CroBIT

Cross Border Information Technology

WP 6450 - CroBIT's Contribution to Common Transport Policy

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Summary

This subtask was defined for CroBIT as a part of CroBIT's Evaluation Work Package 640 - Evaluation. The work of this subtask was carried out during September 2004 – January 2005. VTT Transport, with assistance of CroBIT members, assumed the main effort.

The European Common Transport Policy (CTP) relies on two pillars: *competitiveness* and *sustainability*. Competitiveness is essential for European industries and citizens' employment in global competition. Competitiveness also means low costs in transport, efficiency in supply chains and productivity of work force and capital. Sustainability is essential for promoting quality of life and conserving natural resources in all respects. Sustainability, thus, addresses the issues of reducing environmental impacts and harmful effects as well as protecting human welfare and safety.

The general idea for this assessment on CroBIT's contribution to CTP was to translate policy goals and strategies first into indicators (or sub-goals or interim goals) and then furthermore to factors, parameters or milestones. These then would be compared to CroBIT functionalities and characteristics. Most of the assessment was qualitative.

CroBIT is offering increased visibility along the rail transport chain thereby contributing to higher efficiency. It can be said that the net benefits of CroBIT's key functionalities are substantial and thus the contribution to policies are absolutely significant. But it has to be remembered that benefits accrue over long period of time and are directly dependent on how well CroBIT (or similar systems) can penetrate the user (railway undertakings, freight customers, other operators) market.

The overall contribution to European Common Transport Policy - bearing in mind that we are looking at one single project - of CroBIT is good. The main explanation is that since CroBIT realizes TSI / TAF requirement to a reasonable extent and because the benefits TSI / TAF are substantial, the end result for CroBIT is very positive. The project idea was sound, based exactly on policy targets.

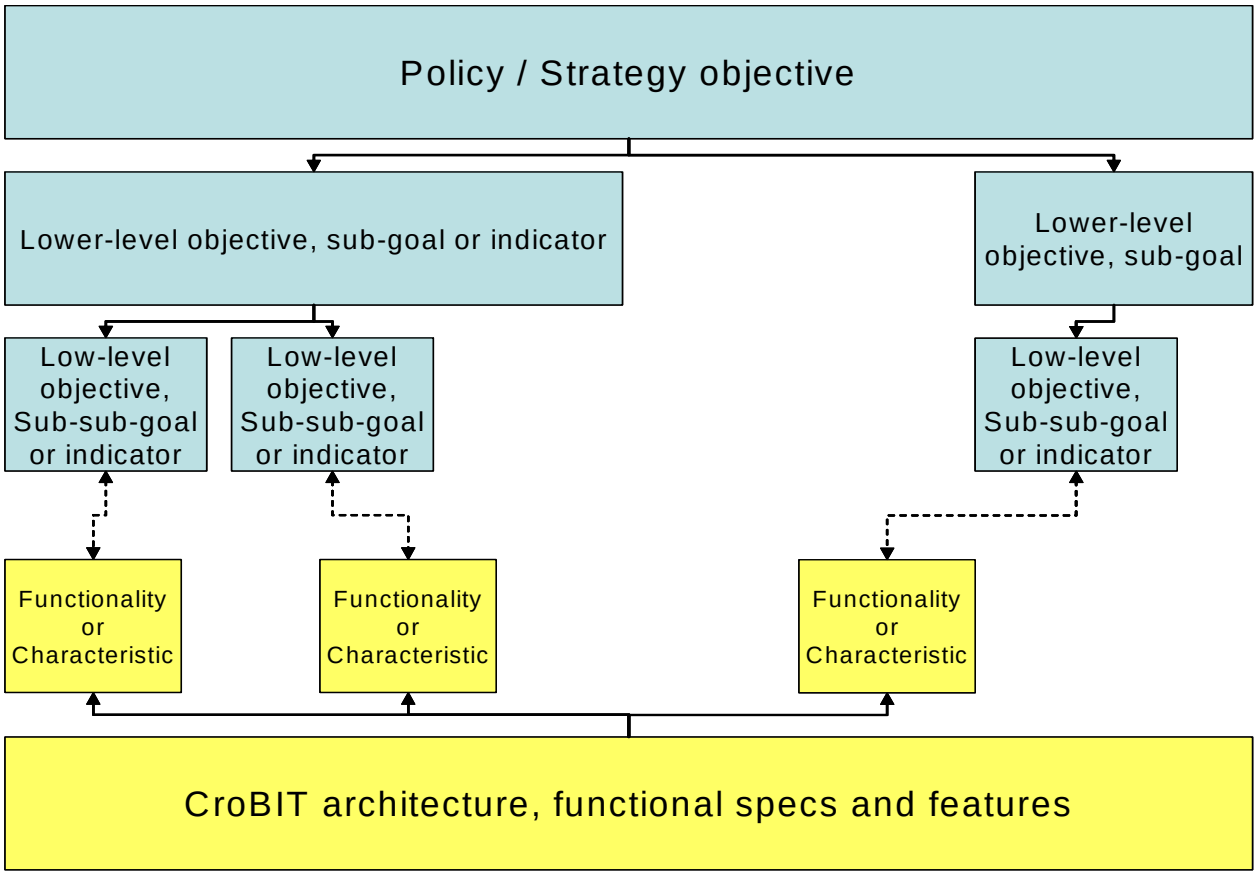
As to successfulness of the process (carrying out the CroBIT project), the lack of a larger scale *in situ* demonstration is a minus, although the basic project concept remains intact. Therefore, the true proof of CroBIT's benefits is based on reasoning and logic, and not so much on witnessed empirical evidence. Whether one weighs more the former (reasoning) or the latter (experiences), it does not deteriorate the need for the CroBIT project.

