APPLICATION OF A WEB-BASED TOOLBOX FOR SCANNING THE POTENTIAL OF INTERMODAL TRANSPORT TO THE GREEK MARKET

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Abstract

The increase of intermodal transport freight volumes is believed to contribute significantly towards diminishing the negative external effects of transport in general. However, the experience of the 1990's underlines the need to direct the efforts to stimulate intermodal transport to the demand side of the market and to examine closely the specific characteristics of the EU industrial supply chains. If intermodal transport is to be enhanced, the opportunities and constraints of a modal shift must be evaluated from a supply chain perspective. A comprehensive tool, capable of supporting the full process of identifying the potential flows for shifting cargo from road to more environmental friendly modes (rail, maritime, inland waterways) and of evaluating the consequences of implementing such a modal shift is developed by the SPIN project. Such a tool will be able to cover the whole spectrum of the business investment decision process. The present paper presents the application of this web-based toolbox for identifying the potential for modal shift to intermodal transport in three real business cases of freight transport from Greece.

Keywords: Advanced scan; Intermodal transport; Modal choices; Shippers; Forwarders; Greek freight market; Freight logistic chain
Topic Area: I Information Networks on Transport Knowledge

1. Introduction

The increase of intermodal transport freight volumes is believed to contribute significantly towards diminishing the negative external effects of transport in general. However, the experience of the 1990's underlines the need to direct the efforts to stimulate intermodal transport to the demand side of the market and to examine closely the specific characteristics of the industrial supply chains in the European Union countries. If intermodal transport is to be enhanced, the opportunities and constraints of a modal shift must be evaluated from a supply chain perspective.

A comprehensive tool, capable of supporting the full process of identifying the potential flows for shifting cargo from road to other environmentally friendly modes (rail, maritime/Short Sea Shipping, inland waterways) is desirable. Such a tool should be able to evaluate the consequences of implementing such a modal shift. Needless to say that such a tool must be able to cover the whole spectrum of the business investment decision process. It is within this framework, that a web-based toolbox – the Advanced Scan – has been developed by the EU research project SPIN for identifying the potential for modal shift to intermodal transport. This toolbox is calibrated to cover the European Union territory and provides benefits to several users:

- Shippers and forwarders, for comparing quality and costs of the alternatives transport modes, and hence for optimizing their logistic structures
- Intermodal operators for marketing purposes and for assessing the need for improvements in their services

The scope of this paper is to present an application of the Advanced Scan tool in a real business environment, and analyze its strengths and weaknesses. The geographical area where it is applied is Greek market. This is quite useful, taking into account the specificities of Greece: mountainous landscape, long coastline, inadequate railway network and a lot of ports. In addition Greece seems to be isolated from the other EU countries due to surrounding sea and frontiers with non-EU Countries. Based on these, the application of the Advanced Scan at the Greek companies, proved to be very interesting.

2. Intermodal transport initiatives

The focus on improving the competitive position of intermodal transport has always been mainly on the supply side of the intermodal transport market. The European Commission supports the development of intermodal freight transport through its multi-annual Framework Programmes, and contributes to the cost of selected Research and Technological Demonstration (RTD) Activities and Networking Activities that are proposed and managed by international consortiums.

Several Research projects funded by the European Commission have addressed the intermodal transport issue, suggesting initiatives for the promotion of its usage for freight transport. Such projects were:

- LOGIQ *(LOGIQ, 1999)*, which identified the actors in the decision –making process and has provided information on underlining criteria and constraints in the use of intermodal transport;
- PROMOTIQ *(PROMOTIQ, 1999)*, which identified the opportunities and barriers for actors, has elaborated a new generation of door-to-door transport services and proposed guidelines for the intermodal transport promotion and its establishment in the market.
- IQ *(IQ, 1999)*, which has suggested ways to improve the quality of intermodal transport and thereby, increase its market share. It sought to achieve this aim by supplying information, tools and insights into ways of enhancing European Intermodal Quality.
- RECORDIT *(RECORDIT, 2001)*, which proposed measures to improve the competitiveness of intermodal freight transport in Europe through the reduction of cost and price barriers which currently hinder its development, while respecting the principle of sustainable mobility.
- SULOGTRA *(SULOGTRA, 2001)*, which has analyzed the relationship between supply chain trends and freight transport operations and proposed ways to facilitate supply chain integration on European level.

Another project, which forms part of a wider OECD framework and is part of the EC's transport programme is the TRILOG *(TRILOG, 1999)*, aiming at providing an overall vision on global supply chain management and the role EU can play in terms of policy actions. Furthermore, the European Commission aiming at the promotion of intermodal

transport has introduced, besides relevant legislation, some financing instruments in the form of Pilot Actions:

- PACT - Pilot Actions for Combined Transport, (1997-2001). The aim of the PACT *(EC Regulation 2196/98)* was to increase the competitiveness of combined transport by promoting the use of advanced technology in the combined transport sector.
- Following the PACT programme, the MARCO POLO *(EC Regulation 1382/2003)* programme intends to help the transport and logistics industry to achieve sustained modal shifts of road freight to short sea shipping, rail and inland waterway.

