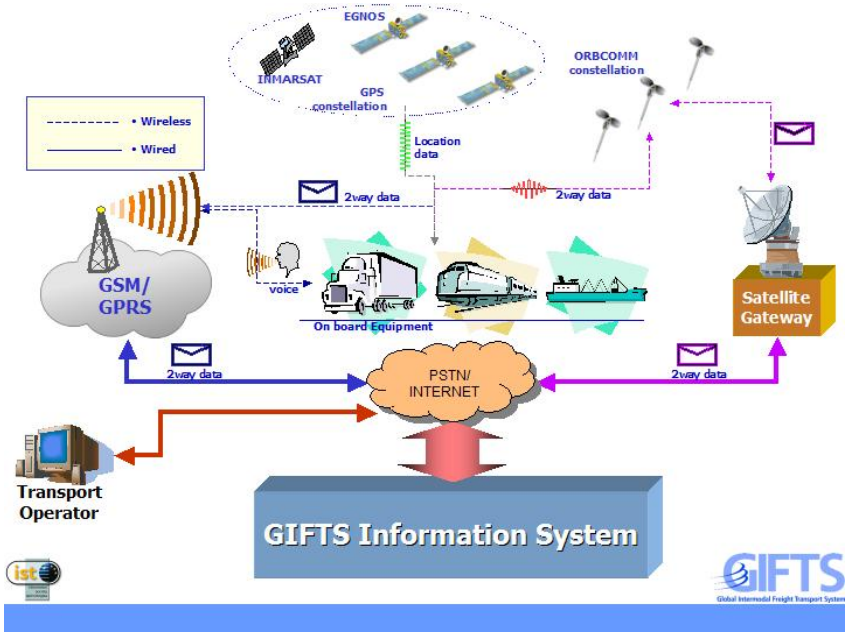


Figure 14. The full scenario of GIFTS platform

Three operative pilot projects using the GIFTS platform were demonstrated to validate the user needs and system concepts to be analyzed. The first pilot project demonstrated how the GIFTS system supports a door-to-door road movement. The second demonstrated how

GIFTS can assist rail transport with consolidation of wagons, full train preparation and delivery to final terminal. The third pilot investigated, through a qualitative simulation process, the potential of GIFTS e-Commerce services to be provided to the transport industry in conjunction with suppliers of Internet-based services

3.2.7 CORY

CORY is a privately-owned UK company transporting domestic and commercial waste on the Thames River. They use 7 tugs, 47 barges and 900 containers. Each barge (Fig 15) is capable of carrying at least 300 tonnes of waste on each journey. The annual volume of CORY is 650,000 tonnes of waste. CORY has provided waste transport and disposal services for its main customer, Western Riverside Waste Authority (WRWA), over 30 years. WRWA is an autonomous statutory local government body responsible for waste disposal on behalf of four London boroughs (Hammersmith & Fulham, Lambeth, Wandsworth and Kensington & Chelsea). Each of these boroughs lie next to the River Thames and are responsible for collecting domestic waste from households and delivering it, by road, to two riverside transfer stations which are owned by the WRWA. Some commercial waste is also collected by the boroughs and taken to the transfer stations for disposal by Cory.

Figure 15. One barge on the river Thames

To improve its services, CORY has made investments in a number of areas. The transfer stations (at Smugglers Way, Wandsworth and at Cringle Dock, Battersea) are equipped with dockside lifting equipment to lift containers to and from barges. There is a new Materials Recovery Facility (MRF) at Smugglers Way, Wandsworth, with a capacity to sort 84,000 tonnes of recyclable waste every year, one of the largest such facilities for a local authority in the UK.

The situation of CORY seems stable due to the simplicity (low-tech approach and equipment), long - over 100 years - experience and the proactive approach of disposal authorities encouraging the movement of waste and recyclable materials by water. Also the streets of London are highly congested making Thames River an attractive option in terms of reducing both direct and external transport costs.

3.2.8 REORIENT

REORIENT was a two-year EC-funded project, which assessed progress in "Implementation of Change in the European Railway System". The project concentrated on interoperability in the chosen corridor from Scandinavia through Central Europe and via Vienna to Constanza in Romania and to Thessaloniki in Greece (Fig 16). REORIENT assessed the target countries' political and administrative structures responsible for interoperability implementation and identify barriers encountered in this process. The project proposed measures to remove these barriers and business models for various service concepts in rail business. The overall aim was to increase rail freight transport in the REORIENT corridor.

Figure 16. The REORIENT Corridors from Scandinavia through Central Europe and via Vienna to Constanza in Romania and to Thessaloniki in Greece.

As a proper rail service is missing in the REORIENT Corridor, it is possible that a new rail service could attract a considerable amount of freight from road to rail-based solutions in the REORIENT Corridor. In order to create new rail freight services, REORIENT:

- suggested rail shuttle services and
- proposed different business models.

Reorient embedded the identified factors for attracting freight from road to rail-based solutions in a set of suggested rail shuttle services in the REORIENT Corridor:

- Swinoujscie-Bratislava/Vienna-Budapest: Full Container Load (FCL) block train dedicated to movement of paper rolls to mills.
- Trelleborg-Swinoujscie-Bratislava/Vienna: Semitrailer, Swap body on Flat Car (SFC), and full container load (FCL) shuttle train customised to needs of 3 PL and 4 PL providers who buy roundtrips.
- Gdansk/Gdynia-Bratislava/Vienna-Budapest-Beograd-Thessalonica: Mixed Container on Flat Car (CFC) and SFC shuttle train.
- Bratislava-Budapest-Bucharest-Constantia: Mixed CFC/SFC shuttle train and/or FCL (for unitised bulk). This service will compete with existing service from Rotterdam.

REORIENT developed business and management models for various service concepts. The complexity of the rail business and the great differences in potential participants' initial assets and financial situation make it infeasible to quantitatively evaluate generic business models. Instead the REORIENT team developed a qualitative survey questionnaire based on the elements of the conceptual framework to acquire information from respondents to make conclusions about the type of business model appropriate for the REORIENT service concept. The questionnaire also aimed at identifying operators interested in the REORIENT shuttle services. These models are discussed in more detail in chapter 3.5.

The service model where 3PLs make agreements with clients and subcontracts the rail freight operator was the most supported. Models 2 where freight operator makes direct agreements with clients and 3 where agents of the rail freight operators make agreements with the clients were also supported, especially in transit countries. Respondents assessed model 1 (rail freight operator and 3PL share business responsibility – 3 PL makes agreements with clients) and 4 as the most appropriate for coexistence. The support for model 1 and 4 complies well with the situation that about 60% of survey respondents do or plan to engage in strategic alliances, networks or agent relationships, and also with the European situation that logistic companies join alliances and joint ventures with operators. Companies acquire other operators or merge in order to complement their service provision to the customers and thereby strengthen their market position.

It was found that the seller more often than the buyer is responsible for planning and executing of logistic operations. The responsibility overall and in parts of the companies transport chains is also frequently outsourced to 3PLs and transport companies, which is in accordance with the archetypical models.

According to the survey the market size and scope were the main factors affecting the willingness to invest in business ventures in REORIENT countries. Institutional environment, ICT and directions from companies' top management were also significant factors. Market presence/expansion in REORIENT countries applies to the most of the respondents. This confirms the analysis based on official statistics that there is a market potential for new rail-based services in the corridor.

3.2.9 INTERFACE

INTERFACE was a three-year EC-funded project under the 5th Research and Development Framework Programme, “Competitive and Sustainable Growth”. INTERFACE aimed at identifying and testing new ways to improve borders crossings terminals operations reducing customs waiting time, increasing safety, harmonising regulations and developing additional functions. Selected improvements focused on combined solutions stressing their potential at technical, economical and organisational levels. The project had the main European economical poles and high potential traffic corridors as geographical frame in order to make possible the transferability of the tested intermodal solutions to other sites.

INTERFACE project conducted:

- a survey on 22 border crossing terminals (Fig 17) in order to gather updated data and to provide a representative sample of the European situation, and
- three demonstrations (Fig 18) in order to check transferability of the results to other conditions and to define pre-conditions and supporting measures for the breakthrough.

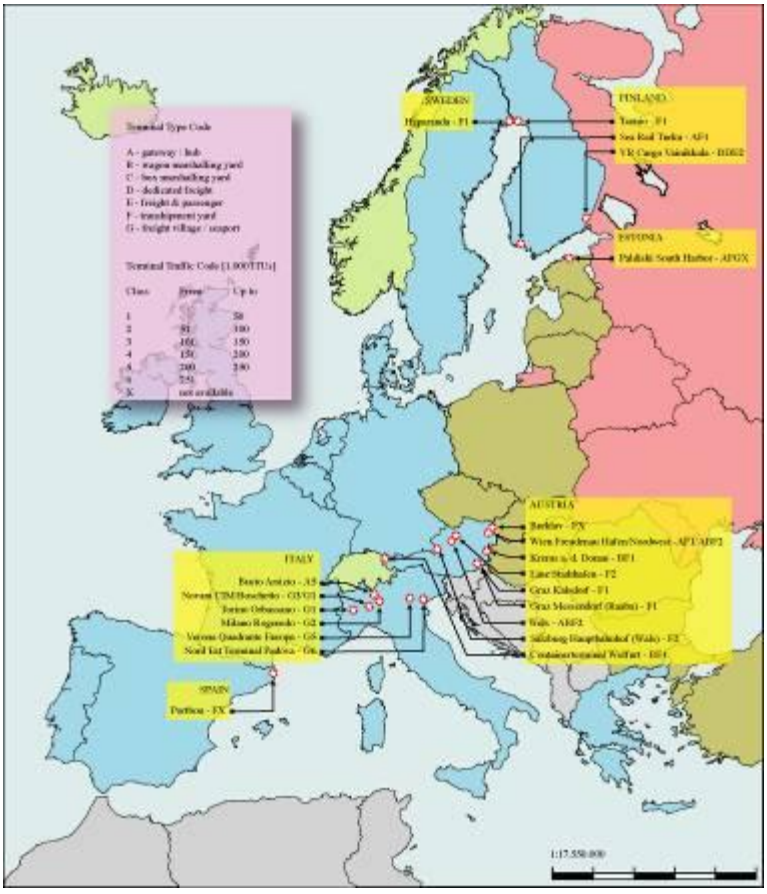


Figure 17. The 22 border crossing terminals interviewed

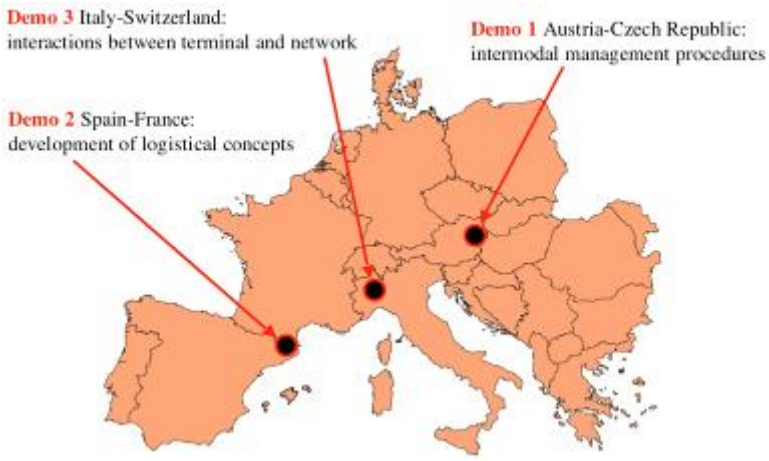


Figure 18. The geographical demo allocation

INTERFACE project main results provide an exhaustive overview of the current development of the intermodal freight transport and suggest the main measures and/or actions that can improve the efficiency and the effectiveness of the border crossing operations. The main recommendations have been structured in five macro groups, highlighting the issues related to the intermodal rail traffic growth; the clusters are respectively:

1. Functionality of EDI at Terminal level: meaning the capability to improve the efficiency of the Electronic Data Interchange Systems among the actors involved in the terminal operations.
2. Functionality of EDI at Network level: meaning the capability to improve the efficiency of the Electronic Data Interchange Systems among the actors involved in the intermodal transport chain.
   - The lack of functionality in EDI at terminal and at network level represents a common weakness (1st and 3rd Demonstrators). The specific 1st Demonstrator solution to integrate the Information Systems between the Railway Undertakings of the two border countries and among them and Terminal Operators improved planning capabilities at the terminal level and reduced the waiting times in Breclav terminal up to 30-40 minutes / train.
3. Timetable Reliability: meaning the capability to achieve trains punctuality preservation and/or delays recovery, optimizing rail line capacity and border crossing operations.
   - Optimization of the road - rail freight transfer, dealing with the improvement of ITUs movements and storage, is supported by the design and implementation of a decision support system for transhipment planning and operation (2nd Demonstrator). In the Port Bou case the reduction of transhipment time is up to 20%.
4. Effectiveness of Technical and Commercial Inspections: meaning the ability to improve the reliability and accuracy of train inspections.
   - Lack of quality trust among the involved actors causes repeated train technical inspections. Agreements among Railways Companies regarding duration and typologies of technical inspection as well as standardization of freight trains configuration could improve terminal efficiency.

5. Production of new intermodal services: meaning the capability to enhance the competitiveness of rail freight transport, providing “customers oriented” innovative services.
   - In a specific case (3rd Demonstrator) the railway transport chain is composed of ten actors. Introduction of round tables and meetings of involved actors could generate a better co-operation. The availability of supplementary slots due to a specific planning in the freight trains circulation could support a new commercial policy allowing choosing the most suitable path for the optimization of freight transport.

3.2.10 VIKING TRAIN

The Viking train offers a 1735 km long link for the Baltic Sea region in Eastern Europe to South-eastern Europe, Black Sea Region (Caucasus and Turkey) and beyond to Central Asia (Fig 19). It makes use of the Pan-European corridor No 9, running through the countries Lithuania, Belarus and Ukraine. The Viking train circumvents the heavily congested western European north-south corridors. The Viking train as a road-rail intermodal connection was designed as a Ro-Ro and a Lo-Lo transport solution. Ro-Ro was intended to offer a long distance transport solution for lorries, as the road infrastructure is still inadequate for today's transport needs (e.g. no through motorways, security concerns). Lo-Lo is introduced to offer a link in-between short sea and deep sea shipping on the Baltic and Black Sea and to the Eastern European hinterland. Empty containers can be relocated between northern and southern European regions.

Figure 19. The VIKING shuttle train

Combined train "Viking" is a joint project of the Lithuanian, Belorussian and Ukrainian railways and train operators, stevedoring companies and Klaipėda, Odesa, Iljichiovsk sea harbours. Train operators are Joint Stock Company “Lithuanian Railways”, The Ukrainian

state transport service Center “LISKI” and Belorussian national transport forwarding company “Belintertrans”.

The transported volume when the Viking train started in 2003 was 175 TEU. The volume has increased ever since and in 2007 40.066 TEUs were transported. The Viking train is the most successful intermodal train link on the broad gauge network.

The project was successful due to:

- strong political support,
- freight carriage management system, and
- co-operation.

The relevant general enablers i.e. aspects that caused a break through had been the Lithuanian and the Ukrainian Ministers of transport. They signed a Memorandum of Understanding in 1999 and assuming obligations regarding development of transport connections in the Middle Section of Crete Corridor IX.

The main strength of the concept is the border-crossing one-stop-shop solution. Freight carriage management system KROVINYS allows easy and quickly perform custom and border crossing procedures for preloaded electronic invoice. System KROVINYS allows easy order wagonload from customer office.

All organisational, technical, transportation services quality and other problems are processed by all sides of Agreement in common meetings. Protocol decisions of meetings become legal rule and all sides are holding obligations. Common conditions for activity container train are appointed by united agreement for organization and working aspects of intermodal carriage on rail network of three states signed 2002 by Lithuanian, Belarusian and Ukraine Railway companies:

- all sides of agreement assist to attract freight for transportation by shuttle train containers, semi trailers, trailers,
- solid and competitive tariffs for all route of transportation goods are determined for each year,
- cross border procedures are simplified and preferences on trains schedule for shuttle train are ensured,
- transportation goods under united invoice is accepted, and
- united requirements for quality and efficiency intermodal transport services are accepted after common considerations and discussions.

3.2.11 EUREWA

EUREWA was an EC -funded project under Marco Polo Programme. EUREWA covers the railroad corridors between major industrial centres of Western Europe and the BILK terminal at the southern suburban of Budapest in the centre of Hungary (Fig 20). The central European terminals are connected to a wide-spread system of gateway trains which deliver loading units, coming from the Western sea-ports, Scandinavia, Spain or Germany into the system. Furthermore, various cities in Hungary have been connected to the service

by antenna trains, such as Györ, Székesfehérvár, Zomba, and Pécs. The operation started in the beginning of 2005.

Figure 20. EUREWA connections

Main Stakeholders are the Kombiverkehr KG (lead partner), the Terminal in Wels (ICA Austria), MAV (Hungarian Railway) and Hungaria Intermodal, a joint-venture of Kombiverkehr and MAV for the very purpose of operating the railway-service between Germany and Hungary.

The target of the project was to implement a block train service, connecting European industrial centres (with hubs in Germany and Austria) with the BLK terminal in Hungary (Budapest) that is competitive towards road transport in terms of quality of the transport, e.g. punctuality and security of the service, and overall costs of the transport. The aim was also to cause environmental and social advantages by shifting transport from road to rail on the east-west-axis.

EUREWA's success factors were:

- a quality system, and
- funding.

Between the partners, contractual agreements are used to determine the responsibilities. Contracts cover the punctuality of the connection, certain quality standards, penalties etc. However, the punctuality was up to 80% compared to road transport. This factor needs further development beyond the projects limits. The implication of detailed contractual agreements in rail transport, concerning the overall quality of service, is an effective, unique tool to improve the situation for rail transport, attract customers and finally have a competitive pricing structure compared to road transport.

The adequate pricing was, at least in part, possible due to the funding of the Marco-Polo-project funds. Whether the project will function in the long run without funding will be determined by the market and the development of road transport prices in the future.

The main benefit of the project is the shift of a greater amount of cargo transports from road to rail, causing benefits from an ecological and social point of view.

3.2.12 TERMINAL MANAGEMENT AT INTERPORTO, BOLOGNA

The terminal is located in the area of the Bologna Freight Village which is strategically positioned in Emilia-Romagna, Italy, on an important node of the terrestrial transportation network, and thus is a crossing point of goods exchanges between the north and the south of Italy. In addition Bologna is located at the crossing point of the trans-European corridors I and V.

The total area of Bologna freight village is 4.270.000 m^2, of which 2.400.000 m^2 has already been developed. The intermodal terminal area is composed of two bulk terminals of 140.000 m^2 each, 11 loading/unloading tracks and the parking area designed for lorries is 290.000 m^2. The terminal manages 52.620 wagons a year, roughly 1.100 wagons a week or 190 trains a week.

In 2007, 2.600.000 tonnes have been moved by road and 2.225.000 tonnes by rail. During the year 2007, 6.287 trains and 5.000 lorries a day were transited by the Bologna freight village. Interporto Bologna hosts roughly 100 transport and logistics companies. Everyday around 135.000 ITUs are moved (64% containers and 46% swap bodies).

The terminal has following objectives:

- Real time exchange of information between actors involved in terminal operation
- Opportunity to trace the assets and track their status within the terminal during any stage in terminal operation resulting in more efficiency;
- Reduction in the number of manoeuvres required to move an asset (-15%);
- Optimization of storage area and reduction of unnecessary handling movements (-12%).

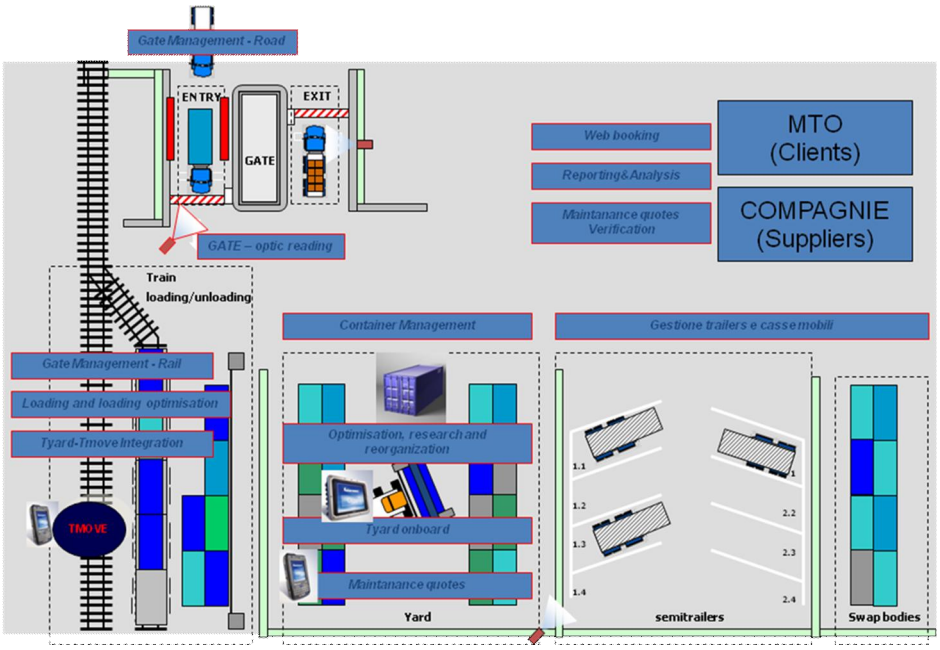


Figure 21.Graphical support of the system.

For a better terminal management new software (T-Yard) was integrated to an existing software (T-MOVE). The T-MOVE is connected to the shunting operations. It handles information concerning train arrival, departure and composition.

The T-Yard manages information concerning container movement and it uses advanced instruments for planning and supervising the terminal. Graphical techniques (Fig 21) provide support to the operator for yard management. The system controls in real time the terminal operability, sends instructions to operational nodes and keeps the information regarding the flow of containers. The access to the information is protected by user identification (passwords).

The integration between the T-Move and T-Yard has been realized with a specific web interface. The T-Move provides the T-Yard, through a web service, the information regarding wagons and trains composition and the availability of the equipments for loading and unloading. The terminal operator realizes the gate in of the train and all the orders for the unloading of the train are automatically generated. In the gate out phase, the terminal operator confirms the train once having concluded the unloading operation. The train is checked and the gate out of the train is performed as soon as the T-Yard communicates the conclusion of the loading and unloading operation and the availability to go on with the manoeuvre. The system will automatically send an e-mail to the railway company and to the multimodal transport operators (MTO) to confirm the concluded operation.

The software service is accessible by all the interested parties, such as ports, road companies, as well as manufacturing companies. Therefore the software manages and represents a support for the entire logistic chain as it also offers interface capacity. Through the web, maritime companies are able to receive information in the form of personalized codes.

Whether the terminal management system reaches its goals or not, will be seen later. The system started to operate in 2007 and will be fully operational in January/February 2009.

3.3 Strategic business model analysis

The purpose of this chapter is to discuss on strategic level about the leadership of intermodal service in a transport corridor. A transport service consists of a network of different companies, and not all of them can be the actual leader of the network. Our previous studies suggest that when a new corridor is opened, the network starts to progress so that the role of 3PL and 4PL companies starts to grow (Lehtinen, Bask, Leviäkangas 2008).

We have chosen three different types of organisations in this analysis; industrial end customer (Volvo), railway operator (HUPAC) and 3 PL logistics service provider (Kuehne + Nagel).

There is much information of intermodal transports in EU, and there have been lots of changes in regards to intermodal transport options focusing on rail roads. However, little attention has been put toward strategies and business models in these transport chains. As the internet era began the business model research is booming due to the business models of trading, B2C as well as B2B, were changing. The same is happening with European railways as the industry is deregulated, re-regulated, restructured and liberalised. Today, in railways studies in Europe much of the discussion has been focused on re-regulation as such and its impacts, but few papers deal with business model questions and even fewer try to structure the models. A number of European projects mention "business model" as one of their outputs (TREND, New OPERA, ROSETTA -mainly focused on systems for rail freight) but seldom is it really defined what is meant by business model. This analysis focuses on business model evolution in a potential intermodal transport connecting Nordic and South-Eastern European countries with road, sea and rail transports. This we call 3ModeCorridor.