Contents

1 Introduction to WP 6450

This subtask was defined for CroBIT as a part of CroBIT's Evaluation Work Package 640 - Evaluation. The work of this subtask was carried out during September 2004 – January 2005. VTT Transport, with assistance of CroBIT members, assumed the main effort.

The figure below describes the idea and the table that follows the rough methods how it was planned to assess CroBIT's contribution to the CTP. The general idea was to split CTP goals into indicators – or sub-goals, i.e. lower level targets - and from thereon to factors and parameters which would then be compared to CroBIT functionalities and characteristics[1]. Most of the assessment was expected to be qualitative.



[1] Indicator may be regarded as a variable that can be measured. The outcome of the measurement then benchmarks how well the objective was achieved. What represents a goal or an objective on one level represents an indicator or variable on another, higher level. Therefore, the definitions for goal, objective, target or indicator are contingent. In this paper, the semantic problems of the aforementioned definitions are simply bypassed. For the interested reader, see e.g. Bärlund (1999).

TASK	NAME	WORK DESCRIPTION
6451	**Selected CTP indicators, goals**	**Finding policy indicators that can be used in evaluating CroBIT's impacts**
64510	Overview of policies	Overview of EU policies and goals with respect to rail IT, IT in general (e.g. information society) and rail revitalisation. The focus, however, is that of CroBIT
64511	List of indicators, goals or milestones	Producing a list of quantitative and qualitative indicators or milestones for policy;
64512	Criteria and justification for indicator selection	Prioritising and selecting the most relevant indicators
64513	Logical causality of impacts on indicators	Drafting a causal map, impact diagram or table on factors that contribute to indicators
6452	**CroBIT's contribution and impact on indicators**	**Assessing the impacts of CroBIT's characteristics and functionalities on policy indicators or on causal factors behind the indicators**
64521	CroBIT functionalities with impacts	Reflecting CroBIT functionalities and characteristics against the indicators and factors
64522	Possibilities for qualitative / quantitative impacts assessment	Assessing what impacts can be assessed quantitatively and what qualitatively
64523	Impacts assessment	Assessing the impacts with chosen methods
6453	**Appraisal by external experts on policy implementation**[2]	**Preparation, planning, agreeing on and carry-out of appraisal**
64531	Appraisal framework, "list of questions"	Preparation and fine-tuning of issues to be appraised
64532	Selection of persons	Finding the right persons
64533	Appointment arrangements	Agreeing on dates and times for appraisal

[2] Originally, interviews with EU officials were planned, but this plan was changed due to time shortage. Also it was considered beneficial to have a truly outside view on CroBIT's policy contribution.