Regarding intermodal scanning applications identifying potential flows for modal shift, it has been developed a limited scale. The above-mentioned research projects LOGIQ and IQ have developed tools for intermodal transport that is worth pointing out. LOGIQ produced a Decision Support System (DSS) for intermodal operators. This DSS can estimate how changes in the service characteristics affect the share of intermodal transport for different kinds of customers. The business tool DIQIT was developed in the framework of IQ research project. It is an interactive decision support tool for intermodal transport. The tool was designed and applied with potential users of intermodal transport on the corridor between the regions of Hamburg and Milan.

Based on the above, the existing tools have been developed to meet specific objectives. Consequently:

- Are suitable on a regional or national base while the market is European
- Are simplistic in modelling the supply chains;
- Pay little attention to differences in transport needs between types of industries
- Do not respect the heterogeneity in the level of services in European Transport
- They do not clearly distinguish between types of users

To cope with the weaknesses of the existing tools, the research project SPIN - **S**canning the **P**otential of **IN**termodal Transport (2003) aims to analyse, develop and to apply a toolbox for scanning the potential for a modal shift towards intermodal transport, mainly through the use of three toolboxes: The Quick Scan, the Advanced Scan and the Macro Scan:

- The Quick Scan aims to assess the general feasibility of intermodal transport of a (target) user on the basis of its transport profile
- The Advanced Scan aims to provide a realistic assessment on the potential of intermodal transport for a (target) door-to-door transport chain in terms of costs and time requirements. It is addressed to intermodal actors (shippers, logistic service providers and forwarders) at local, regional, national and EU level.
- The Macro Scan aims to provide a regional assessment in terms of service quantities and qualities

These tools have been developed to investigate at different levels, whether there is potential for a modal shift from road to inland shipping, short sea or rail transport. Furthermore, SPIN takes this one step further and evaluates opportunities for intermodal transport at ‘supply-chain’ level. This is a customised activity; shippers and logistics service providers deal with specific requirements or circumstances, which may hinder or ease a modal shift and which need to be taken into consideration. The potential for a modal

shift towards intermodal transport in the Greek market has been investigated through the Advanced Scan. This tool is going is analysed in the next paragraphs.

3. Presentation of the advanced scan toolbox

In the framework of SPIN project, the Advanced Scan toolbox provides initial information to support a modal shift from pure road to more sustainable means of transport, i.e. short sea shipping, rail, inland navigation. It is a modeling tool for more detailed appraisal of the costs and level of services of the transport alternatives. Also, it assists in estimating the effects of modal shift on the actors, concerning changes in the supply chain configuration, operational adjustments, changes in service levels (anticipated changes and risks) and investments and costs, to be made by shippers and/or the logistic service providers. Table 1, below presents the main activities related to the Advanced Scan toolbox.

Table 1. Advanced Scan

	Purpose	**Approach**	**Level**	**Tool-Basis**	**Implementation**
Advanced Scan	Detailed analysis of the possibilities of intermodal transport with simultaneous consideration of cost and quality	Modelling and comparison of the transport alternatives (costs, quality), different basic conditions	Company (individual behaviour of the concern)	Combination of transport and cost model (with specific functions and options)	Company and consultant (case-studies)

Furthermore, the toolbox explicitly distinguishes different types and / or levels of use (just for a first orientation / awareness or for analyses of specific real-life supply chains) and different user groups (policy-makers or businesses), as shown in Figure 1.

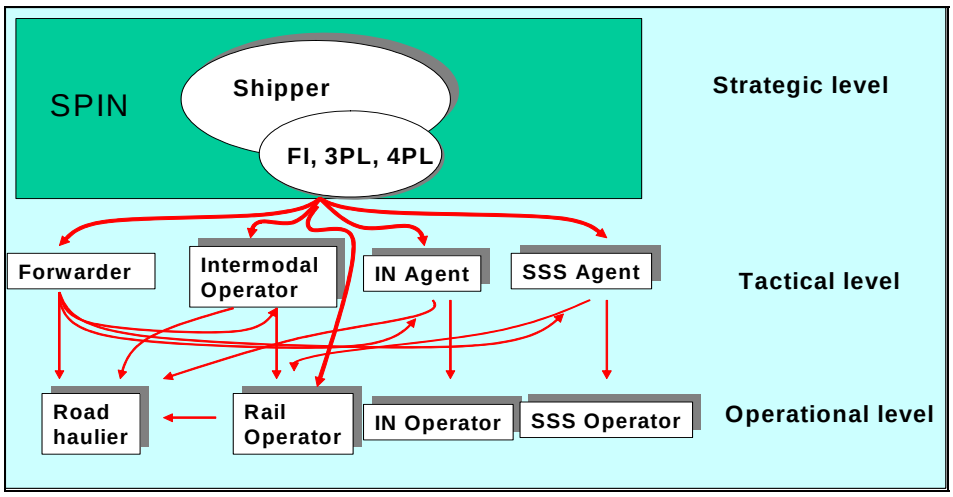

Figure 1. User-Groups for the Advanced Scan

The Advanced Scan is a tool, which is able to suggest transport customers and transport providers alternative mode and route choices based on an infrastructure network and general cost and time parameters.