3.3.1 Business models

The wider emergence of the term 'business model' occurred in relation to new types of services enabled by the Internet. Some of the first text books on the topic of business models were published at the turn of the century (e.g. Afuah and Tucci 2002). Researchers became also interested in business model topology or types, e.g. Rappa (2000), who identifies 29 different types of business models in nine categories. The business model definitions vary, so there is no agreed standard definition for the term. This has lead to confusion in terminology and the term has been intermingled with terms like revenue model, business concept, revenue logic, and even strategy. Below are a couple of examples of the condensed definitions: Malone (http://rgp.ufl.edu/otl/ent_ventures_5.html) defines business model simply as:

> *"It is what a company does and how it makes money doing it".*

Osterwalder's (2004) definition for business model is:

> *"Business model is a conceptualization of the firm's value creation logic describing the value proposition, customer interaction and the asset configuration built and used by the firm to offer value in the chosen markets, in order to make profits."*

In the case of actors in intermodal transport business models comprise transport operators (i.e., ocean carriers, rail operators, and trucking companies) and logistic service companies. In 3ModeCorridor, intermodal freight services are connected to a corridor where exist actual and potential movements of significant volumes of rail and maritime intermodal freight traffic.

As there is no unified definition of business models and specifically for the purpose of this analysis, the definition for 3ModeCorridor used is:

> *"A business model can pertain to strategic and operational solutions of a firm or joint venture that define business relationships such as collaboration with other mode operators, infrastructure providers, management of contractual arrangements with customers, strategic relationships with financial institutions, market communication, unit or partner responsible for customer contact and distribution of revenue from customers to companies involved in the provision of the service"*.

Within a business model concept, management models help operators to ensure the quality and cost effectiveness of the given services, which include intra-organizational solutions governing supply of competitively feasible freight services to international markets. Management models are important both in each link in the transport chain and also at the overall level in order to deliver competitive services to the market (Vold et al., 2007).

3.3.2 Topology for rail freight business models

Four basic models

The experience from US development highlights the appearance of third party operators in rail freight business and particularly the growth of intermodal freight. In the US these operators are often referred as IMOCs – intermodal operating companies - or intermodal marketing companies, IMCs. In Europe, this type of an operator is not well known by this term, but intermediates like forwarders, 3 PL- and 4 PL- companies, logistics service providers (later LSP) and rail operators' subsidiaries or affiliated companies provide similar service. A common role to IMCs and third party operators is that these often have various options (rail, road, sea and air) to offer to the client compared to the rail freight operator, who usually has only a rail connection. The reason for the appearance of the IMCs has been that they linked the clients (owners of the freight) and the transport service. In the early era of intermodal transportation in the US, the rail companies were typically the main link to the clients themselves.

From US experience we found that many intermodal corridors were developed as a result of the emergence of a major freight participant, often a party other than the railroad. This corridor leader:

- sets the service level for the corridor
- makes the agreement with the client (shipper / consignee)
- collects the freight from the clients (or the main part of the freight)
- negotiates rates with the railroads
- credits the subcontractors their shares
- carries the biggest economic risk in the corridor

From our earlier studies (see PROMIT D5.2 case Reorient) we suggest four different types of business models (figure 22):

1) Freight operator-3PL Model,
2) Anchor Customer Model,
3) Agent Model, and
4) 3PL Model.

Each of these four different models suggests a different insight of the leader in the corridor.

In the Operator-3PL Model it suggested that the leadership is somewhat balanced. The logistics service providers (LSPs) work with the clients and negotiate the transport conditions. The Operator concentrates on the multimodal rail operations and is the link to connect the shipment usually from hub to hub by rail.

The Anchor Customer Model suggests that the Operator is the leader of the chain. The anchor customer is a client that controls a significant volume of freight on the corridor. The Operator contacts the client and organises the transport chain without intermediaries. In Europe there are examples of this: the furniture, steel and paper industries are some examples of companies making direct agreements with rail operators to run full block trains through Europe.

The Agent Model suggests that the Rail Freight Operator can establish an agent network to provide the clients the local services in every country. This model is actually a modification of the Anchor Customer Model. [In the business model topology framework, the customer interface is modified in this model compared to Anchor Customer Model]. This model does not include a big role for LSPs either. The Freight Operator controls the corridor and the agents provide the local services and make the agreements under the name of the Operator.

In the 3PL Model the role of the LSP is crucial and the Operator just operates the trains. The LSPs either cooperate with other LSPs or they compete. If they cooperate, only a limited number of Freight Operators is needed to run a corridor. If the LSPs compete, it is to be expected that also more Freight Operators are needed.

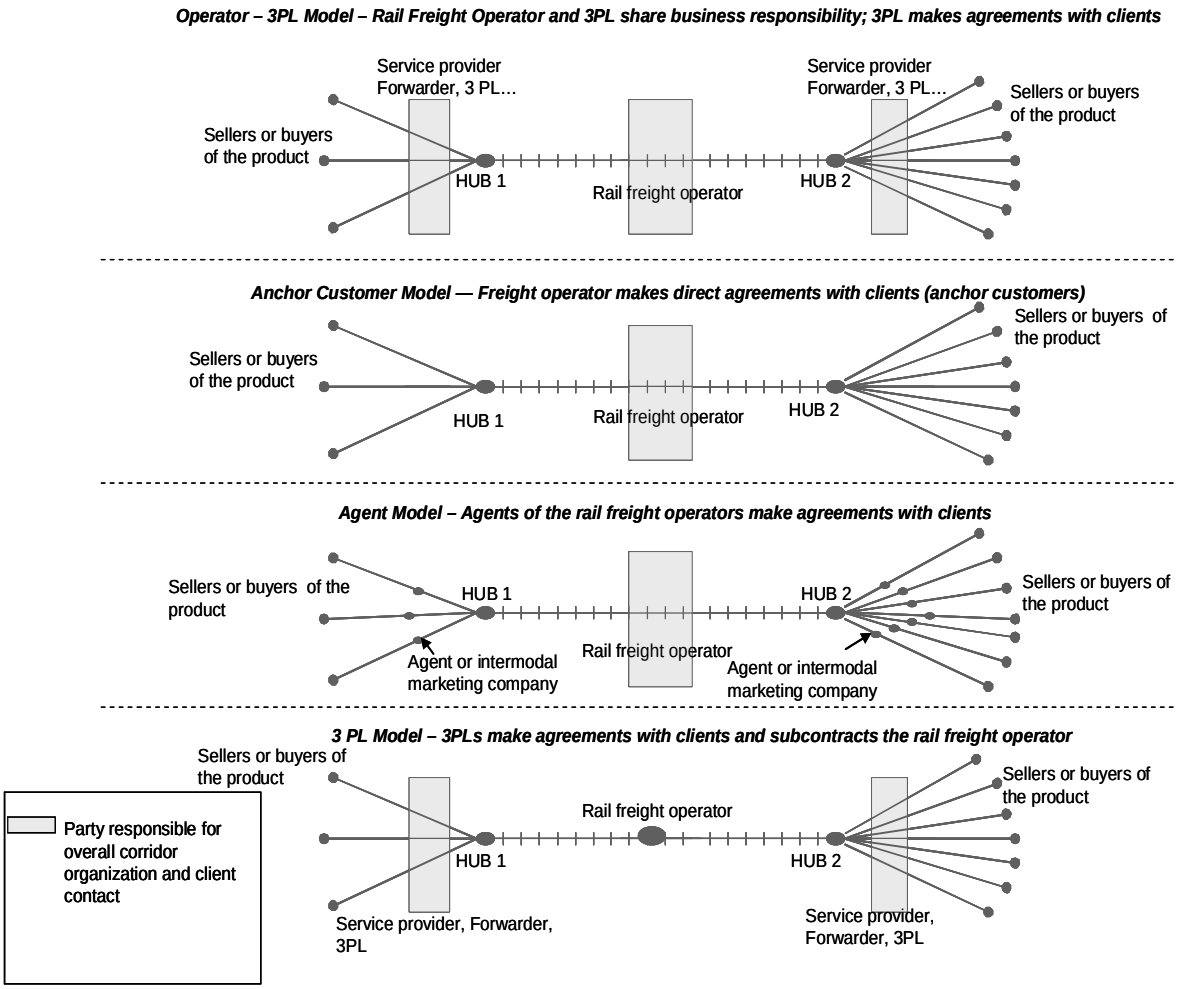


Figure 22. Business model topology

3.3.3 Evaluation of models

The four basic models seem to be characterized also on a time scale. The EU and US railways have been historically been inclined towards Anchor Customer Model. After US deregulation the intermodal service has been shifting increasingly towards 3PL model. The rest of the models, Operator-3PL and Agent Models are transition phase models.

In Europe, the UIRR companies represent mainly a model between the Operator-3PL and the Agent Model. UIRR companies' ownership structures indicate both models' existence, depending on the amount of equity stake that the Operator has invested. The same models apply to DB with its relation to its Schenker business unit. Since Schenker is fully digested by DB, the structure can be regarded perhaps as the Agent Model. On the other hand, Schenker business unit's mere size and geographical coverage suggests the Operator-3PL Model.

In the Nordic countries, CargoNet of Green Cargo (Sweden) and NSB (Norway) resembles Operator-3PL or Agent Models. VR's (Finland) intermodal business is totally within the group and is clearly an Agent Model. The conventional business relies on heavily on the Anchor Customer Model, as is the case with Green Cargo.

On a time scale, the obvious evolution seems to be Anchor Customer Model => Agent Model => Operator-3PL Model => 3PL Model. Anchor Customer Model is transforming to Agent Model as Rail Freight Operator starts to build alliances with Agents or outsources some of its own sales and marketing functions or builds a subsidiary. As these alliances become more common, further alliances are made in co-operation with LSPs. Finally, the LSPs capture some of the customer interfaces totally and Freight Operator becomes a wholesaler. In the US, this wholesaler role has been profitable for the railroads.

Bontekoning (2006) suggests that a hub-and-spoke type of model, with a "chain director" (which we call the "corridor leader") is needed especially for containerised freight where rail hubs are used to consolidate flows and rail operators offer wholesale hub-to-hub service. In her thesis, such a system would enable operational benefits and economies of scale. Trip and Bontekoning (2002) reported some of the same conclusions earlier. Our paper explicitly comes to the same conclusion although using an entirely different line of reasoning and starting points. It is easy to see that hub-to-hub operations do not follow borders.

The different models will co-exist and are not obviously excluding each other in any way. But the evolution phases seem quite logical when looking back at the history of European and US rail sector.

3.4 Hupac Ltd

"Divide and rule"

Hupac[1] is the leading intermodal transport operator through the Swiss Alps and one of the market leaders in Europe. The company works to ensure that an increasing volume of goods can be transported by rail and not by road, thus contributing to modal shift and environment protection. Hupac operates a network of more than 110 trains each day between Europe's main economic areas and between the harbours and the hinterlands. Hupac is an independent operator in the field of combined traffic, the core of the business is related to operate through the Swiss Alps. Their partner in rail operations is Cemat.

HUPAC's target was growing in the market with consequent extension of the network and optimizing intermodal operation. Thus HUPAC aimed at direct shuttle train connections with the most important European ports, consumer and production areas. Efficient logistical solutions would be provided by One Stop Shopping and tracking and tracing services. HUPAC wanted to reach punctuality over 90%, at the moment 70% of the trains were on time. HUPAC also wanted to operate without subvention of the government for the use of the railway lines. HUPAC developed its activities by:

- consequent long term shuttle system development,
- cross border traction, and
- IT applications.

[1] http://www.hupac.com/PDF/Download/40years_HUPAC_E.pdf

The network development started with north south connections on the transalpine corridor through Switzerland and is expanding to include more and more also East-West connections. HUPAC built up an extensive European intermodal shuttle network (Fig 23). HUPAC provides three services in combined transport:

1. Continental services: Terminal-to-terminal transport connections between Europe's major economic areas.
2. Maritime inland services: Inland transport from/to ports in the Mediterranean and in the North Sea with additional delivery services (also called maritime land bridge).
3. Accompanied combined transport: HUPAC also offers a Rolling Highway service for fast transalpine connections.

Figure 23. HUPAC European intermodal shuttle network

The railway market liberalization in Europe and especially in countries on the north-south corridor lead to new opportunities to organize and operate the railway main haul. Earlier every railway partner had to acquire a multi system locomotive for the different electrical networks used in different countries. On border crossings usually staff and equipment (traction) had to be changed due to national regulations and procedures. This was cost and time consuming and the split of responsibilities between the national railways had a negative impact on the efficiency and quality of the intermodal transport chain. The current

change of locomotives at the borders had become unnecessary which has meant that the productivity of the traction has been improved.

2005 was the first year with international integrated traction for over 15000 HUPAC trains. Every traffic relation of the HUPAC Shuttle Net and Rolling Highway services has been entrusted to a single railway company, from origin to destination. This means that there is only one interface between HUPAC and the operator. For each relation, HUPAC has selected the most advantageous railway company, both in terms of costs and of overall service quality. With the integrated traction HUPAC promotes competition between the railway operators. Furthermore, having a single partner to interact with means that information regarding each journey is managed more efficiently, the flow of communication towards customers is considerably speeded up, and as a result the overall quality of service is optimized. . The rate of punctuality, i.e. the number of trains with less than one hour's delay has been improved. There are operational advantages of a single railway company for the entire journey. Quality contracts can be set up in co-operation with the customers. The railway assumes overall responsibility for its performance parameters.

HUPAC introduced its GPS based system e-train in 2006. The positions of all trains are known due to GPS sensors in the trains. This data goes into a software platform called GOAL (Global Application for Logistics). Goal is also connected to CESAR.

The share capital amounts to CHF 20 million divided between about 100 shareholders. Transport companies and forwarding agents hold 72% of the share capital, the remaining 28% is held by railway companies. The biggest owners are Bertschi AG (30%) and SBB (24%). The Hupac Group comprises 10 companies based in Switzerland, Germany, Italy, Holland and Belgium. The head office is located at Chiasso, with subsidiary offices in Basle, Busto Arsizio, Oleggio, Singen, Mannheim, Cologne, Rotterdam, Taulov and Warsaw. Each company operates within defined parameters, so as to offer advanced solutions and maximize the efficiency of the whole Group's response.

The company profile is well organized. The independence is guaranteed with a large scale ownership. Interestingly, the transport and forwarding companies are both their owners, clients and partners. As the ownership is broad, the leadership is kept in the hands of Hupac, "divide and rule". However, two big owners, Bertschi AG[2] and SBB[3] together constitute majority of the shares. This has two-way influence. First, these two companies can ally themselves and so affect the company decision making. But on the other hand their share keeps all the rest in minority. It can be assumed that this kind of a structure "guarantees independence and alignment with the market" as Hupac mentions in their pages[4].

As the amount of the owner-forwarders is large but limited, the leadership cannot be in the hands of these companies. The part-ownership guarantees the players fair and sufficient benefits to compete in the market, but only a minor role in decision making and thus leading the whole chain.

---

2 BERTSCHI: Transporter of bulk chemicals, http://www.bertschi.com/

3 SBB: Switzerland's biggest travel and transport company with 2300 freight trains per day in Switzerland and between Germany and Northern Italy. http://www.sbb.ch/en/index.htm

4 http://www.hupac.com/PDF/Download/40years_HUPAC_E.pdf

The potential risk, anyway, is the role of the two big owners: if these companies are acquired by a third party, the structure can be broken.

3.4.1 Client base

Hupac announces that their clients are forwarders, trucking companies and maritime operators. This means that the end customers are not their direct clients. This strategic decision influences the whole structure of the business. By owning the core business, but not trying to reach all the parts of the chain, the company has succeed in keeping their most potential competitors -forwarders and trucking companies - in line ("if you cannot beat them, join them"). This structure presumably reduces their margin per shipment, but has contributed the vast growth of the cargo- base and eliminates the competition.

3.4.2 Equipment

Hupac owns most the equipment they are using. They own about 6000 wagon modules and a lot of engines. About 10 terminals are their own, in the most important locations in the chain. However the biggest part of the terminals is owned by their partners.

Even though their ownership of the equipment is tremendous, compared to the ownership of the whole chain, their ownership is only a fraction of the total. The ownership can be called as strategic, because by this they can guarantee a solid competitive edge in their side. A newcomer should make immense investments to be able to compete with Hupac. Also by having their own terminals in the critical locations prevents the competitors to join. Those terminals that their partners own are not a threat, but a benefit: by marketing them, the whole chain to the end customers is firmly in the possession of the chain. This factor attracts also new clients because of the coverage of the network. Also their minority ownership of the terminals is in line with their client strategy where the end client service is given to the forwarders.

3.4.3 The product

Hupac is specialized in intermodal transports from terminal to terminal. During the years it could have been tempting to serve also end- customers, because of the leadership of the chain, better prizing possibilities and higher revenues. The decision to stay strictly between the terminals (HUBs) has been a strategic decision which influences the structure of the chain. To be a common carrier instead of anchor customer carrier has enabled Hupac to reach a high portion of the total volumes, which has also monopolistic features. As they have concentrated in their core business, and thus being neutral, they have been able to do co-operation in a group, where several competitors exist. Surely their prizing policy is not favouring one against another and so they can stay outside the competition problems of their part-owners.

As a consequence of being neutral, Hupac has in comparatively short time-scale been able to scrabble about the main volumes that are moving between Italy and other Europe. Instead of a competition between different service providers, their main competitor has been different means of transports, mainly but not only, the trucking. Their traction is integrated

so that all the rail operators are responsible for the whole transport between the terminals. This has been to improve quality and productivity in the chain. When all the operators are responsible, it can be assumed that especially the quality gets better in interfaces between the actors.

In the cases when a same driver is needed in both ends, Hupac offers "The Rolling Highway", where the lorries are loaded in the train and the drivers have sleeping cars. By this operation they not only serve the customers, but also with a good service, eliminate one part of their competition to use the train.

The product is differentiated from the others'. Because of the structure, it is difficult to copy. The product has a monopolistic feature.

3.4.4 The service

Though the rail transport is not unique, in the Hupac case this can be expressed as unique. In their presentations they use the slogan "Through the Alps". The Alps have been a hinder in logistics since milleniums and also Switzerland as a country has tried to minimize the trucking through their country. In this respect the train is more sophisticated solution than trucking.

The Hupac network is quite extensive. They cover all the important destinations to and from Italy and Europe. This they call "Shuttle Net". They have fixed timetables between all the main HUBs and strictly keep them.

3.4.5 The brand

Hupac bases its brand with four main statements:

1. Environment
2. Quality
3. Jams in European main roads
4. Customer minded service

They also have secondary statements, like IT- development and staff.

The question of environment is an acute and effective argument in decreasing the pollution and especially carbon dioxide in the air. The quality is more or less based on more common elements in transport business: ISO- standards of quality management, time tables, staff, IT - development. The jams in Europe are well known facts and it is also true that by using trains, the influence to jams is inevitable. As a conclusion to their brand, Hupac has been able to create a brand that supports its strategy. It is also difficult for their competitors to disprove this brand.

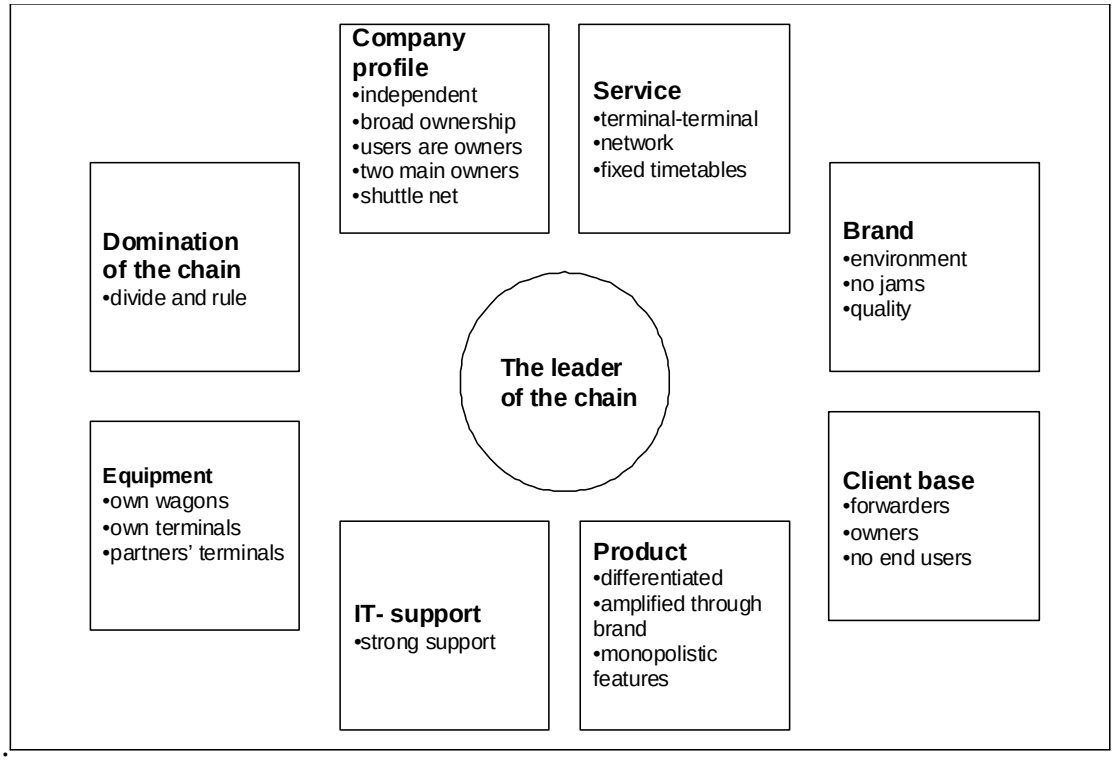
3.4.6 IT- support

The company has invested in IT- development with the intention to monitor data with clients, service providers, terminals and other operators. They have developed tools like "Goal", "Cesar", "e-train" and "E diges" for the efficient exchange of data.

3.4.7 Domination of the chain

Hupac's core business is the intermodal transport between the terminals. This part of logistics chain they strictly keep separated from deliveries from terminals to clients. The core business, however, is split between separate operators which mainly are train operators in the chain. The main partners are SBB Cargo, (Switzerland) Intermodal DB Logistics (Germany), Trenitalia Cargo (Italy), Ferrovie Nord Cargo (Italy) and Rail4Chem (German, a subsidiary of Veolia transport since 21.2.2008). The rail operators cover the business area comprehensively.

The local services in both ends of the chain are carried out by other partners than train operators. They are either trucking companies or forwarders. On the other hand this is a natural splitting, the rail operators concentrate their core business and the client service sector concentrates theirs'. On the other hand this split guarantees Hupac a leadership in the chain: by separating them and allowing a fraction of the whole chain, Hupac can dominate the whole chain (Figure 24



).

Figure 24. The factors of a leadership in multimodal transports, case Hupac.

3.4.8 Conclusions

The data used in this evaluation is based on public (internet) material and mainly from Hupac's own homepages. So, there is a risk of emphasizing positive and underrating some negative aspects. Also some information (especially prizing issues) is very slight. However, as the company is well known, it is to be assumed that generally the information they give is sufficient enough for analyzing the company.