TASK	NAME	WORK DESCRIPTION
64534	Interviews & discussions & feed-back from experts	Carrying out of the appraisal with feed-back from experts
6454	**Compare requirements with reached goals**	**CroBIT's goals compared to CTP policy goal affecting factors**
64541	Review CroBIT goals with respect to CTP and pursued impacts	Identifying CroBIT goals that are associated with CTP factors; matching the policy-indicator-factor causality with these goals
64542	Conclusions	Summing up the results
6455	**Sub-task working report**	**Drafting and finalising the working report**

2 Overview of Policies and Strategies[3]

2.1 European Common Transport Policy Pillars and Elements

The European Common Transport Policy relies on two pillars: *competitiveness* and *sustainability*. This is evident from the foremost policy document for Common Transport Policy: the White Paper. (Commission of the European Communities, 2001)

Competitiveness is essential for European industries and citizens' employment in global competition. Competitiveness also means low costs in transport, efficiency in supply chains and productivity of work force and capital. From that viewpoint the current policies address issues such as sector restructuring, liberalization and utilization of modern information and communications technology (ICT) tools.

Sustainability is essential for quality of life and conserving natural resources in all respects. Thus sustainability addresses the issues of reducing environmental impacts and harmful effects as well as protecting human welfare and safety. This in turn means regulatory frameworks that either possess incentives for or enforce the type of behavior of individuals and organizations that are in line with the abovementioned policies. Transport pricing and transport safety policy measures, therefore, are undertaken.

The EU objective of "the Four Freedoms" – people, goods, capital and services – is also still valid and one of the cornerstones of EU policy setting. This means, among numerous other things, that obstacles for the movements of "the Four" at EU's internal borders should be eliminated.

The analysis that follows, attempts to capture the most relevant policies and strategies that can be regarded as high-level objectives relevant for such projects as CroBIT. The analysis is probably far from being extensive, but the authors believe that most of the relevant policies and strategies are captured. These form the policy foundation for CroBIT.

Not all the documents referred to below belong to "official policy paper" group. Also the actions taken by industries and other communities can be regarded as part of the European strategies for transport, without being included in the official Common Transport Policy. Some of these actions or measures are referred as well, because restricting the analysis to official policies would make the scope far too narrow. Furthermore, some projects are referred to, as they can be regarded as actions to realize policies. Especially European Framework projects are a direct continuation of and feedback mechanism to The Common Transport Policy. In other words, these projects are a part of the policy and they produce knowledge and data to be used in reformulation of policies and strategies.

2.2 Relevant Policies and Strategies in a Nutshell

The rail freight market has already been opened for regulated competition for international freight services on the Trans-European Rail Freight Network. By 2006 the entire international freight

[3] The difference between the terms "policy" and "strategy" is not always clear and their meaning varies depending on the context. In this paper, policy means guidelines or principles laid out by policy makers, which are normally authorities who have regulation power. Strategy means in this paper a selected direction of actions or set of principles that direct the chosen actions. In practice, the terminology issue is not crucial because of its contingent nature.

network will be open for access. Cabotage and getting return loads on international freight routes will be expedited. All unnecessary stops at national borders should be eliminated. Rail freight services should be turned into customer-oriented profitable businesses, radically increasing the speed and reliability of freight trains. (Commission of the European Communities, 2001, p 27-34; European Commission website http://europa.eu.int/scadplus/leg/en/lvb/124057.htm, read in 14.1.2005)

The European Union is contributing to a sustainable freight transport system through many investment initiatives and programmes. Marco Polo is one of the most recent ones with 115 MEUR for 2003-2007. The objective is to boost rail, short-sea and intermodal freight. Cross-border issues are key areas of Marco Polo. (European Commission, 2003)

Interoperability of rail systems has been addressed especially in Directive 2001/16/EC on the interoperability of the trans-European conventional rail system. Interoperability of telematic applications have been operationalised in the working document "Telematic applications for freight" (European Commission 2004)[4]. As rail is almost always a part of the intermodal chain, also interoperability between modes is necessary. Node points, such as ports or transshipment terminals, are key places where interoperability can be realized. (European Communities 2001, p 13, 15)

In order to organize neutral rail policy and establishing control mechanism, European Union is about to establish A European Railway Agency (ERA) responsible for formulating common solutions on matters concerning safety and interoperability. Interoperability control by ERA touches also CroBIT in the sense that CroBIT's functionalities are a part of interoperability in the information exchange between RUs and their partners and customers. (European Commission website http://europa.eu.int/scadplus/leg/en/lvb/124013.htm, read in 14.1.2005)

Another major step from the organizational viewpoint in implementing European policies is the establishment of RailNetEurope (RNE, www.railneteurope.com) in January 2004. RNE comprises the 25 European member state rail infrastructure managers (IMs). RNE offers RUs various services when planning the international rail transport chain and reserving paths. The principle of One-Stop-Shop (OSS) is pursued concerning path and slot requests and reservations of international rail transports. At present OSS is still more of a concept than a functional service offered to RUs.