The comprehensive infrastructure network consists of *(SPIN, 2003)*:

- Road network with more than 60.000 nodes
- Rail network with about 2000 nodes
- Inland navigation network with 3.350 nodes
- A distance matrix of short sea connection from and to 130 ports
- About 500 terminals a links between these networks layers
- About 2000 timetables were integrated as additional network layer as connection from terminal to terminal.

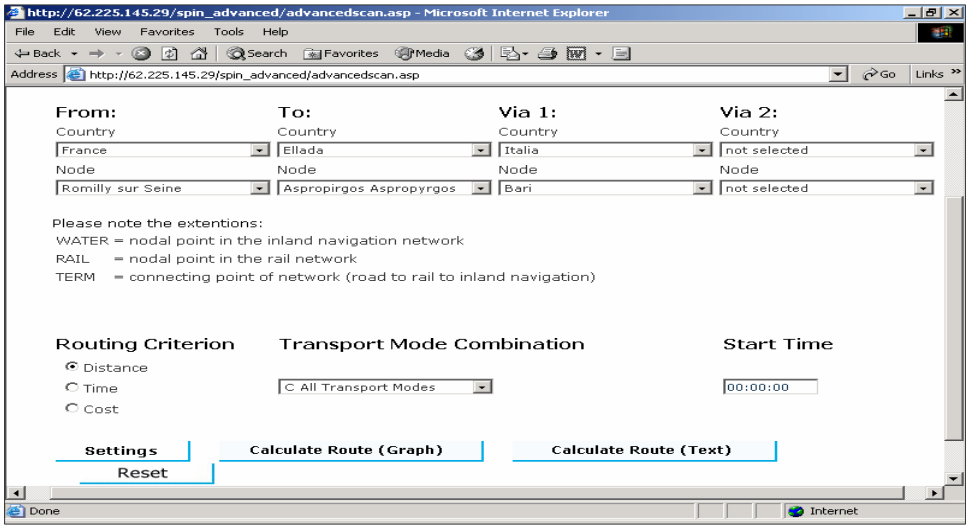

Figure 2. Advanced Scan Interface

After specifying the corridor (Figure 2) the inquiry provides a list of parameters to be completed , as shown in Figure 3 and 4. The main features are:

- The costs are calculated on the basis of time and cost dependent parameters
- Infrastructure costs are calculated on the basis of specific route parameters
- Transhipment costs are calculated on the basis of the number of transhipments.

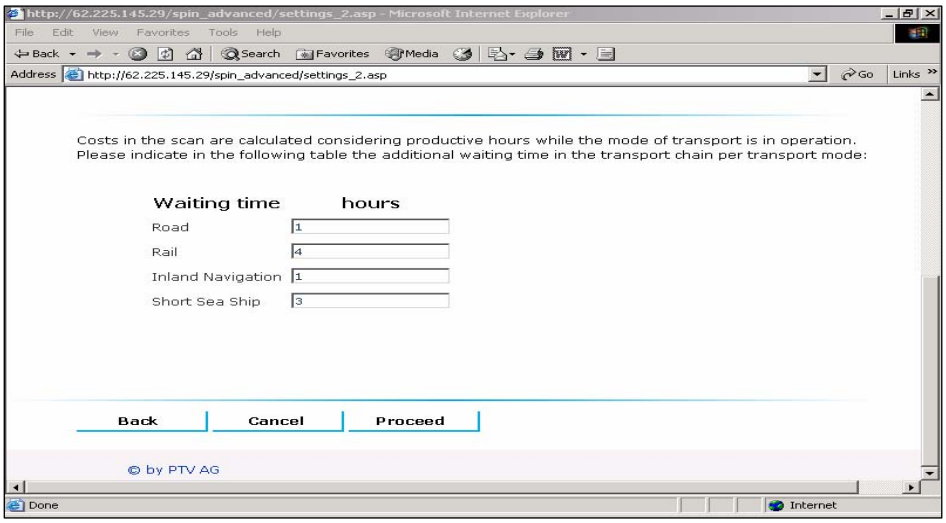

Figure 3. Advanced Scan input data

For a realistic estimate of the potential for modal shift, insight in specific supply side characteristics is required. The tool retrieves data from a matrix, which is constructed for the purpose of this project.