3.4.9 The privileges of the leader

From US experience we found that many intermodal corridors developed as a result of the emergence of a major freight participant, often a party other than the railroad. This corridor leader:

- Sets the service level for the corridor.
  - This seems to be supported in case Hupac
- Makes the agreement with the client (shipper / consignee).
  - Partly supported. Hupac makes the agreement with their clients, which are forwarders. These forwarders make the contract with end customers.
- Collects the freight from the clients (or the main part of the freight).
  - Partly supported. Hupac collects the freight from their clients, which are forwarders. These forwarders collect the freight from the end customers.
- Negotiates rates with the railroads.
  - Supported.
- Credits the subcontractors their shares.
  - Supported
- Carries the biggest economic risk in the corridor.
  - Supported.

3.4.10 The evolution of the Hupac business model

Our studies concerning three-mode-corridors suggest a development of the leadership in a chain. It is presented that progressively the leadership of the chain proceed to 3PL or 4 PL companies, because of complexity of the service, as more and more new clients appear to the market. The unparallel logistical needs, individual it- challenges and cultural differences in separate countries vary, leading to a situation where a transport operator cannot serve all the clients in both ends of the corridor.

The Hupac case shows that this hypothesis is only partly supported. The most important reason for this is that they have established a network where every participant in the chain has a clear and quite independent role. They have concentrated in transport only between the terminals and have left the end-client service to the forwarders. As a consequence of this, they have been able to liquidate their most potential competitors. The trucking, which is the most probable means of competition, they have eliminated by offering the trucking companies a possibility to move their trucks and drivers in the train. This is strongly supported by their devoting to environmental issues, which surely affects -not only the logistics operators, but the general attitude against trucking business. They also emphasize the well known facts about the jams in most European roads. Finally, their company structure also strengthens their position.

Hupac benefits from the geographic fact that the Alps cut the connection between Italy and Northern Europe. Especially the Swiss have suffered from the transit traffic through their country. A train connection has been considered the best solution for the problem. Therefore a real potential competition is more inside the train corridor than outside, like trucking.

As they have gained the competitive advantage, they have strengthened it with additional actions. The equipment is in most parts (especially the wagons) their own, their it- solutions are modern, their client / partner base is growing and they have been able, by dividing the duties and responsibilities, to rule the chain so that it is difficult for the competitors to entry the market.

However, the Hupac group's most important strength is also its weakness: The ownership. Two big companies (Bertschi AG and SBB) own 54 % of Hupac. If this ownership, or a part of it, drifts to "wrong hands", the playing field might change very rapidly. The consequences of that can only be guessed.

3.4.11 Who is the leader of the chain?

Even though Hupac leads the chain, it can be seen that this leadership in only partial. We in our Model 1 (**Freight operator-3PL Model**) call this as a balanced model as the leadership is divided between the operators and 3PL companies. The 3PL companies are supreme in the end- client services and they also have the responsibilities and benefits from that perspective. But because of the disunited ownership, the 3PL companies cannot easily reach a leader's role. This role they actually cannot reach even by allying together, because of the ownership structure. The other operators cannot be the leaders either, as their share of the ownership and the business is rather small. The Hupac case affirms that a balanced model can be based on a long-term co-operation. Hupac represents the model 1 **Freight operator-3PL Model.**

3.5 Case Volvo Logistics, Train "8"

"Own the cargo, lead the logistics, outsource the transport"

3.5.1 Volvo Group

Founded in 1927[5], Volvo is one of the world's leading manufacturers of heavy commercial vehicles and diesel engines. The Volvo Group also offers a comprehensive range of customised solutions in financing, leasing, insurance and service, as well as complete transport systems for urban traffic. Several business units provide additional manufacturing development or logistical support. The Group has about 100,000 employees and production facilities in 19 countries and sales activities in some 180 countries.

Volvo has factories in Umeå, Gothenburg and Olofström/Almhult in Sweden, and the distribution centre in Ghent, Belgium. Volvo Logistics (VL) serves, in addition to Volvo, a number of external customers like Volvo Cars, GM, Nissan, Land Rover, Renault, Ford, Jaguar, Aston Martin, Boeing and "Global Suppliers" to the automotive industry.

---

[5] www.volvo.com

Volvo has a distant location to its customers which gives a competitive advantage to its competitors. Efficient transport is vital to be competitive and to compensate the peripheral location. The peripheral location affects the company's logistics in two ways. Transport costs are high because distances are long both for sourcing of material and for finished product. There is also little choice in transport alternatives and frequencies are low.

Volvo's logistical solutions were already sustainable when starting the activities, but Volvo wanted to optimize costs and reduce environmental impact. In addition Volvo wanted the logistics system to have following features: at least at fast as the existing system, reliable, increasing capacity, potential for future development and possibility to combine product cabs with production material.

3.5.2 Volvo Logistics

Volvo Logistics is a wholly owned subsidiary within the Volvo Group. Volvo Logistics´ mission is to deliver complete supply chain solutions that add value to their customers worldwide. They collaborate with customers and endeavour to act with superior competence, commitment and speed in the total supply chain, both locally and globally.

Volvo Logistics[6] designs, handles and develops comprehensive business logistics systems for the automotive industry worldwide. Volvo Logistics dominate all the necessary logistics areas that Volvo requires: inbound, outbound and emballage, creating good preconditions for customer order-managed production on a large scale. Their staff globally is about 1000 people.

As Volvo's production is based on "built-to-order", the challenge to logistics is demanding. All the parts of logistics must be working exquisitevely, otherwise the customer promises cannot be kept.

Volvo Logistics is specialized in logistics of automotive industry. They have kept all necessary logistics areas in-house. This is a precondition for their built-to-order production on a large scale. Volvo Logistics designs, handles and develops comprehensive business logistics systems for the automotive industry the world over[7]. The transport is mainly outsourced to subcontractors, like rail operators.

Volvo logistics is located in Göteborg, Sweden. They have offices also in Gent, Belgium, Greensboro, USA and Warwick, England. They have represens in Europe, America and Asia. The turnover is about 750 million USD a year.

Volvo logistics' company profile resembles the 4PL- service provider[8] with the exception of ownership and client base. The company structure is more or less a matter of conven-

---

6 http://www.volvo.com/logistics/global/en-gb/home+page.htm

7 http://www.volvo.com/NR/rdonlyres/000317F3-1E3B-442F-85ED-BA3DA91C3C11/0/logistics_eng.pdf (Company brochyre)

8 http://www.businessdictionary.com/definition/fourth-party-logistics-4PL.html: Arrangement in which a firm outsources its logistical operations to two or more specialist firms (the third party logistics) and hires another specialist firm (the fourth party) to coordinate the activities of the third parties.

ience. Basically Volvo Logistics could be a logistics department of Volvo. The ownership - owner is a client- constitutes a structure that is quite typical for big companies, but is in conflict with the concept of 4PL- logistics.

In order to reach the goals, Volvo Logistics:

- created the "8" train
- uses a back-up transport solution, and
- improved transparency.

The Volvo Logistics solution for transport between the factories and distribution centres was solved by rail operation called "8" (Figure 26). The "8" operates two trains per day in both directions Olofström- Gothenburg-Olofström and Olofström/Umeå-Ghent-Olofström/Umeå.

Volvo Logistics acts as the manager receiving information from factories and distribution centre to make transport decisions. Volvo Logistics co-operates with rail operator Green Cargo who has the responsibility to organize transport of cargo from origin to destination. The other rail operators involved are Railion Denmark, DB Cargo, Railion The Netherlands, and SNCB (Belgium Railways).

Transport between Gothenburg and Ghent (Figure 25) is crucial to Volvo's operations and as a back-up transport solution Volvo Logistics uses short sea shipping operation Euro-Bridge offered by DFDS Tor Line. EuroBridge is a relatively high frequency Short Sea Shipping operation. The vessels servicing this operation are RoRo vessels built according to DFDS Tor Line specifications.

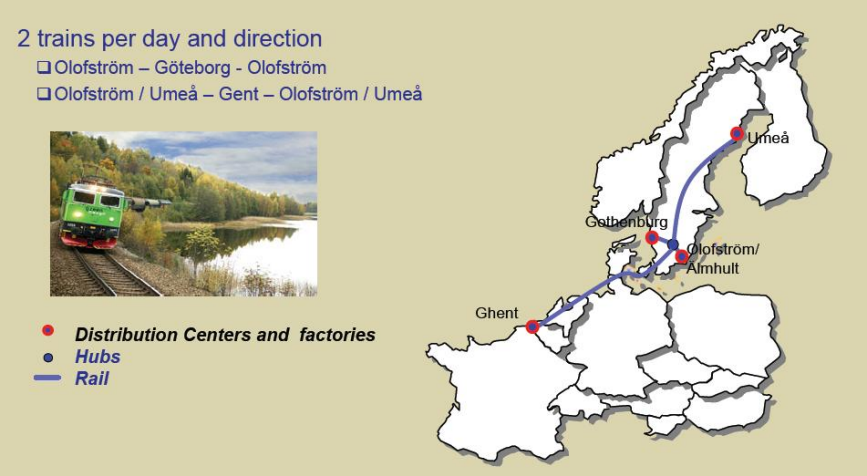


Figure 25. Locations of Volvo Factories in Sweden and the Distribution Centre in Belgium, and the Alternative Transport Routes.

Volvo Logistics made significant efforts related to communication and transparency to have a mutual understanding of efficiency, cost effectiveness and sustainability with all the involved rail companies. In the transport chain there are five countries and languages involved which complicated the situation. It was also necessary to negotiate with different unions of transport workers to secure efficient and reliable operations.

The benefits of the Volvo Logistics transport solution is reliable with precision better than 95%, environmentally friendly compared to road only transport, has potential for expansion, is flexible and able to handle fluctuations in volumes by carrying different number of wagons.

3.5.3 Client base

Volvo Logistics' clients are based on automotive industry, and more precisely, the shipments that the mother company, Volvo, provides[9]. Because of the big volumes, quality requirements and successively balanced in- and outbound shipments, the entity offers a very large action field for executing logistical performances.

Though Volvo Logistics is having only one big client, this client is on a front line to final customers, and thus the requirements to Volvo Logistics are very strict. Being a daughter company to Volvo, their responsibilities and also their power seems to be much higher than normal service providers are having.

> *"We take over-riding responsibility for all deliveries. For example, this means that we handle all customs and risk management issues on behalf of our customers. We have knowhow about and can administrate all necessary customs documents. In our role as importer on behalf of our customer, we often also take care of all direct contacts with the customs service."*

3.5.4 Equipment

Volvo Logistics separate the material flow into two:

- full load trailers directly from supplier to factory,
- an organised transport schedule from several suppliers, following a pre-determined route[10].

The material can be routed either direct or via a terminal. At the terminal the goods are sorted for subsequent transport to the relevant destinations. All the transport services are outsourced, while operations at the terminals are either handled in-house or bought externally.

3.5.5 The product

The “8” is a rail flow[11] between Gothenburg, Olofström/Älmhult and Gent with a rail connection to Umeå. It started 2002. The total turn over time between Olofström and Gothenburg and vv is 20 hours and between Olofström and Gent and vv it is 64 hours, including terminal work.

---

9 They have also other customers, like GM, Boeing, Nissan Jaguar

10 Volvo calls these as “milk rounds”

11 Another "Volvo corridor", EuroBridge, is the short sea connection between the ports close to Volvo’s two major truck factories and Volvo Cars’ car factories in Gent and Gothenburg. .

There are in total 210 wagons, the same for both the Gothenburg and Olofström flow and there are 2 departures 5 days per week from each place. 22 440 wagons are transported every year between Olofström and Gothenburg carrying 67 320 containers, specially built to be able to take more cargo compared to road transports. Between Olofström and Gent is every year 16 960 wagons transported that equals 50 660 containers + 4 800 multi purpose wagons (big conventional wagons) taking truck cabs from Umeå to Gent with back load of racks and cars.

The reliability of the service is 95% in time. The "8" is also the fastest flow between Gothenburg, Olofström and Gent even compared with road transports.

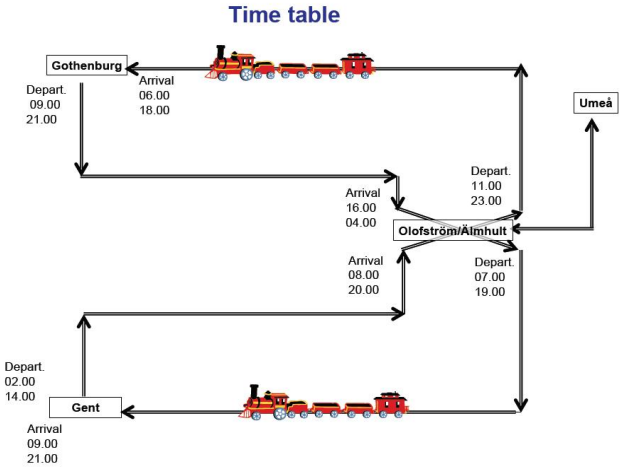


Figure 26. The schedule of Train "8".

3.5.6 The service

A peculiar feature in Volvo Logistics is that their service includes all main activities of logistics: inbound (material supply), outbound (distribution) and emballage (packaging materials). Their service product to Volvo seems to be more Logistics chain flow planning and executing than transporting the goods. The transport is handled by subcontractors which are controlled with rules and standards.

The figure above illustrates the relations and management of Volvo's Supply Chain management. The transport companies are separated from managing the chains; and vice versa, Volvo Logistics is separated from transports. The main actors in the chain are train operators in different countries: Railion in Denmark, DB Gargo in Germany, Railion in the Netherlands and SNCB in Belgium (Figure 27). Above these operators, but below Volvo Logistics, is Green Cargo from Sweden. According to this picture, Green Cargo is the coordinative partner in transport corridor issues. This is natural, because Volvo Logistics mentions the coordination of national rail companies very challenging[12]. The role of different terminals is scarcely mentioned in their presentations, which strengthens our understanding, that terminal operations in Volvo- case are not too big problems.

---

12 Gina Hernefjord (September 25, 2007) Volvo Logistics Corporation

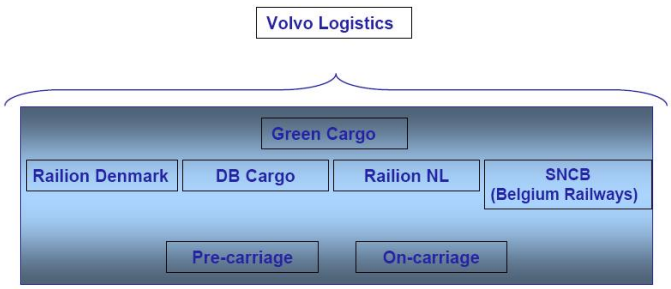


Figure 27. Role of Volvo logistics in a Supply Chain[13]

3.5.7 The brand

Volvo logistics emphasize[14] the following issues:

- Environment
- Quality
  - IT- monitoring
  - Evaluating of the distribution systems
  - ISO 9001 and 14001
  - built-to-order production
  - staff
- Jams in European roads
- Safety
- Costs

Volvo Logistics' brand is corresponding to Hupac's with one exception. Volvo also weights cost factors, which in case Hupac is not an issue. This difference seems to be natural as Hupac is a service provider and Volvo is user. Though Volvo Logistics mentions the jams in European roads, this is not their main argument. Costs, quality and environmental issues seem to be the most important issues to Volvo.

As a conclusion to their brand, Volvo Logistics has created an image of a big Swedish manufacturer being able to overcome the deficits of their remote location. The solution is cost- efficient, high- qualitative and environmentally sustainable.

---

13 Gina Hernefjord, (2007), Volvo Logistics

14 The listed issues here are the ones that either recur several times in the text and / or clearly are stated by Volvo Logistics as their main targets.

3.5.8 IT- support

A comprehensive and transparent data handling seems to be a critical success factor in their operations. The challenge is a common information base for all material flow patterns globally.

A4D (Applications for Distribution) is the world's first distribution system that is totally integrated with order and production systems. Volvo Buses has been using A4D since autumn 2000. This e-business platform is all set to help other customers such as Volvo Cars to further improve the precision of their deliveries and to plan the physical distribution processes.

They are developing a new IT- tool, called "Atlas", which will always have updated real-time information about all relevant activities in the material supply process, and will enable us to provide proposals regarding the best transport solution for each individual customer.

3.5.9 Domination of the chain

Volvo Logistics sets many requirements to their transport companies. This way they achieve their qualitative requirements, but also the domination of the chain. They have set the following (minimum) requirements:

- At least Euro 2/US98 for road transports
- All major suppliers must have a third party certified quality management system according to ISO 9001
- All major suppliers must have a third party certified environmental management system according to ISO 14001/SmartWay or equivalent standard
- Fulfilment of EU Directive 1999/32/EC and MARPOL 73/78 Annex VI for maximum sulphur content in bunker fuel for sea transports (May 19th, 2006).
- Fulfilment of national and international legal requirements concerning road safety. Carriers must present policies and a dedicated work around our focused areas: Speed limits, Use of seat belts, Driving- and resting times, Alcohol- and drug policies, Securing of loads and Dangerous goods.
- Apart from these requirements, they also require additional "Binding documents for carrying Volvo Logistics goods".

3.5.10 Conclusions

The train "8" has connected the Volvo's operations in Sweden with the continent. Quality and environmental issues have been of high importance and minimising the logistical costs has been on of the main factors of the corridor (Figure 28).

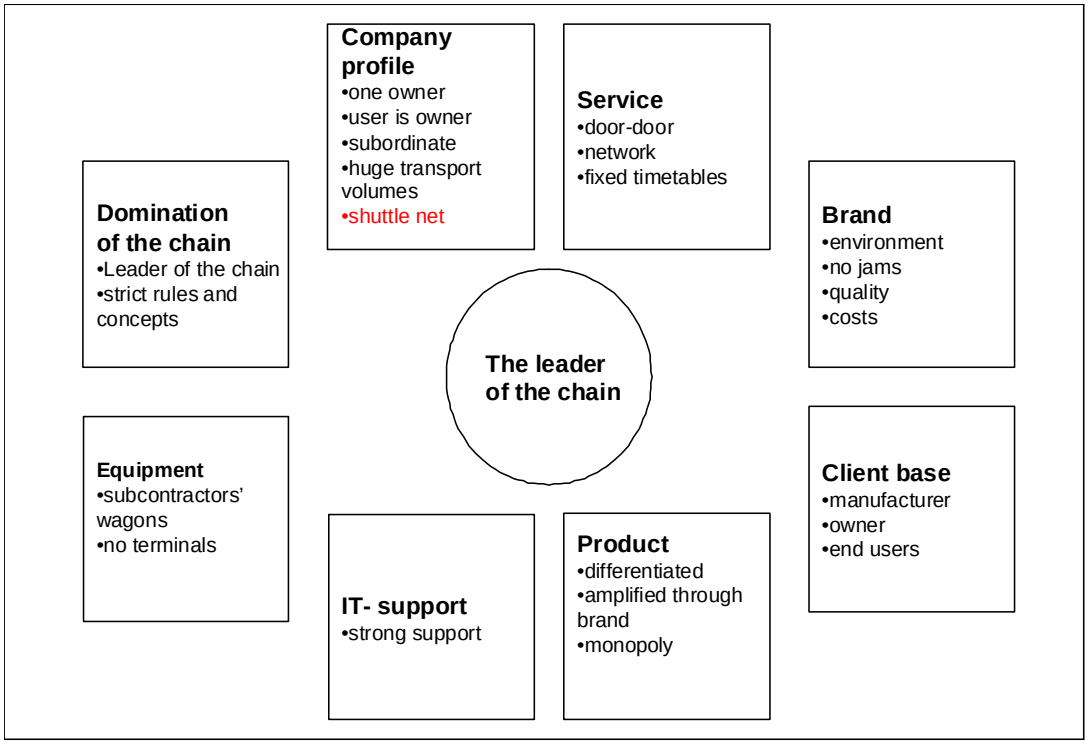


Figure 28. The factors of a leadership in multimodal transports. Case Volvo Logistics

3.5.11 The privileges of the leader

From US experience we found that many intermodal corridors developed as a result of the emergence of a major freight participant, often a party other than the railroad. This corridor leader:

- Sets the service level for the corridor.
  - Supported.
- Makes the agreement with the client (shipper / consignee).
  - Supported.
- Collects the freight from the clients (or the main part of the freight).
  - Supported.
- Negotiates rates with the railroads.
  - Supported.
- Credits the subcontractors their shares.
  - Supported
- Carries the biggest economic risk in the corridor.
  - Supported.

3.5.12 The evolution of the Volvo Logistics business model

The study presents four different types of business models in intermodal transport. The Volvo Logistics case is a combination of two models: Anchor Customer model, and 3PL-model. The anchor customer is Volvo and they have "made the contracts" with their own company, Volvo Logistics, which acts like a 4PL- company with minor exceptions. Thus

the leader of the chain is strictly kept inside Volvo organization. The rail operators are not the leaders, but their role in maintaining the service is essential. They also are difficult to change, if needed, because of the monopolistic positions they have obtained in course of time.

The Train "8" seems to be rather closed circle. It will surely be difficult for other companies to join the corridor. However, joining surely is supposed to be possible in a case that a newcomer can fill all the conditions the corridor has set.

The role of Volvo Logistics seems to be long lasting and it is difficult to predict that an outsider could capture its share. Because of that, it is also difficult to predict that the corridor will develop towards a more comprehensive and generic logistics system for a common use. This - at this moment - seems to fit well to Volvo's goals as the volumes are in a balance.

However, the corridor structure allows speculations. Volvo Logistics announces that their staff altogether is about 1000 people. Today we live in a bank crisis and especially car manufacturers are having problems. What happens if Volvo sells the stocks of Volvo Logistics to one of the big 3PL- companies? Not perhaps all, but a part of it?

Our studies concerning three-mode-corridors suggest a development of the leadership in a chain. It is presented that progressively the leadership of the chain proceed to 3PL or 4 PL companies, because of complexity of the service, as more and more new clients appear to the market. The unparallel logistical needs, individual it- challenges and cultural differences in separate countries vary, leading to a situation where a transport operator cannot serve all the clients in both ends of the corridor.

The Volvo- case is relatively recent and therefore it is premature to make too definite conclusions. Two facts arise in analysing the case. First, Volvo case is today still a closed circle, serving few companies and only very few destinations. The concept is built to serve Volvo and other users are very limited, and surely accepted only if they fit to the system. The management and coordination is strictly in the hands of Volvo (Volvo Logistics). Strict rules and standards limit both new clients but also new service providers. Secondly, the corridor works fine as long as the volumes are sufficient to run the corridor. If this balance will be broken, the basis of the whole system might change.

The model in Volvo case is a combination of Anchor Customer model and 3PL- model where Volvo is both Anchor customer and logistics provider. The strict quality requirements and Volvo Logistics' focusing entirely on the automotive industry, makes it difficult for other potential users to join the corridor. The model type seems to be possible only in cases, where the user is so big that they can establish the corridor alone.

3.5.13 Who is the leader of the chain?

The study shows that Volvo Logistics is quite clearly the leader of the chain. This is mainly due to the fact, that they are totally owned by the actual leader, Volvo Group. Their responsibilities and operations extend to a level where more common service models cannot: they participate the logistical parts of manufacturing processes and also are able to plan Volvo's logistics including all the main logistical aspects that a big manufacturer have.

This has enabled them to concentrate, not only in transport - warehousing issues, but the total coordination and integration of Volvo's supply chain.

The logistical structure of Volvo seems to be strong. Their volumes fill the trains in both directions (inbound and outbound), which makes Volvo with their vast volumes an independent actor in the field.

If there is a risk, it comes from outside: If the changes of buying behaviours of final clients change, the whole structure is in danger. Even quite exiguous changes in amounts of cars bought, can change the cargo volumes dramatically. However, this kind of risks, are typical in business life.

3.6 Case Kuehne & Nagel, a global logistics service provider

"Hold the clients, lead the logistics, buy the transport"

3.6.1 Kuehne & Nagel

Since[15] its 1890 founding in Germany, Kuehne + Nagel (KN) has grown into one of the world's leading logistics providers. Today, the group providers services with 850 offices in over 100 countries, with more than 54,000 employees. The global network, IT systems and high levels of service, have positioned them to increase the scope of their customer solutions and services.