ERTMS is a strategic initiative launched in 4th Framework Programme and now continued as a co-operative effort. ERTMS, the European Rail Traffic Management System consists of different layers of applications, of which GSM-R, the rail-dedicated GSM-based communication system is most concrete. GSM-R is currently being implemented in various parts of Europe. ERTMS is one outcome of European rail policies and aims at interoperable traffic management systems and towards Single Market in rail system supply. ERTMS co-operation includes all the major rail system suppliers. (www.ertms.com, read in 27.1.2005)

Environmental impacts of transport should be reduced. These impacts include air and land pollution, noise and side-effects (e.g. impacts on landscape). Accidents and congestion reduction also are

[4] Technical Specifications of Interoperability (TSI) present a kind of "architecture" for interoperable rail systems. The problem for example with TSI for telematic applications for freight is that in a single document different views on architecture are intermingled. Technical, organisational, business process and administrational views are all present in one document.

included in the policy agenda of the EU. The environmental and social policy aspects of transport are associated with competition and industrial policies since rail's increased market share, due to greater efficiency and customer-orientation, would thus have an impact on the environment. (See e.g. UIC and CER 2000)

External costs of transport are not restricted to environment and safety. Also the costs borne by the industry due to unreliable transport are considered external. Usually this element is included in "congestion" cost, but few analyses have been made concerning the impacts on entire supply chains of industries. Today's supply chains are international, often global, and thus the transport system reliability is having a drastic impact on Europe's competitiveness as a whole.

The European Commission is proposing a regulation on compensation in cases of non-compliance with contractual quality requirements for rail freight services. This proposal attempts to define the responsibilities of different parties (customers, railway undertakings, infrastructure managers, third parties) in case of freight service non-compliance. It redefines the current CIM annex to COTIF compensations in cases of non-compliance. It is argued that current CIM / COTIF agreements do not meet the demands of customers and the new market environment. To support this proposed regulation, a clear monitoring and verification system is needed - as well as tools to monitor and verify. (European Communities 2004)

Intelligent Transport Systems (ITS) are seen as one solution to optimize freight transport in terms of efficiency and minimum external impacts. ITS, by its definition, is a part of Europe's Information Society policies. One of the key areas of European ITS is more efficient management of freight fleet and transports. The applications vary from intelligent cargo vehicles to more efficient utilization of infrastructure and automatic identification of transport units. (Euroopan yhteisöt 2003, p 10)

As a part of industrial strategies, the European ICT industry, automotive industry, and especially road sector actors (authorities, consultants, service companies, etc.) have built a joint organization to promote activities beneficial to their business. Companies like Nokia, Ericsson, Siemens, Texas Instruments, Renault, Volvo, Volkswagen, Ford and Honda Motors, just to name a few, are present in this organization (ERTICO, www.ertico.com) which is actively participating and directing e.g. European framework research programmes. For the rail sector, such a multi-actor, multi-role promoting organization where rail system suppliers and developers would be present on a wider scale is lacking. From CroBIT's perspective, such an organization would be a catalyst for providing interoperable solutions across national borders, organizations and modes. The organization UNIFE (www.unife.org) is closest to this idea, but lacks a strong ICT involvement, authorities and expert services.

The road sector in Europe is also rapidly developing benchmarks and criteria for information services. The "minimum services" are listed by the TEMPO project (TEMPO Secretariat, 2003). The services are focused on real-time information and electronic/automatic transactions. The idea is to define the minimum common set of ITS services that contribute to the Common Transport Policy and create a dynamic level playing market field for different service providers and system suppliers.

The first steps are also taken at national levels to implement TEMPO's list of minimum services[5]. TEMPO minimum services list does not include freight or rail-specific services.