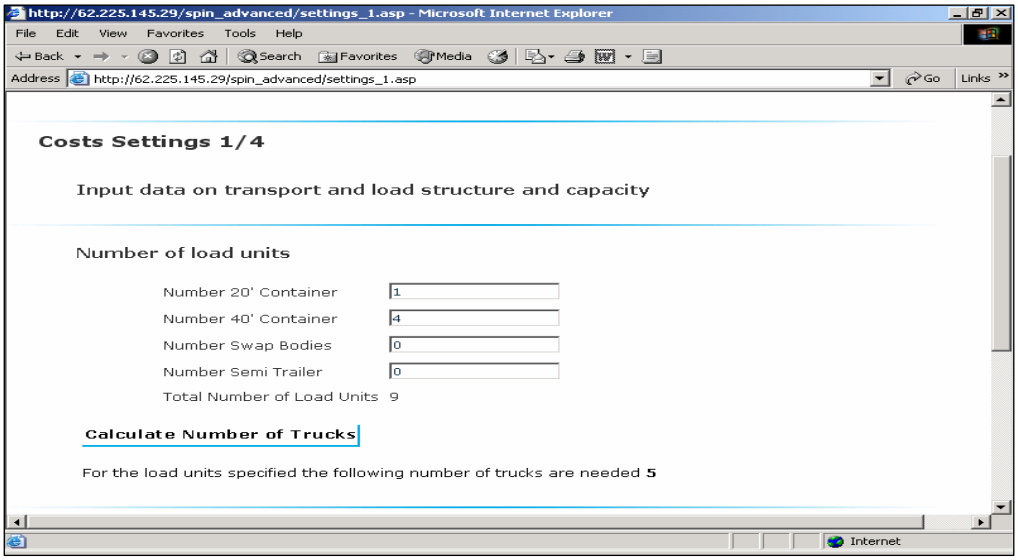

Figure 4. Advanced Scan input data

The matrix contains supply characteristics of each of the transport alternatives for each of the regions, i.e. costs, frequency, lead times and timing of services and where possible characteristics on reliability and control.

The tool provides default cost values for the four transport modes considered, as shown in Figure 5. These values are derived for the SPIN purposes from existing studies on transport costs in Europe. However, each user is free to modify these costs settings, by providing the company's cost rates for the different transport modes (truck, rail, inland waterway and short sea shipping). The final output of the Advanced Scan testing is illustrated in Figure 6.

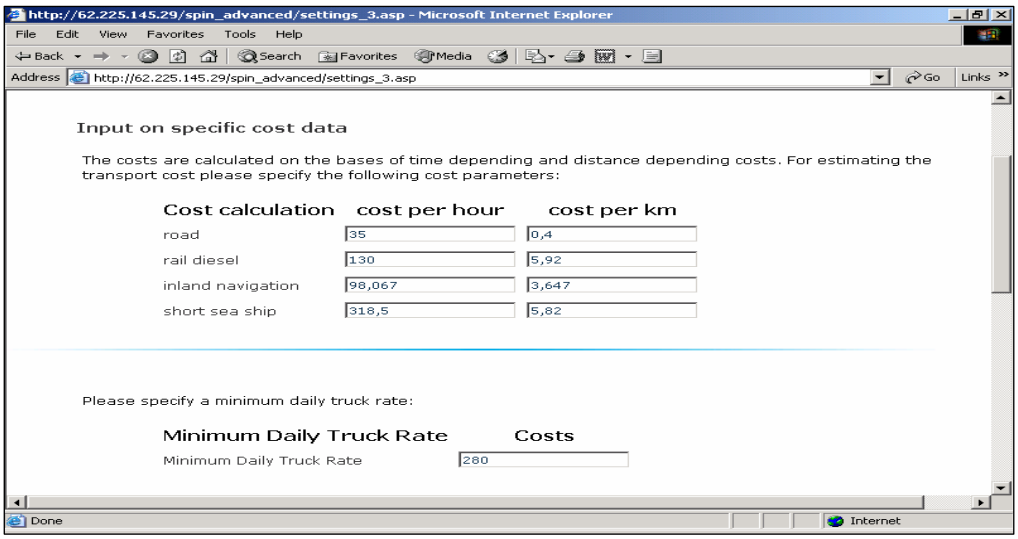

Figure 5: Advanced Scan input data

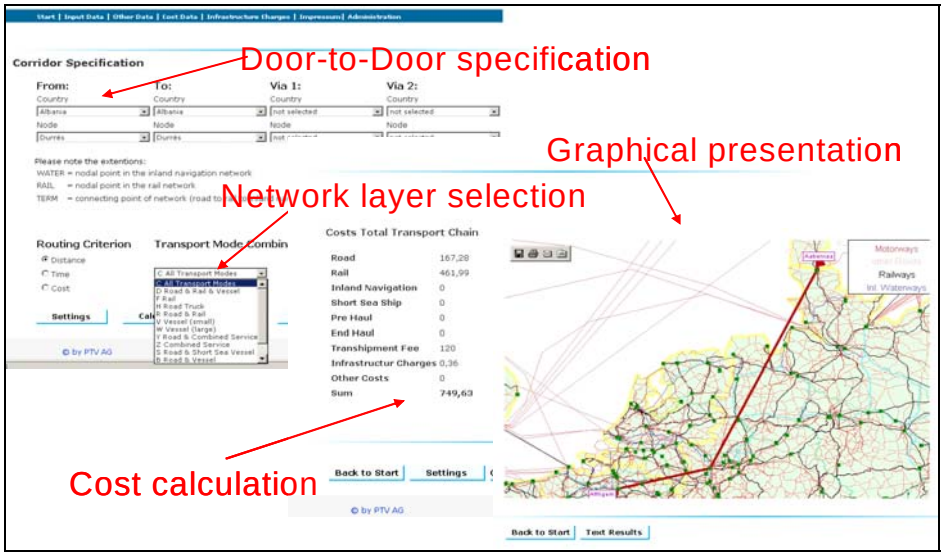

Figure 6. Overview of the Advanced Scan

4. Advanced scan application

4.1 Objectives

The objectives of the Advanced Scan development are to be used by the business consultancy field, to indicate and quantify the effects of the intermodal choice for the various categories of potential users, as well as to identify the barriers encountered for the modal shift. Based on these, the application was done to test the tool in a real business environment and to assess the quality, utility and sensitivity of the outputs.