KN is financially strong and independent organization. The shareholder structure is following[16]:

- Kuehne Holding AG 55.75 %, owned by Mr. Klaus Kuehne
- Free float 42.59 %
- Treasury shares 1.66 %

Even though KN is one of the biggest service providers in their vast offering areas, they rather emphasize their global activities and network than different corridors. Their main business area is global logistics services, mainly dedicated to industry sector, and thus they do not emphasize specific parts of transport services. Actually KN does not seem to be an actual leader of a transport corridor, but a user of them in cases where these services suit to them and their clients.

3.6.2 Company profile

The operational structure of the group is divided into the following primary segments: Seafreight, Air-freight, Road & Rail Logistics, Contract Logistics, Real Estate and Insurance Broker. The geographical regions are Europe; Americas; Asia-Pacific and Middle East; Central Asia and Africa.

---

15 http://www.kn-portal.com/

16 http://www.kn-portal.com/fileadmin/_public/documents/annualreports/2007/Kuehne+Nagel_2007_annual_report.pdf

KN delivers integrated solutions across the supply chain, with a purpose to turn their clients' logistics challenges into real competitive advantages. The customers are served worldwide by their Global Logistics Network, offices and distribution facilities, staffed by their own forwarders.

The company acts as a freight carrier. In most of the cases the transport parts are bought outside from transport operators. The warehouse operations and distribution services are either outsourced or own production, depending on decisions made by the management. The local offices serve as connection points for customer access to global markets. The focus in this paper is intermodal transports of KN.

3.6.3 Client base

KN delivers end-to-end supply chain solutions for many major industries, including high-tech and consumer electronics, retail, fast-moving consumer goods, pharmaceutical/healthcare, industrial, chemical, aviation and automotive.

Judging from their offering areas and size of the company, their client base is immense, varying from big global companies to small and local workshops. All these have different needs, and KN's competence depends on their ability to provide them service required.

The shipments vary between massive packages to groupage shipments. The most common transport equipments are containers and trailers, which often belong to operator own, but they can also be leased or own.

Because of the client structure, KN actually is not too much dependent on one or few big clients. Being a common carrier, they can spread their network in all parts of the globe. With developing their information technology and processes, they are able to serve their clients in the network with similar methods, which guarantee them a reliable and integrated service where ever the client is located.

The relation between a client and a forwarder business can naturally be either loose or tight, but it is very common, that a company, who needs services of a forwarding company, makes a contract with the forwarder, especially in global business. By concentrating specific services to one provider, the clients achieve different logistical benefits.

As a conclusion of a client base, the relation between a forwarder and their clients is relatively strong, which at least partly prevent that the competitors and local transport operators are able to take the client over with low transport prices or other arguments. This is quite clear in the Hupac case, where the company actually do not compete with the forwarders. Instead they say that forwarders are their clients.

A tight relation with the client enables that a forwarder is able to offer a broad service package to their clients by offering also different transport operators' services to the clients. By keeping the most important corridors in their own possession and subcontracting the others, the service package is much more comprehensive than the one based purely to forwarder's own traffic.

3.6.4 Equipment

The material is quite exiguous concerning equipment and their partners in intermodal transport. Generally KN emphasizes the client service instead. Equipment is important but not the main issue. Mainly they do not own the wagons and containers, but use the transport companies' units[17]. If needed, they are ready to lease the equipment:

> *The positive economic environment increased the demand for rail transport, but at the same time led to a shortage of capacity. Kuehne + Nagel successfully counteracted this trend by the long-term leasing of wagons and containers. Additionally, a reduction of standing times allowed for the improved utilisation of vehicle capacity in round-trip traffic18.*

KN co-operates with the carriers even though some of them might be their competitors. They, for example, inform that they co-operate with DB[19] Logistics, a mother company of Schenker. This train operator provides them with train services with wagons and other equipment.

The warehouses and terminals are both own and outsourced, depending on the circumstances. For example, in Finland most of them are outsourced from their partner, also the distribution services[20]. The trailers are leased. On the contrary, in Germany most of the warehouses and terminals are own or leased. The warehouse network is wide. It is estimated that the totally approximately 7 million square meters of warehouse space is controlled by KN worldwide.

The KN service product resembles the 3PL- structure[21]. Especially in global networks most of the services they provide are outsourced, or better, bought outside[22].

3.6.5 The product

KN offers European road and rail transportation products and services, including dedicated and individual delivery services. The transport operations are based on partnerships with carriers. The web-based tracking and tracing supports the service offering.

KN calls the company a neutral rail freight forwarder with access to best-in class rail operators. They offer pre- and post-carriage to intermodal transport logistics options, including cargo handling, warehousing, distribution and customs clearance. They can also design and integrate the necessary logistics services, including packaging, cargo insurance, cus-

---

17 Mika Rapo, Director Road&Rail; Kuehne+Nagel LTD

18 http://www.kn-portal.com/fileadmin/_public/documents/annualreports/2007/Kuehne+Nagel_2007_annual_report.pdf

19 Deutsche Bahn AG

20 Mika Rapo, Director Road&Rail; Kuehne+Nagel LTD

21 http://www.businessdictionary.com/definition/fourth-party-logistics-4PL.html: Arrangement in which a firm outsources its logistical operations to two or more specialist firms (the third party logistics).

22 Mika Rapo, Director Road&Rail; Kuehne+Nagel LTD

toms clearance - even complex projects, such as dismantling and reconstructing entire plants.

Instead of emphasizing the transport corridor and the operators there, KN points out the services they can produce above the basic transport service, like optimizing transportation flows across Europe, integrating with other KN supply chain components, such as Sea/Air and Contract Logistics, and integrating road service with extensive rail capacities, such as cost- and time-effective block trains. Direct-line hauls supplement the network with terminal-to-terminal and door-to-door connections.

They are specialized in:

- Block train transport
  - Directly linked to major European rail-consolidation hubs
  - Serve single-car loads, as well as intermodal solutions
- Single-car transport
  - Across Europe and into Central Asia
- Intermodal transport
  - Solutions across Europe and to the CIS, Central Asia and Far East
- Hazardous goods and oversized shipments
- Services to and from the Commonwealth of Independent States, Central Asia and south-eastern Europe
- Special services, including supplying raw materials to manufacturers, rail-connected consolidation hubs for retailers, and complete management of major industrial projects

3.6.6 The service

Being a logistics service provider, KN devotes to client service. Client needs, supply chain savings, tracking and tracing, skilled people, global network, terminal coverage and partnership with clients, are typical phrases in their company presentation. The presentation is meant for their clients and the purpose is to emphasize the company's global nature. KN do not commit themselves into specific transport corridors, they rather try to find the best solutions to their clients. A use of a specific corridor is more a consequence of client needs than the corridor as an end in itself. Therefore KN in practise uses all the different corridors according to client needs. An example of this is the trailer operations in Europe, which they use largely between same destinations as where they could use trains:

> *"From Italy to Finland, we use Hupac for full loads, if there is no hurry. Especially for groupage we usually use trucks, because they often are urgent".*[23]

3.6.7 The brand

The brand KN is offering has basically three elements:

---

[23] Mika Rapo, Director Road&Rail; Kuehne+Nagel LTD

1) Mastering the logistics:

- Global logistics network
- Skilled people
- Partnership
- IT-solutions
- Complex solutions
- Supply chain management

2) Company structure

- Private company
- Independent

3) Commitment to Quality, Safety, Health, Environment & Security

- QSHE program
- Quality-management certifications
  - ISO 9001
  - ISO 14001 certificate for environmental issues
  - OHSAS 18001 certificate for occupational health and safety
  - Transported Asset Protection Association (TAPA) security attestations
  - U.S. Customs-Trade Partnership Against Terrorism (C-TPAT) certificate
  - Authorised Economic Operator (AEO) Certificate initiated by the World Customs Organization.

3.6.8 IT-support

As the business of KN is based on coordination of logistics, the investments to IT and coordination issues are large. Investments are made in staff, software and hardware, and information technology (IT). The purpose is twofold: to develop their own operations and by that, to meet the client requirements.

KN's IT -focus include Web-enabling business-support applications, customer applications, re-architecting infrastructure, business-process management middleware, and Web services. Examples include development and implementation of standardized international freight, warehouse and transportation management systems, RFID and KN Login's visibility, and monitoring and reporting capabilities. KN is committed of standardizing IT systems with a goal to create added value for customers through better coordination, integration, data quality and analytical capabilities. The Web-services are meant to improve improved end-to-end visibility and exception alerting.

Moving goods globally, from factory to destination, KN is able to match the physical flows with near-real-time information via KN Login on the status of inventory, shipments, orders and order lines down to the product ID / SKU level.

3.6.9 Domination of the chain

It is hard to claim that KN is a leader of a corridor, a specific one or any corridor. They are rather leaders of the logistical system that is based on the entity that all of their clients constitute. They have a strong influence in corridors, because through their system, immense

amount of shipments are transported all around the world. As long as their solutions meet their customers' requirements, they are quite free to change the existing corridors to new ones. There are naturally also binding aspects, but basically they are free. As an example, they could negotiate with Hupac and Volvo Logistics about starting or ending using corridors they provide[24].

The mechanism of usage of a corridor seems to be quite practical: KN uses a specific corridor as long as it in their point of view is the best solution. As soon as they find better models, they start to consider these in details. This also relates to new business areas. When they find out that some new areas - like China, CIS- countries and Central Asia - are booming, they start to seek competitive corridors to and from these countries:

> *A substantial growth in business was achieved, in particular, in traffic to and from the Commonwealth of Independent States (CIS) and Central Asian countries. Apart from the traditional transport corridors, business via the German ferry port of Mukran was expanded. The rapid establishment of a competence centre for CIS traffic in Berlin facilitated the efficient planning and implementation of integrated logistics solutions*[25].

KN is ready to develop corridors, if the business requires it. However, they let the others do the transport and management of the corridor:

> *Besides focusing on the development of intermodal transport the company also expanded its activities in European single-wagon traffic. On the basis of the closer cooperation between the carrier DB Logistics and Kuehne + Nagel which was agreed to at the beginning of 2007 new business programmes have been initiated for single-wagon traffic, mainly between Germany, Scandinavia, and Eastern Europe*[26].

Instead of establishing corridors, KN is developing networks. In these cases, the transport service can be organized with their own brand:

> *Since March 2007 Kuehne + Nagel has been represented with its own groupage network in the European overland transport market. 38 countries, five of which are covered by partner firms, are linked together by daily line-haul services. The strengthening of this network is one of the main objectives for 2008*[27].

The transport and logistics market in Europe is fragmented. The six biggest road freight forwarders' market share is totally less than 10 % of the whole[28].

---

24 This is reasoning of the writer

25 http://www.kn-portal.com/fileadmin/_public/documents/annualreports/2007/Kuehne+Nagel_2007_annual_report.pdf

26 http://www.kn-portal.com/fileadmin/_public/documents/annualreports/2007/Kuehne+Nagel_2007_annual_report.pdf

27 ttp://www.kn-portal.com/fileadmin/_public/documents/annualreports/2007/Kuehne+Nagel_2007_annual_report.pdf

28 Remco Rohaan, DHL (2008): Ciproc Conference

The following figure 29 illustrates the typical features of KN. The most visible features are their global network, emphasizing the client service and IT-support. Their service is not very differentiated from their competitors' and – we suppose – this is one reason, why they use a lot of unclear expressions and positive adjectives about their superiority in business. At the same time, they do not mention the fact that the transport service they are offering basically do not much differ from their competitors' services.

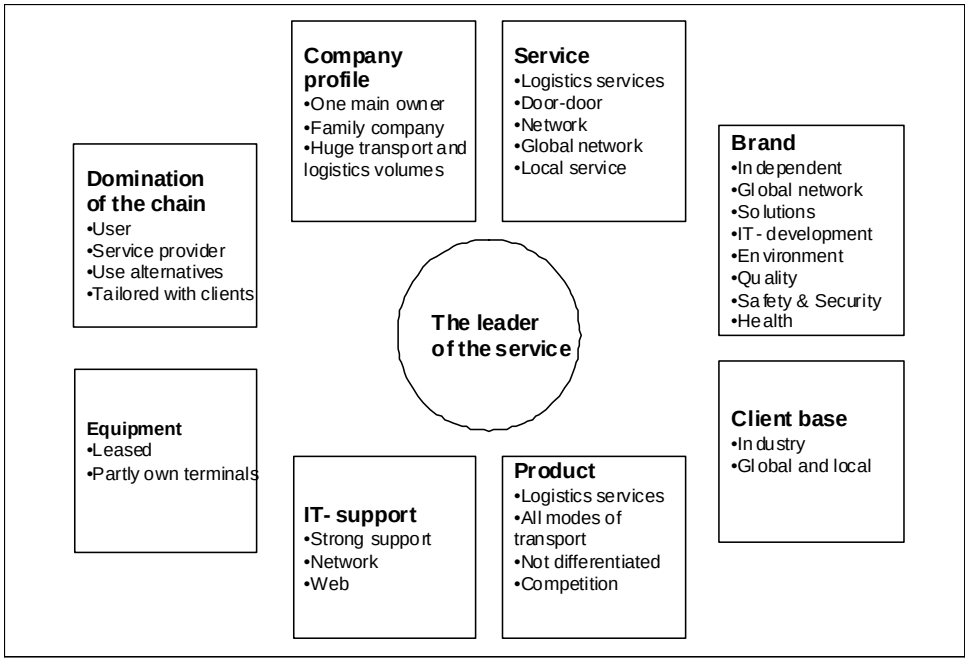


Figure 29. The factors of a leadership in multimodal transport, Case Kuehne + Nagel.

3.6.10 Conclusions

KN is hardly a leader of a corridor, a specific one or any corridor. They are rather leaders of the logistical system that is based on the entity that all of their clients constitute. They have a strong influence in corridors, because through their system, immense amount of shipments are transported all around the world. As long as their solutions meet their customers' requirements, they are quite free to change the existing corridors to new ones.

As the freight market is relatively fragmented in Europe[29], it can be assumed that scarcely any forwarding company (or 3PL- and 4PL-company) at the moment is a leader of a corridor. They utilize all the possible corridors, but are the users, not the leaders of them. They are playing the prisoner's dilemma: They need the clients, but as a matter of fact, the clients need them. On the other hand, the transporters need them, but actually, they need the transport companies.

It is important to note, that the company structure in logistics service sector is not at all uniform. The transport and forwarding are very seldom purely separated from each others. In almost every logistics provider company both of these parts can be found from their activities. For example, the brand Schenker is owned by DB, a big train operator. Schenker is

[29] Remco Rohaan, DHL (2008): Ciproc Conference

a competitor of KN. Another example is Hupac: Even though they are strictly a train operator, they do many services that remind of client service in a network

3.6.11 The privileges of the leader

From US experience we found that many intermodal corridors developed as a result of the emergence of a major freight participant, often a party other than the railroad. This corridor leader:

- Sets the service level for the corridor.
- Supported.
- Makes the agreement with the client (shipper / consignee).
- Partly supported. The freight forwarder usually makes the contract with the consignee. The corridor leader makes the contract with the forwarder, who is in this case the client.
- Collects the freight from the clients (or the main part of the freight).
- Partly supported. The freight forwarder usually collects the freight from the client. There are variations, but this is the most common case.
- Negotiates rates with the railroads.
- Supported.
- Credits the subcontractors their shares.
- Supported
- Carries the biggest economic risk in the corridor.
- Supported.

3.6.12 The evolution of Kuehne + Nagel business model

Our study presents four different types of business models in intermodal transport. The KN- case represents two alternative models, **Freight operator-3PL Model** and **3PL Model,** and the result suggests that the Freight operator-3PL Model as a most potential in today's cases. On the contrary, the usage of 3PL- model seems to be marginal.

The concentration to serve the clients in their different needs in global logistical networks, seem to be in conflict with managing one or many corridors. The transporters seem to think that they are looking for clients that need their transport services and are ready to exclude the others; the forwarders - KN - seem to think differently: they seem to be looking at clients needing logistics anywhere in the world and then they try to find the best solutions for them.

KN is about 130 years old company with staff about 54000 people. During the recent years, the company has grown a lot, mostly because of mergers. The direction for this growth has been towards more and more global networks. As transport corridors are quite local - even though they can be very long and international - and because of the conflict between transport service and global network service, it is difficult to propose that KN

would be interested in starting to lead existing and future corridors. However, the case study does not prove this reasoning. KN has already established a solid global network and their next step can be - but must not - concentrating to local corridors. Some hints of that can be seen: the cooperation with DB Logistics in Germany- Scandinavia and Germany-CIS- business. Today, when bank crisis influences also the logistics services, there might be good possibilities in capturing new markets.

Our studies concerning three-mode-corridors suggest a development of the leadership in a chain. It is presented that progressively the leadership of the chain proceed to 3PL or 4 PL companies, because of complexity of the service, as more and more new clients appear to the market. The unparallel logistical needs, individual it- challenges and cultural differences in separate countries vary, leading to a situation where a transport operator cannot serve all the clients in both ends of the corridor.

The KN- case does not support this progress. It either does not disprove it, but the trend seems to be that the transport service providers and logistics service providers concentrate in their core businesses, which, on the other hand have a lot of similarities, but on the other hand have a lot of differences. The most peculiar ones are the global network and client service for 3PL companies vs. local or regional transport services for transport operators.

A totally different presumption can be made from the progress of DB. They develop both the regional intermodal transport corridors (under the brand DB Logistics) and the world-wide 3PL- services (under the brand DB Schenker):

> ***Deutsche Bahn buys Largest Private Rail Company in Poland***[30]
>
> *(Berlin/Warsaw, January 30, 2009) Deutsche Bahn, Europe's largest freight railroad, is to acquire the logistics arm of the PCC corporate group.*
>
> ***DB Schenker - On land, on sea or in the air***[31]
>
> *DB Schenker combines all transport and logistic activities of Deutsche Bahn AG employing over 91,000 staff in 130 countries. With turnover of some 18 billion Euros, we are a leading company – both in Europe and worldwide.*

KN- case does directly support the suggested development phase of the leadership in a chain to 3PL or 4 PL companies. Because the development in some other forwarding companies is reversed, the conclusion is that the company representing 3PL operations does not alone explain the development. KN is mostly a private (family-) company and though only partly public, its reserves for big investments are restricted. Because the freight market is fragmented, the competition of market shares is still going on, restricting investments on specific corridors. The situation of Deutsche Bahn differs from KN. Being a traditional railway company they have diversified their operations to forwarding business. DB Schenker is a global logistics service provider and from this perspective they

---

30 http://www.deutschebahn.com/site/bahn/en/db__group/press/press__information/transport__logistics/schenker__train

31 http://www.schenker.fi/en-gb/index.html

have reached a position, where a 3PL company have had a natural development from a 3PL company to a leader of the different corridors their mother company is providing.

3.6.13 Who is the leader of the chain?

The study shows that KN is not the leader of the chain. This is mainly due to the fact; concentrate on global logistics and client service. According to KN, the leader is the main operator, for example Hupac in their corridors. Hupac restricts their service only to terminals and this allows KN to do their job with the clients without interference by Hupac. KN makes the agreements both with the clients and transport operator. By this arrangement all benefit. The client does not have to use time in organizing their transport operations in relatively disassembled rail market, the 3PL company can agree with the client the service and rates required, regardless of transport corridors. They can also agree with the operator the different requirements of the corridor so that they fit to most of their clients' needs. The operator benefits from the vast client base the 3PL companies are having. They do not have to agree customized solutions with different clients. This relieves the requirements of IT-solutions leaving them the challenges of rail operations, but without a vast group of clients located in different destination.

We conclude that in KN- case the leader of the corridor is a transport operator, but the leader of the clients is the 3PL-company. The structure is relatively strong, but as DB Logistics shows, it can be broken.

3.7 Discussion

Furthermore, we consider the risk factors of this company in the light of losing the leadership. This "fact" rouses a question: who takes the advantage *before* the corridor starts? We have seen cases, where the criteria for starting a new corridor exist, but the corridor has not started. Our interpretation is that the corridor is missing a leader. In this paper we show (1) that the 3 and 4 PL companies are the potential leaders after five years from the start, but (2) show that this actually is the reason, why "nobody" is ready to take the pioneer's role. These two results prove that the pioneers must be either big companies or multinational actors, like EU in Europe.

In the three- mode corridor, who should:

1. control (be the leader of) the transport chain?
2. carry the economic risk of - the whole chain (door-to- door)
3. carry the economic risk of - the pre- and/or end transports
4. carry the economic risk of - the corridor transports
5. collect the freight charges from the buyer/seller of the goods?
6. make the transport contract with the buyer/seller of the goods?
7. make the contract concerning the train operations?
8. be responsible for the service quality along the entire corridor?
9. be liable for cargo loss and/or damage in the transport chain?

A leader should have the following features:

- Ownership. Capitalization
- Structure of the group
- Independent company
- Clients are owners
- Clients are transporters
- Several clients meaning split. Not too strong ones
- Very limited -if any- end customers
- Owns the terminals
- Own the waggons and locomotives
- Integrated traction
- IT- support
- Advantage towards trucking
- Quality and the environment
- Network (Shuttle net)
- Strategy

It is not clear which of the models is best for a specific service corridor. Results from this study offer four hypotheses as to how the corridors might develop:

1) First, it might be possible that some big industries start the corridor as high trucking costs hinder the growth of their trade. These companies contact the potential Freight Operators and also negotiate the forward transport from the hubs to the destination. After this start, the second step could be that the Freight Operator needs backhaul transport to compensate the empty returns (wagons and containers). They perhaps negotiate the loads with the clients independently or with the help of intermediaries (this is how the IMCs developed in the US). As soon as the loads in both directions are in balance, the participants benefit from the decreasing freight costs and achieve an edge to their competitors. When the competitors learn about the new service, they join the route, but as soon as the quantities of the clients grow, the Freight Operator perhaps cannot provide the client service required. If so, this might open the channel to LSPs who start to act as the link between the operations and the clients.

2) A reverse evolution is also possible. It might be possible that a big wholesaler contacts its LSP and asks it to provide a more cost effective intermodal route. After this, the LSP plans the route and negotiates with the subcontractors all the details needed, including the Freight Operators for the rail part. When this plan is done, it can be assumed that soon the LSPs contact other large customers and market the corridor to them. If the rates and quality requirements meet their needs, the corridor can be tested and later on started. Further, as soon as the experience from the corridor is positive, it is evident that the traffic starts to progress. New companies join the route and more complex transport services are required.

3) A third scenario is that some, or all, of the models appear simultaneously.

4) The fourth scenario is that the corridor never starts. If so, the existing transport solutions are already provided so that there is no need to develop the corridor. A study on the prospective development of an entirely new service corridor can be found e.g. in Leviäkangas *et al* (2005).

4 POLICY STRATEGIES ANALYSIS

The first year analysis dealt with the intermodal policy in connection to the main intermodal flows in Europe. The focus was on intermodal corridors, financing of terminals, terminals in connection to ports, quality of terminals and national transport policy, based on national surveys performed by PROMIT Cluster 5.

The focus in policy analysis for the second year is the enlargement to the East. The cases deal with inland terminal (BILK), port terminal (Gdynia), national policy (Bulgaria) and intermodal rail connections to Asia, mainly the Trans Siberian Rail (TSR) connection.

Third year summarises the policy analysis and makes conclusions and recommendations based on all input.