The eEurope 2005 Action Plan states that the interoperable e-business solutions should be made available for consumers and companies. Cross-border electronic transactions are underlined. Open standards, platforms, and source software are means to enhance interoperability. (Commission of the European Communities, 2002, p 15-16)

[5] Author's discussions, on different occasions, with representatives of the Ministry of Transport and Communications Finland during 2004.

3 Indicators for Policy and Strategy Implementation and Control

The policies and strategies, as they are implemented, need to be monitored and controlled by the political level management. For monitoring and control, some measurement and evaluation of performance is necessary. Measurement and performance evaluation can be done if indicators, parameters or sub-goals that can be used in measurement are available. Indicators may function at different levels: as aggregate level "macro-indicators" or a sub-set of disaggregated indicators. Policies and strategies both serve long-term objectives, the preferred state-of-the-world. Indicators show to what extent these objectives are achieved.

The table below shows how the policies and strategies are categorized, how different indicators are associated with policies and how indicators are disaggregated. Disaggregated "CroBIT Level" means that these indicators (benchmarks) can be directly compared to CroBIT project characteristics and CroBIT system functionalities. Only those indicators that are considered relevant are listed in the table – these represent a fraction of the total number of prospective indicators for different policies and strategies.

The logic of the table is as follows:

Column 1: The policy objective or policy theme that is relevant from CroBIT point of view, is identified based on policy and strategy overview.

Column 2: Policy or strategy for initiating steps towards the objective is identified, again subjectively selected based on policy overview

Column 3: The highest level of indicators are identified based on policy overview and strategy references and the authors' own assessment; these are the "macro-level" indicators

Columns 4: The disaggregated indicators that can be deduced from macro indicators and which are relevant for CroBIT are listed; these are the Level 2 indicators that should have a logical contribution to macro-level indicators

Column 5: Finally, the "CroBIT level" indicators are deduced from disaggregated indicators; these are indicators that one can expect the CroBIT project to contribute on; these indicators contribute to Level 2 indicators; these indicators should also be verifiable by CroBIT functionalities

It should be noted that all the indicator levels are not always necessary nor are all the prospective indicators listed. Also it should be noted that the analysis is heuristic and based on the authors' knowledge, experience and resources.

Objective / Theme	Policy / Strategy	Indicator; level 1	Indicator; level 2	Indicator; level CroBIT
Competitiveness and productivity of EU & Single Market & Information Society	Enhanced competition for intra-EU freight and cabotage	Increased volume of cross-border cabotage for rail freight	Availability of management tools for cross-border rail freight business (enabling new operators easier access to business and resulting in higher volumes)	Availability of cross-border business serving, off-the-shelf information systems for operators/RUs
		New operators for cross-border rail freight		Availability of cross-border information and traffic management systems for infrastructure managers
		Increased labor productivity in rail freight operations	Reduction of manual labor in freight and transport information management	Reduction of manual work for data entry, processing and operations planning
				More efficient event and exception handling possible
		Increased capital productivity in rail freight business	Increased rotation and utilization of vehicle and wagon fleet	Availability of cross-border business serving information systems for operators/RUs
		Increased quality of freight services to European industries	Ability to monitor and evaluate service performance	Availability of information on planned and realized ETAs for freight customers
	Interoperability of rail systems & Enhancing cross-border information services and	Non-stop border crossing	IM-IM information exchange and interoperable cross-border traffic management	Availability of cross-border information and traffic management systems for infrastructure managers
			RU-RU information exchange and interoperable IT systems for transport management	Availability of interoperable, freight information management systems for RUs