The companies that tested the tool are benefited from this application, as they have been offered customised advices for medium and long-term logistic decision-making regarding modal shifts. Furthermore, they found out whether or not the modal shift from road to rail transport, inland or short sea shipping was possible within their company.

4.2 Application procedures

The application was done with the following steps:

a) Approach of the companies and collection of relevant information

In order to get reliable results, a collection and preparation of data and information regarding the company was called for. This was implemented through the form of a questionnaire. The questionnaire covered all issues concerning the logistics, transport chains, flows and decision-making of the company. The characteristics of each of the above issues enabled the consultant to have a spherical view of the company and its performance in the transport chain, in order to identify the suitable alternatives according to the company's needs.

b) Application and assessment of the tool

The companies were supported individually during the application process to ensure the quality and success of the application. During the application the following information was collected:

- A technical assessment of the tool structure, consistency, abilities and missing data or links in relation with the company's logistic scheme

- The company's qualitative experience, the consistency of the findings, added value of the tool and the utility of the tool for the company.
- Qualitative and quantitative elements destined to understand and assess the present company modal choice and potential modal shift.

c) Analysis and assessment of the opportunities and barriers to realise a modal shift.

Based on the questionnaire that identified technical elements, commercial requirements, economic parameters, administrative and documentary constraints, the Scan has been applied considering the qualitative and quantitative parameters. Thus, an assessment is obtained of the real opportunities and barriers, on the basis of the SPIN network of the companies to realise a modal shift.

4.3 The sample and area of the application

The advanced scan applied to approximately thirty European companies, five of which were Greek, which represented different supply chains. The selection procedure of the companies (previously identified) aimed at:

- Full EU coverage, including accession countries, where appropriate
- Representation of different types of supply chains
- Located in regions with different levels of service by each of the modes (road, rail, and short-sea shipping)
- Incorporating small and medium sized enterprises

The case of the Greek market is important as the transport infrastructure in Greece is strongly affected by the landscape and geopolitical status of the country. The country is situated on the Balkan Peninsula, at the southeast of Europe having a land frontier north with Albania, FYROM and Bulgaria, and at the east with Turkey. In addition sea forms a natural frontier to the east, west and south. Greece seems to be isolated from the other European Union countries due to surrounding sea and frontiers with non-EU Countries. Bulk products are generally transported by sea from large and small ports throughout Greece. Containerized and unitized cargo is moved through the two large container ports: Piraeus and Thessaloniki, or with Ro-Ro through the ports of Patras and Igoumenitsa.

Greek policy priorities are given to sea transport as a whole and Ro-Ro connections with Italy that connect Greece with the rest of the EU. Road transport has traditionally played an important role in the economy whilst rail transport has not been adequately developed, although the need for improvement is recognized. Inland waterways are non-existent due to the lack of navigable rivers while airfreight transport is negligible.

Based on the existing situation of the Greek freight transport system, for the application of Advanced Scan to the Greek companies, the following features of the toolbox were used:

- Proposal of alternative modal choices
- Cost estimates for each individual part of the transport chain (operator's costs)
- Proposal for alternative routings
- Travel time estimations for the whole transport chain
- Customised to preferred mode choice and via connections

The outputs of the application are related to a cost / benefit analysis of modal shifts on company level, which is specific for the Greek cases, where short sea shipping is mainly used. The cost / benefit analysis also considers evaluation criteria, related to the external

costs. Furthermore, an assessment of Greek company-specific barriers for modal shift (switching costs, investment risks, company priorities, competence etc.) was necessary. Also, it was proven beneficial the introduction of a first approach for the implementation steps for modal shift, which serves as an indicator for possible measures or investments.

The Advanced Scan toolbox was applied in the following five Greek companies:

Company	Type
CVM	International Forwarding and Marine Agent
OMEGA TRANSPORT & LOGISTICS	Forwarders - Logistics
CALLITSIS S.A.	Shipping Agency
NESTLE HELLAS S.A	Food and Beverage Company
AEROMET HELLAS LTD	Forwarders – Air Cargo Transportation

All companies on which the Advanced Scan was applied have a defined strategy, on a company level, for abiding to EU Directives, regarding modal choice. The decision making process of each company is based on technical, operational, economic, commercial, environmental and legal reasons. Technically, all companies select the transport network that is more appropriate for the transhipment of their goods. According to the companies it is essential for the network to cover at least the main areas and therefore a combination of the different transport modes does offer them a wide range of transport options. However, most of the Greek companies cannot use the rail network, although they consider it useful for their transhipments, since it does not link the ports with the origins/destinations of freight.

Operationally, the application showed that the modal choice is based on the agreements that the companies have with the managers of the different transport modes. The main reason of the modal choice is usually based on economic reasons, since the companies consider as a priority, the lower possible cost, for the selected route. Commercially, the companies make an effort to use all transport modes in order to attract the customer and satisfy the different needs of transhipments.

Environmentally, an effort is being made to use alternative transport modes in order to avoid the use of road transport and therefore reduce the emissions caused. For this reason all companies are trying to promote the use of Short-sea shipping since it is a transport mode that can be further developed in Greece. Legal reasons consist of the restrictions that exist on road transport, namely the restriction of trucks circulation during the weekend. This is in favour of the usage of the remaining transport modes, since the companies can satisfy the needs of their customers even during the weekends.