4.1 Intermodal state-of-the art[32]

4.1.1 Intermodal development

Intermodal transports in EU, has got lots of attention during last decades. By adapting the guidelines for trans-European transport networks (TEN-T) and defining the Pan-European corridors, EU provides opportunity for new intermodal transport options including rail transport as part of the intermodal transport chain for reducing congestion and encourage intermodality in Europe. Historically, the era prior to the EU's rail revitalizing policy was naturally dominated by national, integrated carriers that managed their own customer interfaces and infrastructure. New management and logistics models began to shape the rail freight business and changed the old ways of doing business of railways. The railways had to be faster and more flexible as their customers became more aware of logistic costs. Also the change of production structures and produce altered that railways could not any more compete in growing transport markets. The haulage of cell phones, car parts etc. was not railways' traditional business. Levinson (2006, pp 264–278) gives a nice general coverage of this trend in international production-sharing and just-in-time logistics.

Containerization also changed this trend which the EU railways noticed. European railways, with their non-interoperable systems and lack of cross-border co-operation, stayed slightly behind in this process however. Also unitized cargo demanded economies of scale, the traditional strength of railways, but European railway system could not facilitate the growing demand. Long-haul, large-scale transport encountered problems of border-crossing procedures, locomotive changes, crew changes, and even re-loading the entire cargo (e.g. Musso, 2005). State-owned business entities did not have the proper management incentives or the culture of co-operation and partner-seeking.

However, some new European operators have captured niche markets, e.g. container business or specialized bulk business, whereas the old operators have in many EU member

32 Unitisation of freight transport in Europe, 2005. Statistics in focus. TRANSPORT. 20/2008. Eurostat.

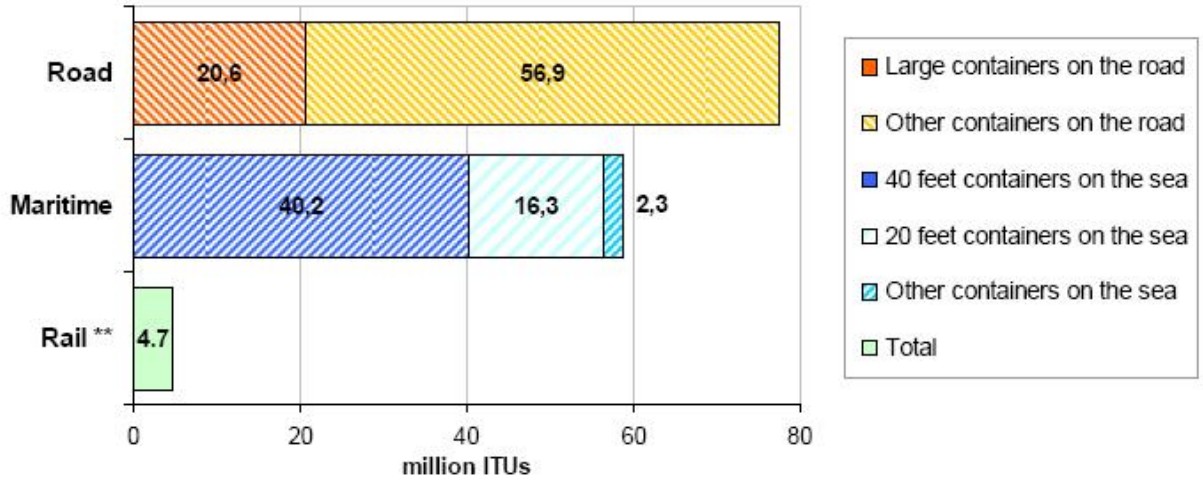
states tried to maintain their core customers and business protected. International operations have been facilitated by the European Infrastructure Managers (EIM), who allocates international train paths on a neutral basis for all operators. The problem still is that the procedure is complicated and not necessarily guaranteeing paths for many years ahead. This in turn means that new operators are facing an additional risk from the path allocation. A new business will require some years of operation to fully pay back all the efforts and investments made. Only a handful of new operators have been really successful (Spierings, 2006). Railway market is always dictated by the infrastructure and thus the access to several infrastructures, i.e. in different countries, means access to new markets too.

However, widening of the wholesale business is still scarce. In Finland, for example, the state-owned operator has established some co-operation with truck carriers but is ever more concentrating on big industrial customers. At the same time, a horizontal integration to trucking business similar to Germany has occurred in other EU countries. At least in Finland, Austria and France this has occurred during the last two decades. Sweden and Norway has also followed too the horizontal and geographical consolidation of freight business.

The European statistics of rail freight volumes development shows that the market share of rail has declined, even though a rough weighed average from statistics shows that during 1990–2003 the rail freight volumes in ton-kilometres has grown about 6% (Eurostat 2005). However, the international freight has increased more than national figures. In the share of goods the "miscellaneous" category is the largest (Eurostat 2005). Looking at the statistics as a whole, the intermodal business seems to be the one that in present business framework shows still some growth potential. Based on the statistics, the annualised growth of intermodal transport during the last years has been well over 10%, and in the Nordic countries over 20%.

4.1.2 Statistical picture

Eurostat statistics gives the following figures for unitisation of freight transport in Europe in 2005. Road, with 77.5 million ITUs carried in 2005, is the most important transport mode in unitised transport in Europe. Another large share of traffic is taken by maritime transport with 58.8 million ITUs while rail is considerably less with 4.7 million ITUs. The major part of unitised transport in the EU is performed on roads. Germany's rail and road transport performances of unitised cargo are more than double that of any other Member State. The rail share in unitisation is high on the North-South axis. Containers and swap bodies are by far the most important rail loading units. In several Member States, over 50% of the container traffic is accounted for by maritime transport (figure 30).



** EU-27 countries except: BG, DK, IE, FR, HU, MT, NL, RO, UK for rail and road transport. Maritime transport is overestimated.*

*** DE, EL: 2004 data*

Note: for inland waterways data not available

Figure 30. Intermodal Transport Units (ITUs) forwarded at EU-27 level*, by mode of transport, 2005

In order to evaluate the importance of unitised transport in total goods transport it is useful to have a look at their shares in the total tkm performed in 2005. Figure 31 shows these shares for rail goods transport. Norway is first among European countries with 37% whereas Spain is first in the EU with a share of 33%, closely followed by Germany, Italy and the Netherlands with shares between 27% and 29%. This group of countries seems to feature a developed level of containerisation on North-South axis, starting in Scandinavia and ending in Spain and Italy. For many other countries, often located at the EU's outer borders, this share is below 3%. In absolute terms, highest performances in unitised traffic expressed in tkm are registered in Germany (25.8 billion tkm), Italy (9.4), France (8.7), Spain (3.8), Sweden and Austria (3.7), accounting together for over 80% of the EU's performance.

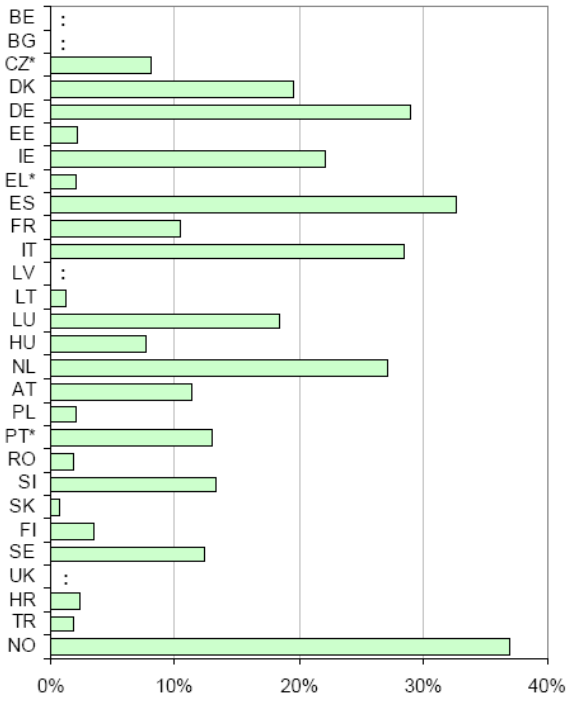


Figure 31. Share of unitisation in rail transport, as a percentage of the total number of tkm performed in rail goods transport, 2005

Duisburg on the Rhine as the largest inland port in the world. Looking at the Duisburg traffic flows, arrivals and dispatches measured in TEUs are nearly balanced for inland waterways (about 150 000 TEUs), i.e. transport over the Rhine. For outgoing transport (leaving the port of Duisburg) road and rail are balanced, whereas for the incoming transport, the rail flow is almost five times as high as the road flow.

4.2 PROMIT vision

4.2.1 Quantitative goal

PROMIT WP5, intermodal strategies and recommendations aims to develop a vision to stimulate the attractiveness, efficiency and quality of intermodal transport. In this context, a strategy is a long term plan of action designed to achieve a particular goal. A vision is regarded as a realistic, credible, attractive future for the intermodal transport.

Intermodal transport (road/rail, road/waterway, rail/waterway of trimodal combination) is natural part of the European transport system realising the idea of co-modality. In ten years the intermodal volumes will **double**, compared to the year 2007.

- Why yes – Existing drivers such as lead-time on long distances, reliability, cost efficiency (80 trucks vs one train), sustainability, especially CO2 efficiency by energy efficiency, good quality, transport policy.
- Why not – Existing barriers such as lead-time, costs, inflexibility, rigidity, unreliability, poor quality, transport policy.

4.2.2 Supportive organisations

EIRAC

The advisory body to the European Commission, EIRAC reflects all sectors of the intermodal industry: intermodal rail and road operators, terminal operators, logistic freight integrators, short sea shipping operators, ports, terminal handling, freight villages, and ICT equipment suppliers.

EIRAC's mission is to determine the vision, scope, and content of the Strategic Intermodal Research Agenda 2020 for Intermodal Transport as a step toward creation of a coordinated intermodal research strategy for Europe. EIRAC is focusing on achieving interoperability between modes with a view to the creation of a single European logistic system in line with the objectives set out in the White Paper on Common Transport Policy. EIRAC will also establish a business scenario for implementation.

International Union of Combined Road-Rail Transport Companies (UIRR)

The aim of tasks carried out by the UIRR link office is the promotion of combined transport, especially road and rail, in Europe. The objective of UIRR operators is to shift as many freight transports as possible from road to rail. In order to achieve this goal, they offer different products which are often developed in collaboration with their clients.

European Intermodal Association (EIA)

EIA’s mission is to develop, improve and promote sustainable intermodal mobility combining innovative rail, waterway, road, air and maritime transport solutions. EIA aims at using every mode of transport in the most optimal way by improving their links with each other (also called "co-modality").

4.2.3 Scenario building as a method for identifying alternative futures

Scenarios are stories or narratives that portray what might happen, why it might happen, and with what consequences. Scenarios can be very powerful tools to contemplate the range of possible futures that could develop from the influence of key drivers, events and issues. Scenario planning aims not to find the right or wrong answers. Instead, it aims to outline what is possible, what is probable and what is desirable and feasible.

Scenario building is one of the most used methods in Future Studies. Scenario building can be described as an instrument that aids decision-makers by providing a context for planning and programming, lowering the level of uncertainty and raising the level of knowledge, in relation to the consequences of actions, which have to be taken, or are going to be taken, in the present (Masini 1993).

There are several reasons to use scenarios, they e.g.

- offer a non-linear and dynamic way of thinking
- have the ability to deal with complexity, to consider multiple variables simultaneously, and with ‘different interpretation’ over time

- counteract the historical bias of quantitative forecasting approaches
- challenge assumptions.

Basically, scenarios can be in their orientation “exploratory” or “normative”. The former use data mainly taken from the present (and from the past) and follow the main lines in terms of the possibles and probables. They are mainly trend based scenarios and the data used are mainly quantitative. Normative scenarios describe the possible alternatives states of the system, “Images of the Future”, taking account of the desirables, hence the goals, of a system that lead to alternatives in action in the present (Masini 1993). Both orientations often make use of other tools, e.g. forecasting/ quantitative; expert opinion; and stake-holder opinions

Several scenario building methodologies have been developed during the past decades. Implementation procedure cited here is a common approach, developed by Schwartz (1996) and Ringland (2002):

Step 1: Identify the focal issue or decision

Step 2: Key forces in the local environment (microenvironment)

Step 3: Driving forces (macro environment)

Step 4: Rank by importance and uncertainty

Step 6: Fleshing out the scenarios

Step 7: Implications

Step 8: Selection of leading indicators and signposts

Step 9: Feed the scenarios back to those consulted

Step 10: Discuss the strategic options

Step 11: Agree the implementation plan

Step 12: Publicise the scenarios

As the main benefits of using scenarios one can name e.g.

- Thinking “outside in” – big, external forces
- Creating common language and understanding – working across disciplines, depart-ments etc
- Organisational alignment to vision
- Develop a group of people with ability to think strategically

PROMIT recommends to survey co-modal and intermodal futures in detail with e.g. fore-sight approaches presented here. This is needed in order to better understand the future, different choices and the role of co-modal and intermodal transport.

4.3 EU Transport Policy instruments[33]

The main aim of all EU policies is to create an integrated market, not only to dismantle internal barriers and provide conditions for fair trade, but also to give it many of the characteristics of an economic and monetary union. The EU transport policy is a component of this integration process. It does have a regulatory emphasis in the areas of working conditions and the environmental protection because of market implications. It also develops a framework for an integrated transport market not just finding solutions to internal barriers. It produces legal basis for the policy development of this area and cooperates with all member-states to implement EU regulations.

The White Paper on European Transport policy identified some 60 specific measures to be taken to enable the completion of an integrated market. In 2005 the Mid-term review concluded that these measures were still topical but the only change was the development of globalisation that changed the context in which the transport policy had to be defined. In the spirit of further policy development, the Mid-term review presents three more objectives for the future of the transport policy – develop, protect and innovate. The goal is to develop the European single Sky, the progressive opening-up of the rail transport and "balanced" competition.

To achieve its policy objectives, the Commission take specific actions in different areas. Such actions are the ongoing Action Programmes that contribute to the policy development. The first four action programmes have already taken place. Two more were presented in the second half of 2008 and the rest are expected to be announced. Other policy instruments are directives, regulations and decisions. In general, directives apply only to the member state to whom they are addressed and leave it to each state to achieve the objective by the means it regards most suitable. In contrast, EU Regulations have a broader meaning and are directly applicable in all member states. Similarly Decisions are binding in their entirety but applicable only to the state to whom they are addressed.

Through the policy actions, the Commission achieved a real impact on the transportation system, for example, the rail sector has been already opened-up, research projects have already established a system for internalising the external effects of transport services, three safety agencies in air, maritime and rail have been set up, and many other initiatives have been started. There is significant progress towards an integrated market and global governance. The White Papers laid down the basic principles of the EU transport policy development. This is their strength in the context of the whole single market development.

Nevertheless, the transport policy has its weaknesses. First, many changes in the legislation need to take place in order to enhance the recent shifts. Second, the structure of the agencies and authorities that implement this policy varies from country to country which leads to delays in its impact. Although the EU has shared responsibilities with the member-states in terms of transport policy instruments, the implementation mechanism seems to be

---

33 Based on V Bojkova GPI, I. Katsoulakos AUEB, EU Transport Policy Analysis: strengths and weaknesses. SKEMA Coordination Action "Sustainable Knowledge Platform for the European Maritime and Logistics Industry" Consolidation study draft 15th Dec 2008.

vague. Third, the White Paper formulates the need to attract private investments in the sector, however, neither of the policy documents or action programmes facilitates these expecting investment flows. There was some discussion on this issue and investment priorities in the Mid-term Review but without any recommendations for specific actions. Certainly some legislative changes will have to happen as well in order to stimulate the private investors.

In conclusion, the main recommendations tend to suggest a future development of the transport policy towards further integration, better implementation and an attractive investment mechanism.

4.4 European transport policy

The European Commission has adopted recently the orientation for the future EU transport policy. Mobility is essential for Europe's prosperity and for free movement of citizens. The negative impact of mobility in terms of energy use and environmental quality must be reduced. Next to actions foreseen in the 2001 White Paper, such as boosting rail and maritime connections for long distance freight transport, additional instruments will be needed to achieve these objectives. They include a freight logistics action plan; intelligent transport systems to make mobility greener and more efficient; a debate on how to change mobility of people in urban areas; an action plan to boost inland waterways; and an ambitious programme for green power in trucks and cars.

The orientations of the transport policy build upon the 2001 White Paper. They include actions to create a competitive European railway network through liberalisation, technological innovation and interoperability of equipment, investment in infrastructure and better market monitoring with a new scoreboard from 2007 onwards. Motorways of the sea and short sea shipping need to be developed with an increased emphasis on landward connections. The European ports policy, which was launched in 2007, has as one of its goals increased investment within ports and towards the hinterland.

Smart charging will contribute to a more rational use of infrastructure. The review announces a methodology as a basis for smart infrastructure charging by 2008. There is also a continuation of measures to improve security and safety in various modes. Measures must be stepped up to reach the target of halving the number of people killed on EU roads between 2001 and 2010. A European road safety day was organised from 2007 onwards to raise awareness and integrated road safety approach targeted vehicle design, infrastructure and driver behaviour. Protection of passenger rights must also be enhanced, most notably in all transport modes for people with limited mobility.

The instruments of the 2001 White Paper must be adapted to a new context of an enlarged Europe, rising petrol prices, Kyoto commitments and globalisation. A European sustainable mobility policy needs more policy tools to optimise the performance of each transport mode and their combined use. The Commission adopted a logistics action plan in 2007 in order to create better synergies between road, sea, rail and river, and integrate various transport modes in logistics chains. This will give the industry a competitive edge but also diminish the environmental impact per unit of freight.

The review puts an increased emphasis on intelligent transport systems. There is no reason why ships, trucks, cars and trains would not have the same sophisticated communication and navigation tools as aircrafts. Real-time management of traffic flows and capacity use as well as tracking will cut costs, improve environmental quality and improve security. Galileo will play a key role to promote new technologies.

Transport accounts for 30% of total energy consumption and 71% of total oil consumption in the EU. The road accounts for 60% of total oil consumption. In order to reduce oil dependence and make transport more sustainable, the Commission presented in 2007 a strategic technology plan for energy and will present in 2009 a major programme on green-powered vehicles.

Today's review calls for more ambitious actions to change mobility in Europe's urban areas. The Commission launched a debate on urban transport policy in 2007 through a Green Paper. The EU can play the role of a catalyst to encourage decision-makers to better tackle congestion, pollution and accidents with innovative actions. As part of the debate, a clear view is needed on what level of government is responsible for new actions.

Actions

The Commission plans on deploying a number of concrete actions. Among others these include:

a. Optimisation of existing transport modes

- An internal market review of road transport to ensure the proper functioning of the market, determine the role of SME's, and provide an analysis of the social elements involved (2006)
- Launch European ports policy (2007)
- Removal of technical barriers in rail transport to ensure interoperability between companies. Programme to promote rail freight corridors and prepare a review of the internal market in rail transport (2006), with a scoreboard for market performance of rail (2007)
- A review of air transport liberalisation measures, airport charges and capacity (2006)
- A mobilisation of all sources of infrastructure financing; multi-annual investment programme up to 2013 for Trans-European networks

c. Better transport solutions through new technologies

- Development of a freight transport logistics strategy, as well as the launch of a broad debate on possible preparation of an EU action plan for 2007
- Energy and transport: strategic technology plan for energy in 2007 and green propulsion programme for 2009
- Technology: RTD and support to market penetration, including big technology projects such as Galileo and ERTMS which should be implemented on certain corridors from 2009 onwards.
- Smart charging (basis for methodology by 2008)
- Major programme to bring intelligent road transport systems to market (2008)

4.5 National Policies

4.5.1 Survey results

The public sector can support the transport sector in many ways. The main tools are legislation, investments and financing. Legislative work in transport has concentrated on liberalisation and harmonisation, especially on the rail sector during the last years. Investments deal mostly with the infrastructure. Financing may be in the form of different supporting actions, R&D financing and subsidies. From the national inventory collected in cluster 5 during the first PROMIT year and updated during second and third year the following topics come up:

- Infrastructure
- R&D
- Services
- Environment
- Taxes
- Legislation
- Transport Policy.

There are quite few Short Sea Shipping topics in the documentation. The other observation is that commodity groups are not handled (except some limited cases). All support actions which are based on EU level legislation are omitted from this analysis.

Most support actions dealing with intermodal transport are directed to rail investments and connections, access to the railway system, intermodal terminals, handling equipment, inland waterway connections, IT systems (mostly waterborne).

Many national intermodal and combined transport R&D projects, pilots, consulting and feasibility studies have been supported. The aim has been to create new rail and waterborne transport services and support the development of new technologies.

Services include setting up of rolling-motorway services and intermodal and combined transport services. SMEs have also been taken into consideration. The aim more or less has been to shift freight from road to rail and waterways. A speciality has been the Dutch experiment on pallet transport by barge. Some examples:

Environmental interests concern replacement and retrofitting of diesel engines in inland navigation, CO_2-reduction and tax-relief programmes that give a direct fiscal advantage to companies that invest in environmental friendly equipment and renewable energy.

Typical measures of taxation are rail track price reduction, tax exemption in pre- and on-carriage and refunds for vehicles or boxes being used in combined transport.

Typical legislative measures are exemptions from weekend driving restrictions for pre- and end- haul carriers and exemptions from maximum weight.

Transport policy support deals with scanning modal shift potential, national or regional transport plans, national plans for logistics centres and freight villages, programs for developmental support for combined transport, development schemes for combined traffic,

logistics competence centres, integration of rail into European rail corridors and establishment of a Combined Transport Section in railways.

4.6 Intermodal Corridors

ISIC task F1[34], the identification of Pan-European corridors with the most intermodal potential, was based on an analysis that related the transport demand side and the intermodal supply side. Based on an evaluation of demand and supply, the most promising corridors for the promotion of intermodal transport were identified. They are the ones with the highest international transport demand and relatively low supply of intermodal transport. The analysis has led to the identification of the following 14 high potential corridors (Fig 32):

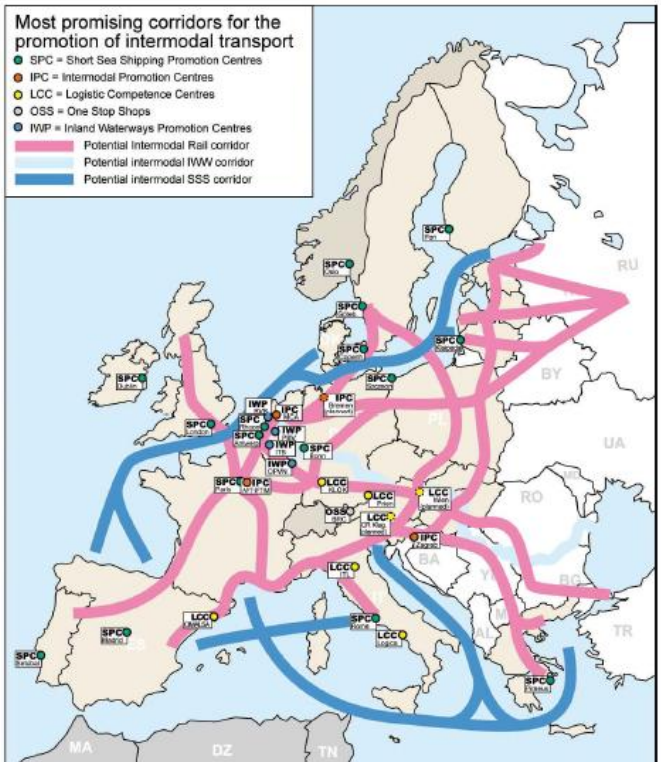


Figure 32. Intermodal transport corridors.

4.6.1 Case Switzerland

Swiss transport policy is based on clear aims for modal shift. Protection against negative effects due to heavy traffic includes measures such as transfer of transalpine freight transport from road to rail and denial of road capacity. There is an explicit modal shift target in traffic transfer act to reduce the number of heavy goods vehicles crossing the Alps by road to a maximum of 650000 per year up until 2009. The cross Alpine traffic in France and Austria are dominated by trucks, the share being 77% of total volume. In Switzerland this

34 http://ec.europa.eu/transport/logistics/consultations/2006_04_26/doc/2006_03_31_logistics_consultation_task_f_en.pdf

share is only 35%. The results of active modal shift policy are evident. The share of road transport is decreasing and the growth is in intermodal transport (Fig 33).