Objective / Theme	Policy / Strategy	Indicator; level 1	Indicator; level 2	Indicator; level CroBIT
	transactions	Common / interoperable technology and software platforms in use	TSI compatibility	TSI compatibility and/or off-the-shelf system components available
		Interoperability control mechanisms in place (ERA)		TSI compatibility
		ERTMS in place and functional		
	Enhancing Intelligent Transport Systems	Multi-actor and multi-role joint promotion of "ITS Rail"	Joint organization for "ITS Rail" promotion including ICT industry, vehicle industry, system suppliers, RUs, IMs	Launching projects that bring actors together and attempt to create knowledge and competence across the modes and industries
Sustainable development (= reducing environmental impacts and external costs + increasing safety and security of dangerous goods)	Enhancing rail freight and intermodal freight	Market share of rail freight increased	New business for cross-border rail freight operators	Improved customer service capabilities of international rail freight operators
	Improving reliability of supply chains within EU	No stops at the border & Transit / transport time reduction	Greater commercial speed of rail freight	Availability of cross-border information and traffic management systems for infrastructure managers
				Availability of interoperable, freight information management systems for RUs
			More efficient event and exception handling in rail traffic and transport management, i.e. tools for this are available	Real-time information available on freight movements and transport situation available for RUs and other operators

Objective / Theme	Policy / Strategy	Indicator; level 1	Indicator; level 2	Indicator; level CroBIT
		Ability to manage and control supply chains in exceptional situations		Real-time information available on freight movements and transport situation available for freight customers
	Reducing the risks of HAZMAT transports and enhancing security	Ability to monitor and control HAZMAT transports and security risk transports	Ability to trace cross-border transports in real time	Real-time information available on freight movements and transport situation available for IMs and authorities

4 CroBIT System Functionalities and Indicators

The CroBIT system design is aimed to be innovative in a number of ways, and attempts to provide a set of functionalities not available in other systems. CroBIT demo system has the following functionalities (CroBIT Delivarable D3, 2003):

- Ability to integrate both Railway Undertaking (RU) and Infrastructure Manager (IM) information into one platform[6].
- Ability to offer visibility on several different levels (i.e. consignment, wagon/container and train).
- Ability to provide Estimate Time of Arrival (ETA), trip/timetable monitoring and exception event reporting to the stakeholders.
- Ability to offer messaging support, translation services and data validation to ensure a high level of data quality.
- Ability to integrate existing application data, respecting the current capabilities of the stakeholders and making it easier to establish connections.
- Ability to integrate GPS information for non-automated transportation segments.
- Allows access of the final customer, based on negotiated authority levels.

Furthermore, the CroBIT demo system is described as follows (CroBIT Delivarable D3, 2003), showing compatibility with Technical Specifications for Interoperability:

> *"It is important to note that CroBIT has respected the recommendations as set forth in the TSI for content and data exchange principles. Although the TSI does not yet specify actual messaging formats, a data catalogue has been developed with corresponding message content defined."*
>
> *"The CroBIT data model developed in Deliverable 3 – Global System Architecture reflects the data definitions as defined in the TSI. These elements have been mapped into the current suite of messaging contained in this document."*

CroBIT demo system contains the following principles with regard to its functionalities (CroBIT Delivarable D3, 2003):

> *"The main principles of CroBIT functionality are as follows:*
> - *message input from various Partners (e.g. RU, IM, Fleet manager)*
> - *message input from GPS positioning devices*
> - *message conversion by the message broker into the CroBIT data format and forwarding to the core systems (i.e. Intelligrator and RailTrace) for processing*
> - *data processing in both core systems*
> - *HTML user interface via RailTrace (queries and responses)*

[6] This was the original plan and also referred similarly in the Technical Annex of the project. However, the scope was later changed and refocused so that infrastructure managers were not included in the demo system. In this section of the paper, we use the original planned scope but will take this scope reduction into account in the final assessment.

- *client software interface to automated customers (Webservice via Intelligrator)"*

We can summarize the previous principles list by associating the following aggregate functionality with CroBIT:

- Ability to receive and process information given in different data formats and from various typical technology applications.

From hereon, it is possible to benchmark the CroBIT demo system functionalities with CroBIT level indicators contributing to policies and strategies.