5. Application results

5.1 Tool application

The Advanced Scan was tested for a specific route selected by each of the companies, where Advanced Scan was tested. In order to have objective results, the chosen route was tested through the tool by using a number of different criteria each time. More than five tests were applied for each company and the results vary based on the transport mode and the criterion used.

A large variety of results was produced throughout the testing. In most cases, when input values were realistic ones, the results are quite plausible. However, in certain cases

the results were not the expected ones. This is mostly due to the fact that the database behind the tool was incomplete. This was observed for some cases of Short-sea shipping.

The maps produced depict the selected route, by presenting the main links of the origin and destination and the different transport modes that should be used. Examples of the graphical output are presented in Figure 7.

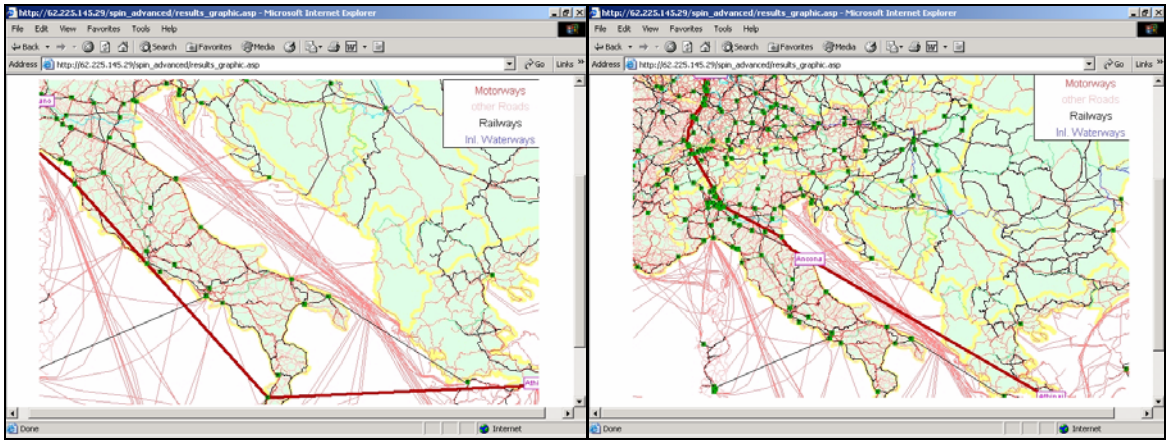

Figure 7. Graphical presentation of Advanced Scan

The application to the Greek market showed a number of factors that affect the utilization of intermodal transport such as:

a) *Market characteristics:* The size of the company influences modal choice as decisions are based on volumes, frequency and regularity of shipments. The location of the company affects modal choice, as distance of the company from sources for raw materials as well as the distance from markets is responsible for choosing or not the intermodal transport solution.
b) *Quality and Cost Criteria:* It approved that quality features influence the modal choice towards a more costly transport service.
c) *Infrastructure network:* There are many infrastructure factors that create barriers to intermodal solutions. These factors are the limited capacity of the terminals, the low availability of freight train slots, the congestion in ports and access to them and some limitation of the utilization of certain intermodal-loading units.
d) *Limitations:* The limitations to road freight traffic at night during the weekend and on holiday periods could strongly influence modal choice, encouraging the utilization of railway and sea shipping, which normally operate without limitations.

The application identified the following necessary key parameters that influence the modal choice:

Technical: The availability of the appropriate infrastructure for the shipper and the one related to the transport network (including the terminal function)

Operational: The ability of intermodal transport to match the shipper logistic scheme and the flow structure

Commercial: The high quality requirements related to time, reliability and flexibility combined with the cost.

Economical: The quantitative impact of the transport fares.

The field applications provided an insight in the mode choice mechanism and in the opportunities and barriers for modal shift. The findings are related to specific contexts (supply chain, market segment or transport supply) the companies are in. Hence, the advanced scan application at the Greek market has provided to the shippers and forwarders that aimed at assessing the potential benefits of using intermodal transport a useful decision tool.

An example of the application of the Advanced Scan including the input of data and output of results is presented in the following Tables 2-4.

5.2 Companies reactions

The companies were rather impressed by the results. The table of results contained all required elements for the alternative route. They found very interesting that a tool could give them so simple and quick results without consuming time searching for information on a specific route from external sources. Additionally, all companies have used similar tools in the past, which mostly indicated the route that should be followed but without indicating any information on costs. All companies seek routes that are most cost efficient. Therefore information regarding costs in the analysis of results is regarded essential for them. The companies expressed an interest in the graphical presentation of the results.

A recommendation was made by the companies regarding the results. It would be more efficient to them if the tool could produce more than one alternative corridor to assist the user to choose the most representative one. In general, if the tool is to be updated often, it is regarded as an efficient tool for forwarding companies. The updating is rather essential, since the itineraries change every month. For realistic results someone must be aware of all relevant parameters that influence the costs, something that is difficult.

Concluding, the output of the application indicated that such a tool seems promising, although at this stage it cannot produce reliable intermodal solutions in all cases.