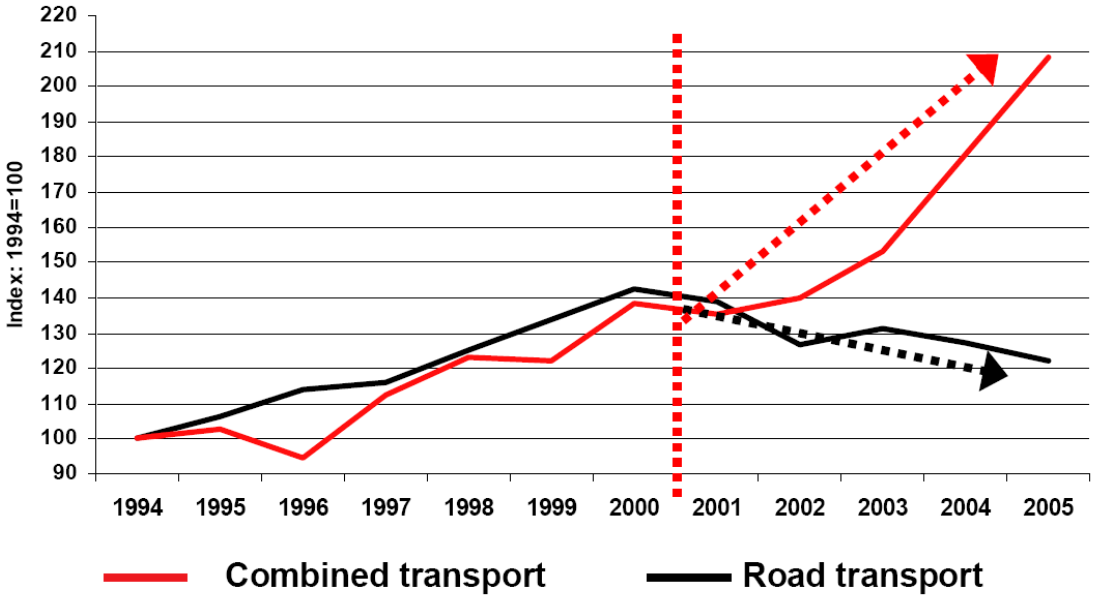


Figure 33. Progress of modal shift policy in Switzerland.

There are multiple measures underway to achieve the modal shift:

- Constitutional obligation
- Traffic transfer act
- Bilateral land transport agreement.

These measures include the user and polluter pays principle, more capacity and productivity, and added efficiency and quality through railway reform. Supporting measures are promoting intermodal transport and reducing rail infrastructure charges. A heavy vehicle fee is used on all roads in Switzerland. The fee is performance based related to distance, weight and emissions.

The total financial support has been about 200 million Euros. The amount of subsidies per shipment has a decreasing trend. Instruments to promote intermodal transport are

- Subsidies to combined transport
- Reduction of track access charges
- Investments in terminals for combined transport
- Investments on connecting lines
- Heavy vehicle inspections.

Intermodal transport helps attain the modal shift goal. Intermodal door-to-door services are not a public duty. There are no direct subsidies for intermodal door-to-door services but there are subsidies for combined transport on rail. Thus there is indirect support for intermodal door-to-door services by private operators. Combined rail transport is of importance for modal shift. Combined transport has grown and its share is more than 60 % of transalpine rail freight. This means more competition and less subsidy per shipment. Source: Marcus Liechti http://www.promit-project.net/

4.7 Intermodal terminals

4.7.1 Financing of terminals

There is no common view on financing of intermodal terminals at the European level. Every country has different financing systems. In Germany the financial aid for terminal construction has stimulated the implementation of new intermodal terminals. Intermodal terminals are not included in the TEN-networks today. In case the terminals will become part of the TEN-network, financial aid from the EU should be introduced as a part of the TEN financing policy.

German terminal policy

German scheme intends to encourage the development of combined transport by supporting the construction of new infrastructure and the introduction of innovative equipment. The scheme is financed from Germany's federal budget. Subsidies will be granted for the construction and extension of terminals of combined transport and the purchase of loading equipment for transhipment. This type of aid is aimed at reducing lacking capacity of terminals thereby fostering combined transport of German and transit traffic.

Terminal development is open to everyone with the same rules and services applying to terminal investments and operation. Anyone who wants can obtain public grants the same as the railways. The main conditions which must be satisfied are:

- No cannibalism (no other terminal nearby)
- Terminal operator holds rights to the estate
- Must operate on a non-discriminatory basis with equal access to all
- Economic plan
- Adequate business plan.

Subsidies can be up to 85% of the investment including land acquisition, necessary infrastructure, buildings, equipments and costs of planning. The intermodal terminal is treated as part of public infrastructure and thus a member state has no restrictions as to the method of financing. Public grants are also available for terminals because they enjoy the infrastructure privilege. A long standing principle is that terminals are evaluated only on economic terms (benefit – cost analysis) and not so much on financial aspects. Now Germany has a network of terminals with basically no capacity problems. There are many good SME business models in operation and intermodal transport is on the increase. Terminals are competitive and playing their part in shifting cargo from road to rail (for trips typically longer than 400–500 km).

In 2006 the available funds for construction of terminals were 81.6 million euros. The trend has been growing from the 90s. This has partly influenced the growth of combined transport both on road/rail and inland waterways (Fig 34). The scheme will be in place until 31 December 2011 with a budget of €115 million annually.

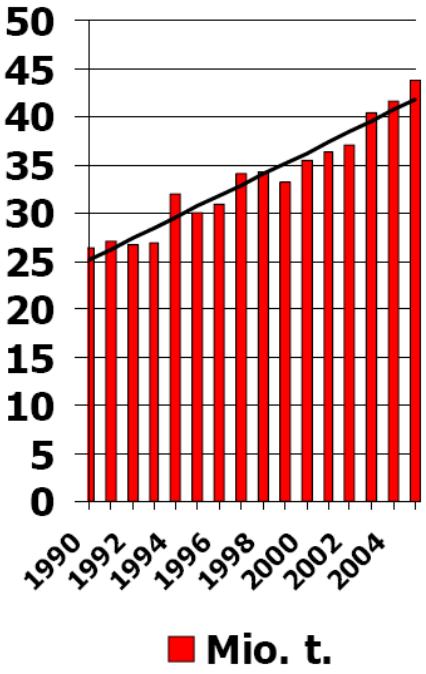


Figure 34. Development of combined transport in road/rail on Kombi-network2000+.

4.7.2 Case of intermodal terminals in close connection with ports

This case is based on two German terminals in the Baltic Sea; Hamburg-Waltersdorf Eurokombi and Lübeck Skandinavienkai Baltic Rail Gate. Service products of these terminals are quite simple, in general lifting of a box (container, trailer or swap-body) between road and rail. The charge for this service is about 20 euros. The terminal does not touch the cargo or does not even know the contents of the box. This is handled by the shipper and receiver. The amount of labour needed is small and everyone should be able to carry out different tasks. The cost of a "typical terminal" is 20 million euros. Only block trains are used. In case there is an empty wagon on the train, it goes empty to the destination. Wagons are not shunted, but block may be handled in the marshalling yard in Maschen.

The competitiveness of the train is based on a speed of 120-160 km/h and non-stop operations. Typical destinations are Verona, Basel, München and Köln. The schedule is tight. If the train is delayed more than 5 minutes, there will be discount in the price.

4.7.3 Quality of Intermodal Terminals

Intermodal terminals and transfer points are important interfaces within intermodal transport chains. The quality of services at terminals and the efficiency of terminal processes have a considerable influence on the quality and costs of the whole transport chain. Task D of ISIC[35] study deals with measures and instruments improving the quality and performance of intermodal terminals. A total number of 469 rail/road terminals, 145 seaports and

[35] http://www.trafikdage.dk/td/papers/papers06/Trafikdage-2006-517.pdf

111 IWW ports were selected as being relevant for the intermodal network (in total 725). Intermodal terminals and transfer points of European importance provide a complete European high performance intermodal network with international access.

In addition to the lists of terminals and ports of European importance a map was produced to visualise the distribution of the important intermodal nodes over Europe. On the rail/road terminal map the 274 'very important' and 'important' terminals plus the 42 terminals fulfilling the minimum density criteria are marked. On the IWW and seaport map a total of 215 intermodal ports (all 'very important' and 'important' ports) are included, thereof 98 IWW ports and 117 seaports.

4.8 Importance of ICT in Intermodal transport and transport policy

There are significant barriers in intermodal transport that can be solved by ICT, e.g. extensive discontinuities in the transport chain and discrepancies between modes and business, organisational and legal barriers imposed by the wide variety of freight transport actors and public authorities. The evolution in ICT is continuous and the solutions ICT provides to the intermodal transport freight community are constantly improving. However, there is still a great deal of work to be done and significant problems and obstacles to be confronted.

The major problems in intermodal transport stem from the series of difficulties arising from the need for interaction with many actors and the differences in the way each actor operates. These problems are:

- Different level of IT penetration: different stakeholders have adopted IT at different scales.
- Low compatibility of systems developed: each of the stakeholders involved in a project has its own philosophy, which is reflected in the final solution developed and thus, often limits its compatibility.
- Different standards: the fact that there are no homogenous standards in intermodal transport causes problems in developing an application applicable to the entire intermodal transport chain.
- Lack of data transmission interoperability: the lack of a common framework for data transmission, that often reflects the lack of willingness of the stakeholders to cooperate with each other, is an important barrier.
- Lack of systems integration: many of the systems developed cannot be integrated or their capabilities further extended by adding new features due to insufficient design and high cost.

A main challenge for the ICT sector in the intermodal transport is the implementation of open architectures in order to facilitate the interconnectivity between various applications and to enable the integration with future applications or modules developed. The interconnection of the applications used by different actors in the intermodal transport chain is of vital importance. The lack of standards is another problem to which ICT has to provide a more concrete solution. Therefore, there is need for interfaces that would interpret information given in different formats in a common, standardised way.

Priority ICT Cluster 3 topics are Intermodal terminals, intermodal networking, public authorities/freight transport networks, unified coding system, intermodal transport chains communication, information systems, harmonisation/ standardisation, intermodal transport Tracking & Tracing and GALILEO in intermodal transport.

4.9 Security

The 6th PROMIT Workshop on Successful Cooperative Intermodal Transport Strategies and ICT Systems took place in on May 2008. Conclusions from session "Successful intermodal security and policy":

4.9.1 Fighting Terrorism (mainly theme for politics)

Today is still unclear which (preferable global operating) party should take the lead for the challenge to enhance global supply chain security. Security is tightly bound to politics of single countries. Different approaches towards enhanced security seem not to go conform or exist in parallel. Mutual acceptance of security standards (ex. EC's AEO, TAPA's FSR-certified partner, US CBP's C-TPAT certification) should be the aim. Inventing additional security (i.e. processes, devices, checks) might change streams of cargo and today's supply chain processes (apart from security processes). The actual fear e.g. for a terminal operator is mainly not the invention of new processes, devices or checks, rather the possibility of knowing something unwanted could be found on the premises.

4.9.2 Fighting Theft (mainly theme for business)

Theft is the main issue for manufacturers, in particular for high value and unique goods. There are different measures on security depending on the goods transported. Thieves work trans-nationally today, omitted 'traditional' customs checks at EC-borders ease the border crossing but police still works nationally.

4.9.3 Legislation

Each invention has to go conform with multiple laws and regulations. For transnational trials sometimes state laws have to be changed. Additional authorities interfering existing processes rather decrease overall efficiency. Standardisation on basic security principles of the supply chain might increase efficiency. This could be independent of authorities if the transport business largely approves.

4.9.4 Cost

The end-consumer finally pays the bill. This has been the case of ISPS and will be the case for future inventions. Transaction charges for certain services (possibly depending on PPP) might pay additional requirements.

5 CONCLUSIONS

5.1 Market strategies

Cargo Domino shows that short distance intermodal traffic is possible and can realise sustainable logistics solutions. High system costs force it into a niche, unless it gives added value to the logistics chain. Short distance intermodal traffic is an add-on to the single wagon network and is therefore does not compete with the big intermodal operators. The added value of SBB Cargo is the intelligent linking of different contracted solutions with general solutions and its single wagon network. The experience gained is now being used for the expansion and management of SBB Cargo's international door-to-door network. The system uses a horizontal technique and needs dedicated boxes, trucks and wagons. The traffic uses existing infrastructure and the requirements are quite modest. Importantly, bulk and daily goods transport opens new possibilities for intermodal transport. The systems need financial support.

The **StoraEnso** case is a new intermodal system for paper reel and pallet deliveries. Their clients as well as ultimate customers, such as newspaper and magazine readers, demand environmentally friendly solutions. StoraEnso by itself has the cargo volumes needed. The innovative characteristics of the system are dedicated boxes, automated loading of boxes at mills, the loading system of boxes in terminals, and the fast horizontal loading and unloading operations of boxes in hubs.

Rail4Chem was initiated for customer demand. The state owned operator could not offer the service level needed. Also in this case the main actor had the volumes needed for start up of the intermodal service. The system is based on scheduled block trains and a hub system. Very significant cost and time savings (25%) were gained compared to previous services.

Distrivaart is an innovative pallet level solution. The system needs dedicated ships and fully automated loading and unloading of the ship. Development is still in progress. The main driver of the system is that inland waterways have high excess capacity. The system needs several participants in order to reach the volumes required for economic viability.

D2D and **GIFTS** shows the possibilities of ICT. In D2D the complexity of IT architectures and the effort needed in integration can be seen. A centralised information hub solution is a prerequisite. GIFTS show different type of solutions for intermodal communication and how to integrate SMEs into ICT networks.

CORY is a UK company transporting domestic and commercial waste on the Thames River. They have 7 tugs pulling 47 barges and the annual volume is 650,000 tonnes of waste per year. The company has invested in a number of areas to improve their services. The future of transporting waste on the Thames River appears to be secure, because it is sustainable and efficient method for moving waste across London. It is estimated that transporting this waste by river removes 100,000 heavy goods vehicle movements a year from London's highly congested roads, equivalent to 400 trips per day. London's streets are highly congested so using the centrally located River Thames is an attractive option in terms of reducing both direct and external transport costs.

Several rail-based shuttle services are currently in operation between countries in the **RE-ORIENT** Corridor and Western Europe, but no shuttle service is provided in the north-south direction of the Corridor. REORIENT developed business and management models for various service concepts. The complexity of the rail business and the great differences in potential participants' initial assets and financial situation make it infeasible to quantitatively evaluate generic business models. In the 3PL business model the 3PLs make arrangements with clients and subcontracts the rail freight operator. Support for the 3PL business model as the best model in increasing. Other models are 1) operator – 3PL model where the rail freight operator and 3PL share the business responsibility, 2) anchor customer where the freight operator makes direct agreements with clients and 3) agent model where the agents of the rail freight operators make agreements with clients. All these models are possible in practice. The REORIENT corridor is still waiting for realisation.

INTERFACE aimed at identifying and testing new ways to improve borders crossings terminals operations reducing customs waiting time, increasing safety, harmonising regulations and developing additional functions. One of the barriers in railway border crossings is the lack of functionality in electronic data interchange at terminal as well as at network level. The harmonisation of the Information Systems among the involved actors and the setting up also of a Central Database can significantly enhance the efficiency and reliability of data transmission. The specific solution to integrate the Information Systems between two Railway Undertakings of the two border countries and among them and Terminal Operators improved planning capabilities at terminal level and reduced the waiting times in terminal up to 30-40 minutes per train.

The **Viking train** offers a 1735 km long link for the Baltic Sea region in Eastern Europe to South-eastern Europe, Black Sea Region (Caucasus and Turkey) and beyond to Central Asia. The Viking train as a road-rail intermodal connection was designed as a Ro-Ro and a Lo-Lo transport solution. In 2007 40.066 TEUs were transported. The project was successful due to the strong political support, freight carriage management system, and co-operation. The main strength of the concept is the border-crossing one-stop-shop solution.

EUREWA covers the railroad corridors between major industrial centres of Western Europe and the BILK terminal at the southern suburban of Budapest. The central European terminals are connected to a wide-spread system of gateway trains which deliver loading units, coming from the Western sea-ports, Scandinavia, Spain or Germany into the system. Furthermore, various cities in Hungary have been connected to the service by antenna trains, such as Györ, Székesfehérvár, Zomba, and Pécs. The target of the project was to implement a block train service, connecting European industrial centres. EUREWA's success factors were a quality system, and funding. Between the partners, contractual agreements are used to determine the responsibilities. Contracts cover the punctuality of the connection, certain quality standards, penalties etc. However, the punctuality was up to 80% compared to road transport. This factor needs further development beyond the projects limits. The adequate pricing was, at least in part, possible due to the funding of the Marco-Polo-project funds.

The **Interporto Bologna** rail terminal manages 52.620 wagons a year, roughly 1.100 wagons a week or 190 trains a week. In 2007, 2.600.000 tonnes have been moved by road and 2.225.000 tonnes by rail. Interporto Bologna hosts roughly 100 transport and logistics companies. The terminal aims at real time exchange of information between actors, opportunity to trace the assets and track their status, reduction in the number of manoeuvres and

optimization of storage area and reduction of unnecessary handling movements. New software (T-Yard) was integrated to an existing software (T-MOVE). The T-MOVE is connected to the shunting operations. It handles information concerning train arrival, departure and composition. The software service is accessible by all the interested parties, such as ports, road companies, as well as manufacturing companies. Therefore the software manages and represents a support for the entire logistic chain as it also offers interface capacity. Through the web, maritime companies are able to receive information in the form of personalized codes. Whether the terminal management system reaches its goals or not, will be seen later. The system started to operate in 2007 and will be fully operational in January/February 2009.

The **HUPAC** group is a European wide intermodal operator. Its target is growing in the market with consequent extension of the network and optimizing intermodal operation. The adjustment from national to international integrated traction is tantamount to a revolution on the European rail landscape. Every railway partner had to acquire a Multi-System locomotive for the European electrical Network. The current change of locomotives at the borders had become unnecessary which has meant that the productivity of the traction has been improved. One railway only is responsible for the traction and is the only contact for this connection. Train, waybill and customs data currently sent to up to five different railway and customs offices can be co-ordinated in future via one interface. This saves money and time for everyone concerned. In 2006 612000 trucks could be shifted from the road to intermodal transport. In terms of IT-applications, HUPAC uses the system e-train (also e-Goal) (Fig. 5). HUPAC introduced its GPS based system e-train in 2006. Trains are equipped with a GPS sensor. So the positions of all trains are known. This data goes into a software platform called GOAL (Global Application for Logistics). GOAL is also connected to CESAR.

The in-depth strategic study shows that **HUPAC** has been able to establish a leader's role in the chain. It also seems that their position is rather solid. The reason for their position is a result of the concept they have established, which is an outcome from eight factors found: Company profile, service, brand, client base, product, It- support, equipment and domination of the chain. It seems like these factors together support their concept and guarantee a solid ground for the company's long time strategy. Their greatest structural risk is a consequence of their ownership. Two companies, out of their about 100 shareholders, together own a majority of the shares. There can be a risk that these companies change their strategies, which could lead to a deterioration of the existing structure. However, there are no observations of that. Generally, the study shows, that it is possible to maintain a leadership in a transport corridor during the decades. This provides that the structure of the network is properly constructed. The structure of the network and the roles and responsibilities should be parallel to the needs of the players.

Recognising the fact that **VOLVO**'s factories are "peripheral" in relation to customers, the company perceives a distance handicap compared to the competition. In peripheral regions there are few transport alternatives to choose from and these have typically low frequencies. On the other hand, transport efficiency is decisive to compensate for the distance handicap of the Volvo factories. In practice these factories have to pay transport costs twice, both for sourcing of material and for the finished products. The Volvo Logistics solution for transport between the factories and distribution centres comprises two elements. The rail operation, called the "8" (the physical shape of the network), operates two trains

per day in each direction: Olofström- Gothenburg-Olofström and Olofström/Umeå-Ghent-Olofström/Umeå. Volvo Logistics acts as the manager of the supply chains, which means that Volvo Logistics is informed by the factories and distribution centres as to what cargo is to be transported when. Volvo Logistics then interacts with Green Cargo who has the complete responsibility to organise transport of cargo from origin to destination. Transport between Gothenburg and Ghent is crucial to Volvo's operations. As a consequence, a back-up transport solution exists between the operations in Gothenburg and Ghent using the Short Sea Shipping operation EuroBridge offered by DFDS Tor Line. Volvo´s case is a good showcase for efficient intermodal solutions. The benefits lie in the reliability with is better than 95%, the solution is environmentally friendly and the solution is flexible and able to handle fluctuations in volumes.

Kuehne + Nagel (KN) have grown into one of the world's leading logistics providers with more than 54,000 employees. The global network, IT systems and high levels of service, have positioned them to increase the scope of their customer solutions and services. KN delivers end-to-end supply chain solutions for many major industries, including high-tech and consumer electronics, retail, fast-moving consumer goods, pharmaceutical/healthcare, industrial, chemical, aviation and automotive. Because of the client structure, KN actually is not too much dependent on one or few big clients. KN co-operates with the carriers even though some of them might be their competitors. They, for example, inform that they co-operate with DB Logistics, a mother company of Schenker. This train operator provides them with train services with wagons and other equipment. The KN service product resembles the 3PL- structure. It is hard to claim that KN is a leader of a corridor, a specific one or any corridor. They are rather leaders of the logistical system that is based on the entity that all of their clients constitute.

5.2 Policy strategies

5.2.1 National policies can influence

The Swiss transport policy is based on distinct objectives for modal shift and shows clearly the power of policy tools. Protection against negative effects due to heavy traffic includes measures such as transfer of transalpine freight transport from road to rail and denial of road capacity. There is an explicit modal shift target in the traffic transfer act; namely, to reduce the number of heavy goods vehicles crossing the Alps by road to a maximum of 650000 per year until 2009.

Intermodal terminals and transfer points are important interfaces within intermodal transport chains. The importance of terminals is analysed e.g. in ISIC and EUTP studies. There is no common view of financing of intermodal terminals at the European level. Every country has different financing systems. In Germany the financial aid for terminal construction has stimulated the implementation of new intermodal terminals and prerequisites for increased traffic and service. Intermodal terminals are not included in the TEN-networks today. In case the terminals will be a part of TEN-network, also financial aid from EU should be introduced as a part of TEN financing policy. Support for terminals can be up to 85% of the investment including land acquisition, necessary infrastructure, build-

ings, equipments and costs of planning. Another promoting trend is the integration of ports and intermodal terminals, based here on experience in northern Germany.

PROMIT cluster 5 collected extensive data on national transport policies supporting intermodality through infrastructure, R&D, services, environment, taxation, legislation and transport policy. This analysis shows the many strategies available to support sustainable transport.

- Most support actions dealing with intermodal transport are directed to rail investments and connections, access to the railway system, intermodal terminals, handling equipment, inland waterway connections, and IT systems (mostly waterborne).
- Many national intermodal and combined transport R&D projects, pilots, consulting and feasibility studies have been supported.
- Services include setting up of rolling-motorway services and intermodal and combined transport services. SMEs have also been taken into consideration. The aim, more or less, has been to shift freight from road to rail and waterways.
- Environmental interests concern replacement and retrofitting of diesel engines in inland navigation, CO2 reduction and tax-relief programmes that give a direct fiscal advantage to companies that invest in environmentally friendly equipment and renewable energy.
- Typical taxation measures are rail track price reduction, tax exemption in pre- and on-carriage, and refunds for vehicles or boxes being used in combined transport.
- Typical legislative measures are exemptions from weekend driving restrictions for pre- and end- haul carriers and exemptions from maximum weight.
- Transport policy support deals with many types of actions such as scanning modal shift potential, national or regional transport plans, national plans for logistics centres and freight villages, programs for developmental support for combined transport, development schemes for combined traffic, logistics competence centres, and integration of rail into European transport corridors.