Indicator; Level CroBIT	**CroBIT Functionality corresponding to Indicator**
Availability of cross-border business serving, off-the-shelf information systems for operators/RUs	Ability to integrate both Railway Undertaking (RU) and Infrastructure Manager (IM) information into one platform
Availability of cross-border information and traffic management systems for infrastructure managers	Ability to integrate both Railway Undertaking (RU) and Infrastructure Manager (IM) information into one platform
Reduction of manual work for data entry, processing and operations planning & More efficient event and exception handling possible	Ability to offer visibility on several different levels (i.e. consignment, wagon/container and train). Ability to provide ETA's, trip/timetable monitoring and exception event reporting to the stakeholders. Ability to offer messaging support, translation services and data validation to ensure a high level of data quality. Ability to integrate existing application data, respecting the current capabilities of the stake-holders and making it easier to establish connec-tions. Ability to integrate GPS information for non-automated transportation segments
Availability of cross-border business serving information systems for operators/RUs	Message input from various Partners (e.g. RU, IM, Fleet manager) Ability to integrate both Railway Undertaking (RU) and Infrastructure Manager (IM) information into one platform
Availability of cross-border information and traffic management systems for infrastructure managers	Ability to integrate both Railway Undertaking (RU) and Infrastructure Manager (IM) information into one platform
Availability of interoperable, freight information	Ability to receive and process information given in different data formats and from various typical

Indicator; Level CroBIT	CroBIT Functionality corresponding to Indicator
management systems for RUs	technology applications
TSI compatibility and/or off-the-shelf system components available	Compatibility with TSI[7]
Launching projects that bring actors together and attempt to create knowledge and competence across the modes and industries	
Improved customer service capabilities of international rail freight operators Ability to monitor and evaluate service performance	Allows access to the final customer, based on negotiated authority levels
Real-time information available on freight movements and transport situation available for RUs and other operators	Message input from various Partners (e.g. RU, IM, Fleet manager) Ability to offer visibility on several different levels (i.e. consignment, wagon/container and train)
Real-time information available on freight movements and transport situation available for freight customers	Ability to offer visibility on several different levels (i.e. consignment, wagon/container and train) Allows access to the final customer, based on negotiated authority levels
Real-time information available on freight movements and transport situation available for IMs and authorities	Message input from various Partners (e.g. RU, IM, Fleet manager) Ability to integrate existing application data, respecting the current capabilities of the stakeholders and making it easier to establish connections.

In sum, CroBIT demo system functionalities correspond well to the disaggregated indicators for policies and strategies identifiable in Europe at present. Also the fact, that the demo system is based on existing systems in operation and use enhances the level of achievement.

[7] This was carried out by CroBIT in D3 but assessed also by an external expert, Mr Eldon Horsman from Horsman Group. The assessment report is part of CroBIT Deliverables.

5 CroBIT Project, CroBIT Demonstration Process and Indicators

The only point in the above analysis that was not covered by the CroBIT demo system functionalities was the point concerning projects that increase knowledge across organizational boundaries and modes of transport (the empty box on the right hand side of the table above). This is, of course, the process followed by the CroBIT project itself, which has to be evaluated against this indicator.

The CroBIT project consortium included a railway undertaking, a software company, two logistics IT consultants (one an IT arm of a large railway undertaking), a transport consultant, an intermodal operator and researchers as well as an international rail organization. Taken all together, a variety of competencies and knowledge has been built up. Later, another railway undertaking joined the project for system demonstration purpose. So the project in itself responds sufficiently well to this indicator.

The demonstration process revealed, however, a serious lack of interest from European railway undertakings' side. This shows that the implementation of policies and strategies as they were carried out in CroBIT is not functioning well. Something is missing in the way that attempts are made to bring forth and implement new ideas and systems. One possible explanation is that motivational drivers and restrictions are not taken into account sufficiently. New systems' demonstration and trials can be very large and demanding operations especially when multiple actors need to co-operate, negotiate and agree on common efforts. This requires time and money, both of which seem to be scarce in freight transport business. Also conflicting interests in the competitive environment restrict organizations' co-operation possibilities, even if co-operation would make economic sense.

Indicator; Level CroBIT	**CroBIT Functionality corresponding to Indicator**
Launching projects that bring actors together and attempt to create knowledge and competence across the modes and industries	CroBIT project and demonstration process.

6 Qualitative and Quantitative Assessment

Part of the impacts, both positive and negative, that result from CroBIT can be assessed more or less quantitatively, but most of the assessment is presumed to be qualitative. This section focuses on the logic and argumentation as to which type of assessment is feasible. Impacts per identified indicator are each discussed separately and the feasible assessment alternative is decided upon. Each row of the indicator-functionality table is shown in its turn followed by the discussion and argumentation.