Table 2. Advanced Scan application outputs- Company A

TEST
COMPANY A

Origin: **Greece, Kavalla**
Destination: **United Kingdom, Teesport**
Via: **Greece, Thessaloniki**
Via: **Greece, Piraeus**
Modality: **All transport modes**

Specific settings: **Cost Criterion**

- nb of 20' **: 4**
- nb of 40' :
- nb of Swap bodies :
- nb of semi trailers :

- train capacity : **60**
- IWW capacity : **208**
- SSS capacity : **700**

- nb of pre haul : **2**
- nb of end-haul : **2**

- waiting times road : **1**
- waiting times rail : **4**
- waiting times IWW :
- waiting times SSS : **8**

- cost per hour / per km (road) :**35 0,40**
- cost per hour / per km (rail) : **130 5,92**
- cost per hour / per km (IWW) : **98,1 3,6**
- cost per hour / per km (SSS) : **318,5 5,82**

- min. truck rate : **280**
- transhipment costs / sea : **15 / 30**

- other charges road :
- other charges rail :
- other charges IWW :
- other charges SSS :

- Infrastructure charges road :

Greece 0,044
Netherlands 0,01
Germany 0,15
Belgium 0,01

- infrastructure charges rail :

Belgium 1,5
Greece 0
Netherlands 0,25
Germany 2,6

What are the relevant results? routing :

Kavalla	(roadlink)
Elevtheroupolis Eleutheroupoli	(roadlink)
Moustheni	(roadlink)
Podhokhori	(roadlink)
Amfipolis	(roadlink)
Asprovalta	(roadlink)
Nea Madhitos	(roadlink)
Langadhikia Langadikia	(roadlink)
Yerakaroz	(roadlink)
Stavrozpolis Thessaloniki	(roadlink)
Thessaloniki	(roadlink)
Thessaloniki	Transhipment to/from Road
Thessaloniki	Transhipment to/from Rail
THESSALONIKI	PLATI==THESSALONIKI
PLATI	PLATI==EGINION
EGINION	EGINION==KATERINI
LEPTOKARIA	LEPTOKARIA==EVANGELISMOS
EVANGELISMOS	EVANGELISMOS==LARISSA
LARISSA	LARISSA==PALEOFARSALOS
PALEOFARSALOS	DOMOKOS==PALEOFARSALOS
DOMOKOS	LIANOKLADION==DOMOKOS
LIANOKLADION	TITHOREA==LIANOKLADION
TITHOREA	INOI/INOFYTA==TITHOREA
INOI	ATHINAI==INOI/INOFYTA
ATHINAI	Transhipment to/from Rail
Athen	Transhipment to/from Road
Pireas	Motorway
Pireas sea Port	Pireas sea Port ==>Naples sea port
Naples sea port	Naples sea port ==>Lowestoft sea port
Lowestoft sea port	Lowestoft sea port ==>Teesport sea port
Teesport sea port	

- transit times road : **4:39**
- transit times rail : **17:46**
- transit times IWW : **0:0**
- transit times SSS : **331:47**
- transit times sum : **354:12**
- cost road : **453,16**
- cost rail : **356,73**
- cost IWW : **0**
- cost SSS : **801,87**
- pre haul : **280**
- end haul : **280**
- transhipment fee : **60**
- infrastructure charges : **0,26**
- sum : **2232,02**
- cost / load unit : **113,36 for road, 104,18 for rail, 200,47 for SSS**
- distance road : **159,29**
- distance rail : **513,57**
- distance IWW : **0**
- distance SSS : **5954,18**
- distance sum : **6627,04**

Table 3. Advanced Scan application outputs – Company B

TEST
COMPANY B

Origin: **Greece, Athens**
Destination: **Germany, Frankfurt**
Via: **Italy, Ancona**
Modality: **All transport modes**

Specific settings: **Cost Criterion**

- nb of 20' **: 10**
- nb of 40' :
- nb of Swap bodies :
- nb of semi trailers :

- train capacity : **60**
- IWW capacity : **208**
- SSS capacity : **700**

- nb of pre haul : **5**
- nb of end-haul : **5**

- waiting times road : **1**
- waiting times rail : **4**
- waiting times IWW : **0**
- waiting times SSS : **1**

- cost per hour / per km (road) :**35 0,40**
- cost per hour / per km (rail) : **130 5,92**
- cost per hour / per km (IWW) : **98,1 3,6**
- cost per hour / per km (SSS) : **318,5 5,82**

- min. truck rate : **280**
- transhipment costs / sea : **15 / 30**

- other charges road :
- other charges rail :
- other charges IWW :
- other charges SSS :

- Infrastructure charges road :

Greece 0,044
Germany 0,15

- infrastructure charges rail :

Greece 0
Germany 2,6

What are the relevant results? routing :