The Hungarian government, in the frame of increasing the share of the combined transport, approved the **BILK** programme for the improvement of the Hungarian logistical service centre. The BILK combiterminal is about handling of accompanied and unaccompanied combined traffic in Budapest, in a modern logistic service centre. Main connections are to the ports in Hamburg. The planning and start up of a new and first bigger intermodal terminal in a country is a demanding task. A joint effort of different stakeholders and also a backup from government is needed in order to promote and speed up the start-up. The case of BILK shows that intermodal connections combined with a new terminal can bring up new business opportunities. BILK is an excellent benchmark for those countries where the intermodal transport is still in development phase.

The combined transport operations are still only a marginal part of railway operations in **Poland**. Transit position of Poland enables to join in the development of freight traffic in both east-west and north-south directions, thereby to stimulate development of rail and maritime connections. The port of Gdynia is a good example of an intermodal port hub development. The unitised traffic has increased very fast and totalled 460000 TEUs in 2006. Most of the units were containers. The number of swap bodies has been decreasing during

the last years. The growth and concentration in container traffic gives better possibilities to develop intermodal solutions in Poland.

Key process, seen from the **Bulgaria**n transport policy point of view, is in integration of transport system of Bulgaria to the transport systems of the Member States of the European Union. Bulgaria will respond adequately to the increasing interest of foreign companies toward logistics market. Creating of intermodal terminals has been started. There are planned two intermodal terminals in the seaports Varna and Burgas - every with capacity of 500 000 TEU. The challenge for Bulgaria is the development path for successful intermodal development.

RailTrace is a working consignment and wagon tracking and tracing system operated over the Internet. The concept serves customer requirements for visibility in intermodal transports covering all modes. RailTrace is based on existing messages and no extra manual input or technical devises are needed. By receiving information about the incoming goods before the physical arrival of the goods railway companies may send pre-arrival notices to their customers, logistics service providers and other partners and this way better serve the whole logistic chain. Information received in advance reduces the turnaround time on the border crossing places, making it possible to allocate resources and pre-plan operations.

5.2.2 Europe – Asia connections

There are good perspectives for rail cargo in the transport to East. Some examples of the drivers are European congested ports, new terminals in East, investor's interests eastwards and truck driver protection in EU. The competitive factor for rail transport is the end to end connectivity. In case there is a need for a maritime link in the transport chain, the competitive advantage is lost compared to direct maritime transport. This is also a barrier to the idea to collect volumes on regional basis e.g. in Scandinavian Countries. There is also space for new concepts and new routes (Korea, Vietnam).

Production is moving eastward as well as logistics service providers (LSPs) and distribution centres (DCs). Between China and Europe two container transfers between wagons are needed. Transport price defines the interests of logistics service providers. Price level compared to sea route is important. Some clear advantages of rail connection are the bigger container weights compared to maritime transport and faster transit time.

There are several rail corridors between Europe and Asia: TSR, Trans China and TRACECA. At the moment the capacity of TSR is about 1 million TEU /year. The traffic on TSR via Far-Eastern ports was 621 000 TEU in 2007. Most traffic is Russian import and export. The transit traffic has almost ended after the increase in prices. Reliability or uncertaintity of the TSR service (schedules) is one of the key barriers at the moment. There must be trust on the service. Tracing in TSR is working. Also security is good, no thefts have happened during last seven years. TSR is not competing with the sea route, it is more a supplementing service. Technical feasibility of TSR is in order and plans for improvement exist. Management of the corridors must be improved as well as more transparency is needed in order to attract customers. Service providers have to solve the question on how to bring in the volumes.

Working rail services between Europe and Asia exist. Far East Landbridge is offering the service between Asia and Central Europe. Polar Logistics is offering services between China and Finland. There are several rail services between Europe and Russia / Kazakstan.

Traffic is very unbalanced as 70% of the containers go empty from Europe to China. Development is needed on the areas of customs clearance, e-messaging, monitoring and control, schedules and timetables. Transit time is a very broad concept and calculated in many different ways. 14 days rail transport time can be 36 days for final customer. Russian customs is opening sealed transit containers which is against customs procedures. CCTT proposed a joint task force approach for the TSR development. All parties from the supply chain should participate to rebuild the transit business.

5.3 Consolidated recommendations

5.3.1 Business

Business models

Enhance cooperation, it is key to secure volumes and to reduce costs along the transport chain

In the new, developing transport corridors the start up of the services is a challenge. The formulation of the business model is of importance. Somebody must take the management of the business which is not self evident in existing supply chains management practices. Conflicts can also be resolved by clear agreement on responsibilities by implementing the business model. Introduce service level agreements on responsibilities & quality levels

For an intermodal solution it is important to have a steady transport volume. Investments in equipment are so high that the utilization level of the equipment must be high enough to make the rail undertaking or shipping line profitable. Utilization rate must be high, but it is not necessary that the volume is being provided by one big anchor customer.

When setting up intermodal service initial losses are often made. A critical success factor is the time required to start making profit. Shippers using the service can immediately benefit in terms of transport cost savings.

The most important performance indicators are cost/price, lead time, lead time variability, frequency of service, shipment compatibility and theft/damages. Often the indicators are cost of service, frequency and reliability. To measure the performance of an intermodal initiative it is important to make them comparable with road shipments, thus increasing transparency and showing the advantages of intermodal transport.

ICT

New IT solutions are desired on many areas of intermodal services such as management, tracking & tracing, planning and scheduling. Examples are managing the fluctuations in volumes and to obtain flexibility in the system. The main key features of a successful IT

solution are the modularity and expandability, allowing new services and applications to be integrated, open source approaches and protected accesses and data.

The actual implementation and performance of the IT systems depend also ICT acceptance by its potential users, a positive attitude towards collaboration rather than competition among the intermodal transport chain actors, aspects regarding access and privacy of information.

Go towards co-operative systems. More cooperation among different transport partners is needed; trust creation.

Integration of systems and robust solutions on different levels are needed. Be simple; fast development, core functionalities, simple application. Use de-facto standards instead of waiting for “official” standards. Implement and integrate tracking and tracing & status monitoring systems and technologies. Web based solutions reach the SMEs. Adapt one-stop-shop and single windows solutions. End-users must be included in the development

Share information with other actors to increase visibility and real time data along the supply chain. ICT transport chain manager / integrator is needed

Operation and services

Competitive edge for an operator in European rail freight business covering several countries with interoperable technology and personnel is a key to success. When expanding the current rail service, for instance by developing integrator services and outsourcing traction, relations change. New interests and competition with customers or collaborators can arise. Unreliability of intermodal choices and lack of services can be solved by organising a back-up for the services. BASF, IKEA, Volvo and Coca-Cola Norway are good benchmarks.

Awareness for intermodal measures is needed to increase the efficiency of intermodal processes and new intermodal services. Intermodal services are co-operative services. Consider intermodal options and Best Practices, taking into account also adaptations in the logistics processes. Intensify cooperation between the actors along the chain and along corridors. Be open for innovations which are more sustainable. Invest in infrastructure and equipment which is compatible with intermodal transport. Transhipment technology is still the focus towards efficiency in intermodal transport chains

5.3.2 Policy

Both business as well as intermodal transport policy needs visions, more clear and measurable objectives and also tools for follow-up. Improvement lies also in the monitoring and learn from worst-practices (why unsuccessful), which is not politically popular but important.

Many different types of national support measures were found in PROMIT surveys. EU should support national efforts. More detailed analysis of these instruments and evaluation of results is needed.

We should learn from the impact of national programmes, but the member states should support these projects. In addition, the EU should support programs of European importance, thus strengthening the national support programs (complementary).

The Swiss and German policies show the power of national instruments. The question is the willingness of decision makers to support sustainable transport solutions. In Switzerland the focus is modal shift, in Germany support to intermodal terminals.

EU policy actions should speed up the development of east-west intermodal preconditions. There are good results from Hungary which can be benchmarked. We recommend support actions for the main national intermodal hubs, as well as support to international intermodal rail / waterway connections to these hubs.

Direct rail connections between Europe and Asia are a competition factor for the European industries. We recommend a bottleneck analysis of intermodal choices and a programme for further development in co-operation with CCTT, Coordinating Council on Transsiberian Transportation. Rail connections provide alternatives for shippers thus improving the competitiveness of Europe and increases market share of rail transport and might relieve the congestion problems in seaports.

Distances to dumping sites are growing as the places have to move further from city centres. Rail and waterways offer intermodal solutions, thus decreasing truck traffic. Bigger cities should monitor their dumping place policy with a view to intermodal solutions.

Development of interoperable information technology and systems is still at the initial phase and a huge potential lies in new solutions and their implementation. More public support is needed to boost the systems integration and user acceptance. The role of governments is to achieve interoperability by setting common standards and improve Business to Government information exchange.

In many PROMIT case studies the whole project or a part of it has been partly funded by EU. The majority of the cases are framework programme funded projects. On the user/service provider side there is a strong demand for this funding instrument. EU funded projects are often selected since the information about these cases are easily accessible, not always because they are the real 'best practices'. For programs that support the start up of a new intermodal service the funding is needed to cover the risks and help to overcome these risks and become economically viable.

Public support is needed for innovative measures to improve operation and services for intermodal transport. Support for a framework for harmonised quality agreements and benchmarking is also needed.

Support and promotion is needed for standardisation and improvement of interoperability relating to used technologies and information exchange. Focus areas are integration of SMEs into intermodal ICT networks, coordination between intermodal actors and ICT providers and promotion of one-stop-shop / single windows solutions.

PROMIT recommends to survey co-modal and intermodal futures in detail with e.g. foresight approaches presented here. This is needed in order to better understand the future, different choices and the role of co-modal and intermodal transport.

6 REFERENCES

Abel, Heiko et al. 2005. ISIC Final Report Task D: Improving Quality of Intermodal Terminals". Subtask D4 Standardisation relating to terminals. European Commission, Zürich. 34 p.

Afuah A. Tucci, CL. Internet business models and strategies. 2nd ed. Text and cases. McGraw-Hill Higher Education. 2002.

Bontekoning, Y (2006). Hub exchange operations in intermodal hub-and-spoke networks – comparison of the performances of four types of rail-rail exchange facilities. PhD thesis. Technical University of Delft.

EIRAC. 2005. Strategic intermodal research agenda 2020. European Intermodal Research Advisory Council. 35 p.

EIRAC. 2006. EIRAC Implementation Plan 2020, Realisation of Improvements. European Intermodal Research Advisory Council. Brussels. 72 p.

ELA. 2004. Differentiation for Performance. Results of the Fifth Quinquennial European Logistics Study "Excellence in Logistics 2003/2004". European Logistics Association, A.T. Kearney Management Consultants. Hamburg. 36 p.

European Commission. 2006. Communication from the Commission to the Council and the European Parliament. Keep Europe moving – Sustainable mobility for our continent, Mid-term review of the European Commission´s 2001 Transport White Paper. Brussels. 29 s.

European Commission. 2006. Communication from the Commission to the Council, the European Parliament, the European economic and social committee and the committee of the regions. Freight Transport Logistics in Europe – the key to sustainable mobility. Brussels. 10 p.

European Commission. 2006. Consultation Document on Logistics for Promoting Freight Intermodality. 14 p.

European Commission. 2007. Communication from the Commission. Freight Transport Action Plan.12 p.

European Intermodal Association (EIA). 2006. Bringing modes together for a common future. A decade and more of experience. Brussels. 19 p.

Heikkilä, Jussi. Supply and demand chain management. Lecture at Helsinki University of technology.2004.

INTERFACE. Public Final Report.

Lehtinen, Jarkko; Bask, Anu; Leviäkangas, Pekka, Analysis of business models for three-mode intermodal transport. Proceedings of the Nordic Logistics Research Network NO-FOMA Conference, Helsinki, 4 - 6 Jun. 2008 (2008), 16 p.

Levinson, M (2006). How the Shipping Container Made the World Smaller and the World Economy Bigger. Princeton University Press.

Leviäkangas et al. Pol-Corridor - Assessment of Demand for the Blue Shuttle Train's Services in North and South European Markets. , 2005. VTT, Espoo. 72 p. VTT Research Notes : 2293. http://www.vtt.fi/inf/pdf/tiedotteet/2005/T2293.pdf

Liechti Markus. The role of intermodal transport in the Swiss Freight Transport Policy. 13 November 2006 Promit Workshop.

Masini, E. (1993) Why Future Studies? Grey Seal. London.

Musso, Antonio (ed.) (2005). Interface – Public Final Report. November 21st, 2005, 5th Framework Programme Shared Cost Project, contract number GRD-2000-30249 SI2.339954

Osterwalder, A (2004). The Business Model Ontology - A Proposition in a Design Science Approach. PhD thesis, University of Lausanne.

Spierings, R (2006). Freight operators see good prospects if the MARKET is truly open. Railway Gazette International, Jan 2006, 162, pp 31-33.

Rappa, M. Managing the Digital Enterprise. Business models in the web. http://digitalenterprise.org/models/models.html

Ringland, G. (2002) Scenarios in Public Policy. John Wiley & Sons Ltd. UK.

REORIET. Implementing Change in the European Railway System. Selected Findings from REORIENT. 2007.

Schwartz, P. (1996) The Art of the Long View: Planning for the Future in an Uncertain World. New York: Currency Doubleday.

Schultz, Leo. Combined Freight Transport. 13 November 2006 Promit Workshop.
Spierings, R (2006). Freight operators see good prospects if the MARKET is truly open. Railway Gazette International, Jan 2006, 162, pp 31-33.

Trip, JJ, and Bontekoning, Y (2002) Integration of small freight flows in the intermodal transport system. Journal of Transport Geography 10, 2002, pp 221-229.
UIRR (2006). Report 2005. UIRR.

Vold, A. et al. (2007), " Implications of New Management and Business Models for Rail Operators and IM Companies" REORIENT WP 6, Deliverable 6.2; Implementing Change in the European Railway System; European Commission, Sixth Framework Programme.

Year 1

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
1	Vos Logistics, Modal shift and floating stocks	Vos Logistics optimises the transport from production sites in Germany, The Netherlands and Spain to customer sites in Italy by modal shift and using vendor managed inventory system.	1	Road haulage, short-sea shipping and Rail transport	Test period mid 2001, full implementation and acceptance 2002. This solution is still operational and successful.	Information exchange and an innovative new technique for loading and unloading granulates in the standard 40ft containers enable intermodal transport which lowers costs and contributes to sustainability. Vos Logistics is involved in inventory management by planning and controlling stock levels at the different sites and underway.
2	Ikea Rail AB	Daily service by rail from Älmhult in the province of Småland in Sweden to Duisberg in the Ruhr area of Germany through Denmark, a distance more than 1000km	1	Rail	Start of operation June, 2002; ended January 2004, service is now taken over by the Dutch company Van Dieren Maritime	Using sale and leaseback railcars, and rented locomotives and co-operating with rail companies of different counties it is possible to realize an international over 1000 km rail transport and avoid traffic jams and road tax.
3	Ewals Cargo	Daily door-to-door intermodal railway transport under full control of Ewals Cargo. Pre and end haulage partly by third parties. Hired railway service with DLC (Belgium), BLS (Switzerland) and FNC (Italy); and terminals of Genk harbour (Belgium) and Novara Broschetto (Italy)	1	Rail/ road	Started 1999, new collaboration partner 2004 with a new service. 2006: 5 trains per week (about 24 hours transport time).	Quality can be improved without increasing costs by intermodal transport, logistics integration (one stop shopping by Ewans and using Genk logistics centre) and using optimal loading units enabling combination of light and heavy freight
4	Nike, multimodal optimization through an inland terminal and rail access	The facility of Nike is located in Meerhout, Belgium. Incoming goods are transported by full truckloads from Zaventem airport and inland waterway container ships from the port of Antwerp. Outgoing goods are transported in containers by rail to the United Kingdom. In the future there will be more flows by rail transport.	1	Inland waterways/ rail/ road	2003-2005 evaluation of best practices and demonstration projects. The continuation was decided 2006	Use sustainable transport solutions which reduces CO^2 emission by using full truckloads, inland waterway container ships and container transport by rail
5	OverNight Express	Transportation of goods by the OverNightExpress (ONE) passenger service from Amsterdam to Milan. Combined train for passengers, fresh produce and foodstuffs and other time-critical cargo.	1	Rail	Started may 2000, ended October 2001	To create a European network of fast, frequent and reliable train connections for time-critical cargo, the cargo was transported in passenger trains.

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
6	Rhinecontainer, Producing inland waterway services	RHINECONTAINER maintains regular scheduled Container Barge Services between the seaports of the Benelux and the various Rhine ports.	1	Inland waterway	In operation since 1978	Offer reliable services (JIT)
7	Waterslag	The Waterslag project aims at making the best possible use of the capacity of small waterways, encourage a modal shift to inland shipping, enhance the value of small waterways as sites for industrial activities, strengthen connections between main ports and interior regions and promote innovation in transport and logistics.	1	Inland waterways	The project started 01/2006 and ended 05/2008	Inland vessels could transport twice as much cargo if they used pushed barges that comply with all applicable technical requirements and can pass through locks on their own. That would make goods transport by water a more attractive option and reduce its cost, which would benefit mobility, the economy and the environment.
8	Venlo Trade Port (Transaction Modal Shift-program (TMS))	The program has given financial support for two projects in Venlo. One is a modal shift project aimed at a shift from maritime haulage from road to rail. The other project focused on shipper cooperation by combining freight for inland distribution.	1	Modal shift from road to rail and cooperation amongst shippers	Start 2001, execution 2001 - 2002	Reductions of road kilometres by modal shift and cooperation amongst shippers
9	GILDANET Global Integrated transport Logistics DAta NETwork	The GILDANET project focuses on the evolution, extension and consolidation of the older GILDA / TRANSLOGNET systems, prototypes developed under the INTERREG IIC Programme as a widely accessible IT support solution for the information and document exchanges among authorities and operators of the intermodal transport.	3	Sea-rail (plus road)	Started 10/2002 and ended 10/2005	The accuracy and rapidity of information exchange and the increase of openness and interoperability can be improved with an open, transnational and intermodal platform with the most relevant technological and business standards and codifications
10	PARCELCALL (An Open Architecture for Intelligent Tracing Solutions in Transport and Logistics)	ParcelCall develops and verifies an open architecture for intelligent tracking and tracing in transport and logistics. New network technologies are combined with advanced sensors and innovative service engineering.	3	All	Started 01/2000 and ended 12/2001	Simple, inexpensive, easily accessible, scalable, reliable and secure system focusing on interoperability, open interfaces, and standardisation in order to allow seamless tracking and tracing across the entire logistics and transport chain
11	GLORIA (Gnss & LOran-c in Road and Rail Applications)	The emphasis of GLORIA was on the development of hybrid navigation units to be installed in road and rail vehicles, integrating navigation signals from different sources. The aim was to find the optimised combination of signal sources for different transport applications with improved navigation performance at reasonable costs.	3	Rail/ road	Started 09/2000 and ended 10/2002	Combining GNSS with the existing terrestrial LORAN-C position determination system improves the market penetration of positioning services

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
12	F-MAN (Rail Car Asset Management)	This project aimed at improving the sustainability of rail freight transport and the competitiveness of Railway Cargo Operators (RCOs), including the new Rail Undertakings. The original main objective of F-MAN was to provide the RCOs with innovative tools to control their international wagon fleet, and to enhance the productivity of wagons.	3	Rail	Started 10/2001 and ended 03/2004	By means of using IT the productivity of wagons and the quality of the service can be improved to raise the market share and competitiveness of rail freight transport.
13	Also Danube (Advanced Logistic Solutions for Danube Waterway)	The main aim of the project is the development of a CSL-DB (Common Source Logistics Data Base) as a part of the development program to be used by the parties in the logistics chain of inland waterways (specifically on the Danube river network).	3	River-borne traffic	Started 05/2000 and ended 05/2003	By the development of a CSL-DB (Common Source Logistics Data Base) statistical, actual and real-time traffic information linkes to the RIS (river information system) can be passed on to the various actors in the supply chain which improves efficiency
14	COMPRIS (Consortium Operational Management Platform River Information Services)	The COMPRIS business case aims at linking traffic information from various traffic information sources – traffic centres, lock centres, reporting systems, inland ECDIS, etc. – to freight planning systems. The traffic information and the freight transport information should be exchanged in an automatic way. Information can be retrieved by the different categories of users, authorities, skippers, shippers, VTS operators, lock operators, customs.	3	Inland waterways	Started 09/2002 and ended 08/2005	Linking RIS and traffic information from various traffic information and exchanging it in an automatic way improves traffic safety, efficiency, planning and value added services
15	MIRTO	This project aimed at designing and implementing state of the art telematics solutions for the automatic monitoring of cargo/vehicles in the context of Hellenic Railways Organisation (HRO), Thessaloniki Port Authority (ThPA) and Heraklion Port Authority (HePA) operations, which are major representatives of the Greek transport industry.	3	Sea and rail	Started 01/2004 and ended 12/2005	By an integrated telematics system, including an open e-freight communication platform, organisations and their partners/clients can optimise their business processes by accelerating operations and increasing accuracy. Also the competitiveness of alternative modes (sea, rail) can be increased.
16	GIFTS (Global Intermodal Freight Transport System)	The fundamental aim of the GIFTS project is to develop and demonstrate an infrastructure which can act as a “one-stop-shop” to users within the intermodal freight transport industry. This is achieved by designing and developing, for the project pilot cases, a fully Integrated Operational Platform for the use of systems that manage door-to-door freight transport in an intermodal as well as unimodal sense.	3	Rail, Sea, Road	Started 09/2001 and ended 08/2004	GIFTS offers greatly improved real-time information with all the typical benefits related to it (improved planning, monitoring and security, and reduction in inventory and lead time etc.) to large user groups because of open access and low cost services

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
17	Container Terminal Altenwerder (CTA)	Objective was to increase productivity by 30 to 50% compared to a conventional container terminal through a very high degree of automation and innovative software solutions.	4	Deep sea/short sea shipping with road and rail container networks	Operational since 2002	In order to keep up with growing volumes and to compete with rival ports, a new IT concept was developed to integrate complex operations and communication processes.
18	ACTS (Abroll Container Transport System)	ACTS is a horizontal load transfer system from road vehicle to rail. It requires no fixed terminal installations, and can be operated at any railway line or siding positioned beside a 10 metre wide roadway.	4	Road/rail container transhipment	tested in 1984 and commercially introduced in 1987	The ACTS system makes intermodal rail transport more attractive for shorter distance regional operations, makes the rail freight network more accessible and improves efficiency
19	Cargo Domino, door to door transport by road and rail	Cargo Domino is a new transport concept in combined service offered by the Swiss railway operator SBB Cargo. This intermodal transport is based on vehicle related horizontal transhipment. The system was developed by SBB Cargo with focus on consumer goods, raw materials and bulk ware.	4	Road/rail	Started 2002	Flexible horizontal transhipment facility increases the transfer from road to rail in medium distance inland transports, which optimizes the economic and ecological balance of logistics.
20	AlpFRail: Adriazug	Adriazug was developed to offer rail access for companies in the regions Bavaria and Salzburg to the Mediterranean sea ports (Triest and Koper). Target market are container transport, carrying load from the Bavaria and Salzburg region to Asia.	4	Container transport rail/road	2007	By exploiting capacity reserves in the existing network for intermodal transport, a reliable and faster transport can be realized with better access and competitive price.
21	BRAVO Brenner Rail Freight Action Strategy Aimed At Achieving A Sustainable Increase Of Intermodal Transport Volume By Enhancing Quality, Efficiency And System Technologies	The Brenner Corridor from Munich to Verona (448km) is one of the mostly used European freight corridors both by road and rail, which is transiting the sensitive Alpine region. BRAVO will lay foundations for achieving a significant and sustainable increase in intermodal volume on the Brenner corridor and BRAVO is designed as a blueprint applicable to other European corridors.	4	Rail	Started 05/2005 and ended 04/2007	The project was successful because of focussing on full interoperability between the involved countries and profound quality management and customer satisfaction.
22	Gleisanschluss Ruhr	The project focused on supporting the consignors of the Ruhr region in Germany. Project included the stimulation of the rail transport and hence to contribute to the renaissance of rail cargo from and to the region.	4	Rail, road and inland water transport	Started early 2005 and ended early 2006. Restart planned for May 2007	To increase rail cargo, an internet platform was created, which aimed at providing a complete set of information, including all harbours, sidings, rail operators, rail affine logistic service providers and supporting organisations of the region. The platform was new and comprehensive, and links to other initiatives were included.

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
23	Graz-Duisburg – Express	The aim of the project was to shift goods from road to rail between the cities of Graz (Austria) and Duisburg (Germany) and create long-term cooperation and sustainable position for rail transport in this corridor	4	Rail, road	Started 2003 and ended 2006	In order to shift goods from road to rail a new company was founded to carry out transport and services.
24	AlpFRail: TrailerTrain	Large truck flows are operating between Bavaria and Triest. A complete train from Triest to Nürnberg of unaccompanied trailers is to be implemented. The approach is to set up a seamless services without waiting times in the sea port terminal and optimising the lead time to the destination area. Customs will take place in Nürnberg.	4	Rail/road trailer transport	2007	For a successful implementation five possibilities for the transhipment of trailers were analysed. In addition to time savings the users benefit from cost reduction too.
25	POLZUG GmbH	The objective was to connect by rail the northern German seaports of Hamburg and Bremerhaven with the seven most important economic centres in Poland and further on with many other regions.	4	Rail/road	founded 1991	By own rolling stock, terminals and customs clearance agencies, and a direct connection to the seven important Polish economic centres Polzug can offer fast, reliable and cost effective transport with good availability.
26	Ostwind	Increasing freight demand to Russia requires development in freight transport. The objective was to have a connection Berlin-Moscow with freight trains (block train and intermodal train) with a fast connection (about 3 days) which is one of the driver for intermodal transport connection.	4	Rail/road	Mid 90ies	Political willingness and economic interest on both sides were the main drivers for the system. The system is functional due to standardisation, interoperability, IT applications, one-stop-shopping etc.
27	InHoTra Interoperable Intermodal Horizontal Transhipment	InHoTra target was to develop transhipment equipment for horizontal transfer and include this into European standardisation process, such equipment must serve in functions and areas where vertical transhipment does not create satisfactory solutions	4	Intermodal rail/road	2000 - 2003 (42 month)	Scientific research has concentrated on a market research on all existing and invented horizontal transhipment technologies with the last 25-30 years, the feasible rail operation system and the assessment of the developed technologies. Three horizontal transhipment test facilities have been built and tested in Austria, Hungary and Switzerland. All the prototypes designed within the project are in operation.

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
28	Samskip Multimodal Container Logistics	Samskip aims to provide its door/door and quay/quay customers with an optimum transport service based on a wide range of equipment and a network of shortsea routes within chosen European markets.	4	Intermodal: short sea shipping, inland waterway shipping, rail and road	founded 1990	The objectives were reached by a new management structure and new management tools. Then share capital was increased and sold to new investors. Since then, Samskip has experienced constant growth.

Year 2

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
29	Cory Environmental	A UK company transporting domestic and commercial waste on the River Thames. They have 7 tugs pulling 47 barges and the annual volume is 650,000 tonnes of waste per year. The company has invested in a number of areas to improve their services.	1	River (Thames) /Road	In operation	The future of transporting waste on the River Thames appears to be secure, because it is sustainable and efficient method for moving waste across London. It also reduces waste collection vehicle mileage by road substantially.
30	SINGER project - Slovenian Intermodal Gateway to European Rail	The SINGER project is a modal shift action to transfer traffic from road to rail. The main goal is to create an international network of fast and reliable unaccompanied services with Slovenia as gateway country between West and Central/Eastern European countries.	1	Rail/Road	In operation for the second year	To reach the goal electronic documentation using a standard format was implemented, project partners improved their computer systems related to timetables and online booking, and formed a partnership to develop, realise and operate rail services for international combined transport. This business model is transferable to other relevant European transport actors.
31	The cooperation between Salerno Container Terminal (SCT) and Nola Interporto showing the potentiality of a very efficient case of logistic system in Italy.	The main objectives of the project is to grant a central role of railway service for transport in Campania, to increase modal shift in the use of rail transport and to contribute new logistic system in Campania region.	1	Rail/Road/Maritime	The service in operation since September 2007.	Investments in infrastructure and development of the Gate Allocation System, which is a simple and efficient system for movement and allocation of all types of containers, took place in SCT. Interport of Nola is the only highly concentrated Italian "hub" which can attract all types of goods and carriers. The link between the two nodes is relatively short and available by road and by rail.

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
32	Coca-Cola Drikker AS	Coca-Cola Drikker AS is responsible for sale, production and distribution of Coca-Cola in Norway. It is the largest supplier of non-alcoholic beverages in Norway. The main objectives of this case are to describe how Coca-Cola company serves the warehouse in Tromso that supplies the northern par of Norway with products from its main production plant in Oslo.	1	Rail/Road/Maritime	The services are fully implemented and in operation	After the new structure of productions and bottling, logistics distribution needed restructuring. The modes used are mainly ship or ship combined to rail transport. Long haul is used for hurried transportation.
33	BILK Combiterminal	BILK terminal is the main intermodal centre of Budapest. The objective is to develop the terminal in two phases so the capacity of the terminal can be increased.	1	Road/Rail	The first development phase has been in operation since 2003 and the second one will be soon accomplished	A lot of innovative, electric solutions have been used in the development process. The use of the Kalmar loading machines is innovative both from the point of view of the informatics and of the electronics. Also the terminal controlling system was introduced, an electronic data connection is used with the partners, and there is an XML connection in the Container Depot.
34	Port Feeder Barge	The Port Feeder Barge is a very manoeuvrable self-propelled both-direction pontoon equipped with an own crane for container handling by itself. It helps to ease container port operation by making container transport and transshipment inside the port more economical and cost efficiency, taking over container haulage within the port and reducing feeder vessel shifting.	1	Rail/Road/SSS/Inland waterways	The service has been planned since 2003/2004, but the beginning is still unknown	Transport problems can be solved between different terminals within a port. The waiting time for inland vessels can be reduced for better inland navigation services. Addressed to ports with problems in hinterland transport and haulage of containers within the port.
35	CroBIT - Cross Border Information Technology	CroBIT is a new system that gives the railways a tool to track consignments and calculate ETAs for their traffic throughout Europe. The objective is to develop, test and evaluate many kind of solutions for improving service reliability and new technical systems.	3, 4	Rail	The project ended in year 2005	Service reliability is now surpassing pricing as the most important customer criteria for choosing a particular mode of transport. The CroBIT system provides railways a toolset to achieve better visibility, enhanced service reliability and customer service.
36	MOCONT/MOCONT II - Monitoring the yard in CONtainer Terminals	The project deals with telematics application to intermodal transport, with particular care to the management of container terminals. MOCONT aims at providing terminal operators with precise knowledge of the container positioning in the yard. MOCONT II aims at the assessment of the MOCONT concept.	3, 2	Rail/Road/Maritime	In operation	The MOCONT concept represents a good example of an ICT implementation that can readily improve the productivity of a terminal.

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
37	CESAR I&II / CESAR INFORMATION SERVICE - Co-operative European system for advanced information redistribution	The objectives of the projects are to make intermodal transport in Europe more attractive by reducing the technical barriers, performing a harmonisation of information exchange both between combined transport operators and between operators and customers.	3, 1, 4, 5	Rail/Road	The CESAR platform has been implemented and is in operation	CESAR represents a clear success story concerning the possibility of an EU-sponsored research project to originate a new business and have a permanent impact on a specific market.
38	SESTANTE - Strumenti Telematici per la Sicurezza a l'Efficienza Documentale della Catena Logistica di Porti e Interporti	SESTANTE wants to operate at the level of data and services sharing between local communities, which need to be integrated with other national and international communities. One of the main objective is to increase the whole interoperability and intermodality of the freight logistic chain.	3, 4	RO-RO/Maritime	The project is fully implemented and the applications have been used for a pilot period	The project succeeded in laying down a communication chain between the single user components and the principal centers of the intermodal chain which simplified particularly the operative interactions and the document exchange processes amongst the institutional bodies and the operators of the whole logistic chain.
39	RailTrace	RailTrace is a consignment, wagon and open messaging tracking and tracing system over the Internet. Its objectives are on-line exception reporting, to increase railway's competitiveness against other modes of transport and more reliable East-West rail transportation.	3, 4	Rail/Road/Maritime	In operation since December 2000	The concept serves customer requirements for visibility in intermodal transports covering all modes and integrating both consignment and wagon information. RailTrace enables control of wagon and consignment movements, based on existing messages. No extra manual input or technical devises are not needed.
40	POL-CORRIDOR	One of the important parts of the Pol-Corridor project was to outline the IT service architecture in order to design guidelines for implementation of information systems, the rules for information exchange between the Pol-Corridor stakeholders, and the management of functional interfaces. An important task was to determine how currently available IT systems could serve this intermodal transport corridor.	3, 1, 4	Rail/Road/Maritime	POL-CORRIDOR and follow-up research Reorient have been completed. The implementation process continues.	This project learned that US intermodal experiences are extremely important and that infrastructure issues must be solved. Long term paths are important. These experiences can be used in other intermodal corridor projects.
41	INTEGRATED TMS - APS	The integrated TMS-APS software determines the most cost-efficient load and route for a container or trailer across various modes. The integrated system takes into account capacity of equipment, departure times of trains and ferries, location of equipment, nearest cleaning station, etc.	3, 4	Rail/Road/Maritime	The project is still in motion	Potentially TMS-APS integration can lead to many benefits, such as cost reduction, profit optimization, customer service etc. However, it is still too early to draw conclusions already.

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
42	SPIN (Southamton Port Information Network) / VBS (vehicle booking system)	The main aim of SPIN is to provide an efficient electronic, e-port, facility to create a streamlined system and a paperless environment. It is claimed to be one of the most advanced port networks in the world. VBS smooth the supply chain and produce a more even workload throughout the day. It also aims to reduce the misuse of bookings and to maximize resources.	3, 4, 5	Rail/Road/Maritime	In operation	SPIN is a well-established network of the various actors involved in the port's activities. It is designed to allow paperless communication and transactions and is now viewed as a vital part of the port's day-to-day functioning.
43	M-TRADE	The main goal is to explore and promote GNSS (EGNOS /Galileo) use in Freight Multimodal Transport.	3	Rail/Road/SSS/ Maritime	Demonstration	In the first stage a critical analysis was performed, which included a comprehensive survey and evaluation of the GNSS applications in the combined transport. Later in the implementation stage M-TRADE uses a demonstration to assess and validate the impacts and differentiators of EGNOS and GALILEO use. The last stage performs the assessment of the results gathered during the demonstrations for generating recommendations & guidelines towards a successful introduction of GNSS.
44	INTERFACE	The project scientific research objective is to improve the interoperability of the transport networks at terminals at the border crossings (inside EU and between EU and CEECs) in order to overcome the technical and operational barriers.	3, 4	Rail/Road	In operation	Functionality of EDI at terminal and network level, timetable reliability, effectiveness of technical and commercial inspections and providing customer oriented innovative services
45	PORT INFOLINK	Optimization of the processes in the transport chains that run through the port of Rotterdam by means of on-line information and communication services to boost the efficiency levels of customers. This leads to cost reductions, quality improvement and user-friendliness.	3	Rail/Road/SSS/ Maritime	In operation	As long as no true EDI or XML-standards exists which could facilitate the exchange of information, a Port Community System like Port infolink helps to overcome the problems related to the exchange of information between these partners
46	HUPAC - Shuttle network with international integrated traction on transalpine corridors	The HUPAC group is a European wide intermodal operator. Its target is growing in the market with consequent extension of the network and optimizing intermodal operation.	4, 1, 3	Rail/Road	In operation	The main innovation of the approach are integrated traction on cross border intermodal operation and services, consequent shuttle system and consequent long term strategy of HUPAC to increase intermodal transport.

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
47	TransRussiaExpress	The specific targets of TransRussiaExpress were providing a fast and reliable connection from Germany to Russia for intermodal SSS transport and safety for carrying valuable goods.	4, 1	SSS	In operation	The early positioning in a developing transport market will enable a strong position in the competition transport market. Using of existing infrastructure and good hinterland connections are essential for all SSS operators.
48	ITA-BEL Express	The project address the flows South-North and North-South from Italy to UK. The main target is the shift from road to rail indesit freight transport directed to the UK.	4, 1, 2	Rail/Road/SSS	In operation	The main innovation of the approach is the direct involvement of a productive company. It is possible to build up an international D2D services collaborating directly with the industry in order to understand their needs.
49	Shunting Improvement at Interporto Bologna	The project targets are to increase the efficiency of the shunting process, to optimize the information flow between different actors involved in intermodal transport, to develop core IT services following an international approach and try to convey results of implementation of new IT services to actors/partners.	4, 3	Rail	The approach is implemented partially. The final release is foreseen by the end of 2008.	One very interesting aspect of this project is the very positive experience that a terminal operator had with the implementation to ICT solutions. Such success stories can be used to show-case the potential benefits of ICT and help in the wider adoption of such solutions.
50	Volvo logistics cooperation using intermodal transport	When starting the activities, Volvo had premium transport and the logistics solutions were sustainable. However, the cost was not optimal and the environmental impact could be reduced. Therefore this new solution needed to be more cost effective, reliable and sustainable and also increase capacity as well as provide a potential for further development.	4	Rail/SSS	In operation	In order to reach the goals, Volvo Logistics reorganized the transport between the factories and distribution centres, uses a SSS back-up transport solution, and improved transparency among operators.

Year 3

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
51	COSMA Container Operation System for Management and Administration	The aim of the COSMA software system is to support the user for fulfilling his daily tasks at container terminal management, also in small and medium-sized enterprises.	3	Rail/ road/ vessel (inland navigation, deep sea, short sea shipping)	2004 (last software version dated June 2007)	COSMA is a modular system. It is built on a fixed kernel offering basic functionality. This flexible basic principle allows adding new functionality or modify existing modules easily. In addition customers pay for used and adapted components only which makes the solution affordable also for small and medium-sized enterprises.
52	E-train Hupac	Hupac wanted to be independent of railway companies for getting information about how their trains run and allowing them to be informed about any incident that may have an impact on the punctuality of their trains. The main targets for Hupac are: - Receiving high value qualitative information in real time without having to make costly enquiries with the various rail companies; - E-train automates manual processes and frees resources, to the benefit of the customers of Hupac.	3	Rail	June 2008	E-train manages transport information in real time provided by a GPS train control system and coordinates all phases of intermodal traffic from the departure to the arrival. The GPS location via satellite requires energy, which in e-train is sourced by equipping the units with long life batteries.
53	EUREWA - EUROPEAN INTERMODAL RAIL SERVING THE EAST WEST AXIS GERMANY-HUNGARY	The target of the project was to implement a block train service, connecting European industrial centres (with hubs in Germany and Austria) with the BLK terminal in Hungary (Budapest) that is competitive towards road transport in terms of quality of the transport, e.g. punctuality and security of the service, and overall costs of the transport. The aim was to shift transport from road to rail on the east-west-axis, causing environmental and social advantages.	3	Rail and road	Started 2004 and ended 2006	A working train connection in a less developed east-west-axis succeeded due to a quality system between partners via contracts that is determined by the punctuality of the service and the adequate pricing due to the funding of the Marco-Polo-project funds.
54	Terminal Management at Interporto Bologna	The terminal is located in a strategically important node of the terrestrial transportation network. It has following objectives : •Real time exchange of information between actors involved in terminal operation •Opportunity to trace the assets and track their status within the terminal during any stage in terminal operation resulting in more efficiency; •Reduction in the number of manoeuvres required to move an asset (-15%); •Optimization of storage area and reduction of unnecessary handling movements (-12%).		Road/rail intermodal	2007, fully operational in 01-02/2009	For a better terminal management a new software (T-Yard) was integrated to an existing software (T-MOVE), which is connected to the shunting operations. The T-Yard system uses advanced instruments for planning and supervising the terminal. Graphical techniques provide support to the operator for yard management. The system controls in real time, the terminal operability, sends instructions to operational nodes and keeps the information regarding the flow of containers.

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies
55	Shortsea XML	Shortsea XML project, funded by the EU Marco Polo programme, supports a network of shippers, carriers, ports, intermediaries and IT providers who are working together to develop the new standard. The aim is to reduce administration and costs and therefore encourage more freight to transfer from road to shortsea shipping.	3	Short sea shipping	Duration 2 years, ended 09/2008	The objectives can be achieved by a standardised messages based on XML technology which is cheaper and more flexible that other more established platforms and is generally present in most software applications. It has also good availability and it is easy to use. Shortsea XML is not intended to replace the more heavy weight applications (such as EDIFACT) but to operate in tandem with them.
56	DZRS : Duisburg – Zeebrugge Shuttle	The aim of the project was to establish a frequent running rail shuttle service between Belgium and Germany to carry intermodal loadings units such as ISO containers, swap bodies and European intermodal loading units between the seaport of Zeebrugge and the inland terminal of DIT in Duisburg.	7	Rail/road	Started 10/2006, duration 3 years	Regular shuttle train with a price range comparable to road transport and a punctuality that is acceptable was achieved by flexibility. Flexibility refers to a greater stock of available railcars and a bigger planning staff, along with IT-solutions. The surplus costs of the flexible approach are covered by the funding of the Marco Polo project.
57	Pact Euronet, Phases I and II	Because of a notable increase of transport flows between Germany and Italy, accompanied by a growing demand for transport services in both directions, new block trains were planned and introduced by the Kombiverkehr KG (Germany) and Chemat SpA. (Italy). In order to be competitive to road transport, efficient capacity utilisation was identified as essential for the rail part of the intermodal connection.	12	Road/rail	Phase I 10/2000- 09/2001 Phase II 01/2001- 12/2002	To improve the capacity utilisation within the train service, a software programme was developed to help calculate and enforce the efficiency in the follow-up of trains. The “Capacity Management Software” (CMS) concentrated on tightening the transport net between transports, thereby increasing the number and punctuality of trains in the rail transport net.
58	PORTNET - Networking for the Intraregional Co-operation of Baltic Sea Ports and the Promotion of their Multi-Modal Hinterland and Feeder Connections	The main objective of PORT-NET was to achieve within the participating port communities and beyond a better understanding of the factors which describe a suitable organisation, appropriate operational structures and capacities and an optimal regional integration of ports. Sub-objectives were to increase quality of port services and to encourage cost efficient and environmentally friendly maritime transportation and hinterland structures.		Maritime, multimodal, passengers public transport	Started 3/2005 and ended 12/2007	The objectives were achieved by combining business and policy levels and through a conjoint decision and the involvement of private actors in the decisions.

EIA awards

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies	Year, Arguments
59	B-CARGO / IFB	NARCON stands for 'National Rail Container Network'. The concept provides daily national A/B rail connections between the Port of Antwerp (Mainhub) and inland terminals. NARCON binds the different players (railways, terminals, intermodal operator, ports, stevedores,...) in a reliable and intermodal transport chain.	4,1	Rail, road, and barge	In operation since 2004	Detailed cost analyses, market studies on potential traffic flows and discussions with potential customers led to a well defined commercial concept with competitive rates. The Belgian Government decided to support the development of domestic intermodal transport by providing financial means. In the Narcon-concept IFB acts as intermodal operator, buying the global traction package from B-Cargo, and selling an all-in service to the different inland terminals.	2006 Positive railway answer to the growing intermodal transport needs Great service and flexibility
60	INTERMODAL BLOCK TRAIN OPERATION BETWEEN COLOGNE/GERMANY AND FORD OTOSAN TURKEY	Ford Otosan Kocaeli plant in Turkey receives 85 % of total import materials from the consolidation centre located in Cologne, Germany. The materials which are collected in Cologne are either being loaded on the train or truck according to the requirement of the production at that time. In 2005 , Ford Otosan imported 56 % of its total material from Europe by block trains and the objective was to increase block train transport. A ferry transportation is required to cross Bosphorus in Turkey and a road transportation is needed between Kocaeli terminal and the plant.		Rail, road, ferry	Transit Connect was launched in 2002 and Transit Export in 2004.	The solution was successful due to : - lower transportation costs of intermodal transport - effective cube utilization in swapbodies - well designed transhipment - infrastructural changes at the arrival station - investment in needed equipment : swapbodies, lowbed wagons, special trailer chassis, special handling equipment	2006
61	Equipment Management System STINNES AG	Stinnes Intermodal belongs to DB Logistics, Deutsche Bahn AG's transport and logistics division. Equipment Management System (EMS) is an IT system for the efficient control of equipment for combined transport. Due to the variety of wagon types and designs, and the special requirements of individual transport orders regarding wagon composition, wagon provision is complex. The target of using EMS was to increase productivity 5% annually, and improve customer satisfaction and quality.		Combined transport (rail, road)		The objectives were achieved by EMS due to the interplay of several functions and following aspects : - Automation of scheduling - Automation of provision fulfillment - Stock status in real-time - Fleet management for third parties - Improving the management process.	2006

Nb.	Project inventory	Short description	Clusters covered	Modes used	Status	Strategies	Year, Arguments
62	RODER & UN Ro-Ro Group of Companies	RODER IKT. ISL. (RODER) is an economic enterprise for the purpose of developing and further enhancing combined transport and short sea shipping services in Turkey. UN Ro-Ro Group of Companies are service providers in the field of Short Sea Shipping with the purpose of transshipping Heavy Goods Vehicles (HGV's) from Turkey to Europe through the ports of Turkey and Trieste – Italy.	4	Short sea shipping, road, rail	RODER was founded in Nov. 2001, UN Ro-Ro Inc. was formed in 1994.	Just in Time transport : intermodal solution is much faster than a road transportation in this corridor. Schedules are frequent and reliable. In order to enable the quick return of the vehicle, an interoperable freight management system is created. Compared to the road transport this intermodal solution reduced customs formalities, road user charges and taxes, and other operational savings and advantages.	2005 An innovative approach for sustainable intermodal transport
63	Outokumpu Stainless	Outokumpu needed to transport vast quantities of semi-manufactured steel between Sheffield (England) and Avesta (Sweden) mills. A SteelBridge solution was created to fulfil the needs. The New SteelBridge started the concept later in Tornio (Finland) and Degerfors (Sweden). Transportation required a rail-sea system with minimum lead-times and daily frequency. It also had to be fast, safe, reliable with a reasonable cost.		Rail, sea	SteelBridge started 2001 and the New SteelBridge 2005.	The major issue was to eliminate delays and costs at the interfaces between the modalities. The solution was a multi-modal unit, capable of carrying slab and coil, which can be easily transferred from rail to vessel and vice versa.	2005
64	SolVin Italia Railway Intermodal Operations SIRIO	In 1998, the Solvay PVC production plant in Ferrara (Italy) stopped the production of the resin. The year after a new company was created, JV SolVin. It brought PVC raisin from SolVin's other factories from France (Tavaux), Belgium (Jemeppe), and Germany (Ludwigshafen). SolVin Italia had a lot of logistical problems, like delay in deliveries and increased lead time.		Rail, road	Started 2002	By using the SolVin Group's supply chain management and external consultants the solution was to use a multimodal transport system, managed by only one supplier. This solution was efficient and reliable. The solution was innovative also because of patented containers, especially created for the purpose, and rotatory valves, which allow quicker unloading and prevent contamination of the resin, and avoid the pressurizing of the customer's silo.	2004