Athinai		(roadlink)
Pireas		Motorway
Pireas sea Port		Pireas sea Port ==>Ancona sea Port
Ancona		Transhipment to/from Road
Ancona		(roadlink)
Ancona		Transhipment to/from Rail
ANCONA		FALCONARA==ANCONA
FALCONARA MARITTIMA		RIMINI==FALCONARA MARITTIMA
RIMINI		BOLOGNA==RIMINI
BOLOGNA		Transhipment to/from Rail
Bologna Interporto		Bologna Interporto ==Basel SBB
Basel SBB		Transhipment to/from Rail
BASEL		BAS-MUL==BASEL
BAS-MUL		Transhipment to/from Rail
Basel		Transhipment to/from Barge
Basel	Swiss	Rhein
Colmar Neuf-Brisach	France	Rhein
Germersheim	France	Rhein
Speyer	Germany	Rhein
Ludwigshafen	Germany	Rhein
Mannheim	Germany	Rhein
Worms	Germany	Rhein
Gernsheim	Germany	Rhein
Mainz	Germany	Main
Kelsterbach	Germany	Main
Frankfurt am Main	Germany	Transhipment to/from Barge
Frankfurt/Ost		Transhipment to/from Road
Frankfurt		

- transit times road : **2:31**
- transit times rail : **10:22**
- transit times IWW : **38:3**
- transit times SSS : **89,2**
- transit times sum : **130:43**
- cost road : **700** - cost rail : **360,2** -
- cost IWW : **239,28**
- cost SSS : **536,54**
- pre haul : **280**
- end haul : **280**
- transhipment fee : **600**
- infrastructure charges : **6,73**
- sum : **3002,75**
- cost / load unit : **70,15 for road, 96,54 for rail, 23,93 for IWW, 53,65 for SSS**
- distance road : **21,6**
- distance rail : **137,42**
- distance IWW : **341,13**
- distance SSS : **1580,04**
- distance sum : **2080,19**

Table 4. Advanced Scan application outputs - Company C

TEST COMPANY C.	What are the relevant results? routing :	
Origin**: Italy, Milan** Destination: **Greece, Athens** Via: Modality: **All transport modes**	Milano	(roadlink)
	Milano Rogoredo	Transhipment to/from Rail
	MILANO	MILANO==VOGHERA
	VOGHERA	TORTONA==VOGHERA
	TORTONA	ARQUATA==TORTONA
	ARQUATA	GENOVA==ARQUATA
	GENOVA	Transhipment to/from Rail
	Genova	Transhipment to/from Short Sea
	Genova sea port	Genova sea port ==>Leghorn sea Port
	Leghorn sea Port	Leghorn sea Port ==>Gioia Tauro sea Port
	Gioia Tauro sea Port	Gioia Tauro sea Port ==>Pireas sea Port
	Pireas sea Port	
	Pireas	Transhipment to/from Road
	Pireas	Motorway
	Athinai	
Specific settings: **Cost Criterion** - nb of 20' : - nb of 40' : - nb of Swap bodies : - nb of semi trailers : **2** - train capacity : **60** - IWW capacity : **208** - SSS capacity : **700** - nb of pre haul : **1** - nb of end-haul : **1** - waiting times road : **3** - waiting times rail : **4** - waiting times IWW : - waiting times SSS : **8** - cost per hour / per km (road) :**35 0,40** - cost per hour / per km (rail) : **130 5,92** - cost per hour / per km (IWW) : **98,1 3,6** - cost per hour / per km (SSS) : **318,5 5,82** - min. truck rate : **280** - transhipment costs / sea : **15 / 30** - other charges road : - other charges rail : - other charges IWW : - other charges SSS : - Infrastructure charges road : **Greece 0,044** **Italy 0,12** - infrastructure charges rail : **Greece 0** **Italy 1**	- transit times road : **4:17** - transit times rail : **8:52** - transit times IWW : **0:0** - transit times SSS : **104:40** - transit times sum : **117:49** - cost road : **318,08** - cost rail : **132** - cost IWW : - cost SSS : **248,29** - pre haul : **560** - end haul : **560** - transhipment fee : **120** - infrastructure charges : **9,92** - sum : **1948,29** - cost / load unit : **79,67 for road, 65,33 for rail, 62,07 for SSS** - distance road : **22** - distance rail : **139,64** - distance IWW : **0** - distance SSS : **1737,34** - distance sum : **1898,98**	

6. Summary and conclusions

The Advanced Scan is a promising tool for promoting intermodal transport in Europe. The companies on which the tool was applied found it efficient and useful. It must be noted that all companies have used similar tools in the past to establish alternative routes

for the transport of the goods. However, they found that the Advanced Scan produced an analysis of costs that could assist them in selecting a specific route more efficiently.

The output of results of the tests implied that the tool is not yet fully developed. A number of information regarding the costs and the links between the areas is missing. The general idea is that although it is quite impossible to insert all information required in the database (e.g. ship schedules) an effort however has to be made to include them. Another weak point is the updating of the tool. The Advanced Scan is a tool, which produces results based on data that change constantly (e.g. time schedules, tariffs and costs), therefore for the results to be reliable it needs consistent updating.

The application of the Advanced Scan at the Greek market has shown that there are possible alternative options for a modal shift towards intermodal transport for the selected corridors, contrary to what was the feeling of the companies before its use. Furthermore, the application of the Advanced Scan, proved that a combination of two or more modes of transport, provide for a potential for a modal shift to intermodal transport, since the costs are lower and the travel time reasonable.

The aim of the companies is to provide a cost effective transportation solution together with a reasonable lead-time. They believe that the Advanced Scan is an interesting tool, which provides all the viable options for the company to choose among various modes of transport for all Europe destinations.

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