Indicator; Level CroBIT	CroBIT Functionality corresponding to Indicator
Availability of cross-border business serving, off-the-shelf information systems for operators/RUs	Ability to integrate both Railway Undertaking (RU) and Infrastructure Manager (IM) information into one platform

This is basically binary indicator[8] so we can either answer the question "yes" or "no" as to whether there is an off-the-shelf information system available for operators and RUs. In the final assessment, however, the answer is not that straightforward. CroBIT is available, but not perhaps directly off-the-shelf as such. But with reasonable effort, interested RUs are able to integrate information into the CroBIT platform. So we can reason that we are able judge that CroBIT's answer to the indicator is more on the "yes" side than on the "no" side.

Indicator; Level CroBIT	CroBIT Functionality corresponding to Indicator
Availability of cross-border information and traffic management systems for infrastructure managers	Ability to integrate both Railway Undertaking (RU) and Infrastructure Manager (IM) information into one platform

This indicator-functionality relationship is identical to the one above. However, during the project the CroBIT demo system functionalities were restricted to RU information thereby excluding IMs from the demo. Therefore, the CroBIT as its present form does not contribute to this indicator.

Indicator; Level CroBIT	CroBIT Functionality corresponding to Indicator
Reduction of manual work for data entry, processing and operations planning & More efficient event and exception handling	Ability to offer visibility on several different levels (i.e. consignment, wagon/container and train) Ability to provide ETA's, trip/timetable monitoring and exception event reporting to the stakeholders. Ability to offer messaging support, translation

[8] Binary indicator receives values 0 or 1, "yes" or "no", "true" or "false". ("The last mentioned indicator values are also logical values and thus used for logical indicators).

Indicator; Level CroBIT	CroBIT Functionality corresponding to Indicator
possible	services and data validation to ensure a high level of data quality. Ability to integrate existing application data, respecting the current capabilities of the stake-holders and making it easier to establish connec-tions.

CroBIT is offering increased visibility so the contribution to higher efficiency is evident. The magnitude of the impact is harder to assess. However, a rough approximation can be derived. This is explained in detail in Appendix 1. With the help of studies related to this issue and based on simple assumptions, it can be said that net benefits of these functionalities are substantial and thus the contribution to policies is absolutely significant. But it has to be remembered that benefits accrue over a long period of time and are directly dependent on how well CroBIT (or similar systems) can penetrate the user (RUs, freight customers, other operators) market.

Indicator; Level CroBIT	CroBIT Functionality corresponding to Indicator
Availability of cross-border business serving information systems for operators/RUs	Message input from various Partners (e.g. RU, IM, Fleet manager) Ability to integrate both Railway Undertaking (RU) and Infrastructure Manager (IM) information into one platform

These indicator-functionalities and their impacts are assumed to be identical to the previous section. It is assumed that there are no additional impacts over and above the previous estimates.

Indicator; Level CroBIT	CroBIT Functionality corresponding to Indicator
Availability of cross-border information and traffic management systems for infrastructure managers	Ability to integrate both Railway Undertaking (RU) and Infrastructure Manager (IM) information into one platform
Availability of interoperable, freight information management systems for RUs	Ability to receive and process information given in different data formats and from various typical technology applications

These indicator-functionalities and their impacts are assumed to be identical to the previous section. It is assumed that there are no additional impacts over and above the previous estimates.

Indicator; Level CroBIT	CroBIT Functionality corresponding to Indicator
TSI compatibility and/or off-the-shelf system components available	Compatibility with TSI
Improved customer service capabilities of international rail freight operators Ability to monitor and evaluate service performance	Allows access to the final customer, based on negotiated authority levels
Real-time information available on freight movements and transport situation available for RUs and other operators	Message input from various Partners (e.g. RU, IM, Fleet manager) Ability to offer visibility on several different levels (i.e. consignment, wagon/container and train)
Real-time information available on freight movements and transport situation available for freight customers	Ability to offer visibility on several different levels (i.e. consignment, wagon/container and train) Allows access to the final customer, based on negotiated authority levels

These indicator-functionalities and their impacts are mostly identical to the previous section. However, one can expect that the ability to monitor and evaluate service performance will have a significant impact on RUs performance because of the obvious management incentives. A stack of evidence exists that once performance is adequately evaluated, the behaviour of individuals and organisations change (see e.g. Emmanuel *et al* 1995). This impact cannot be estimated reliably, though, within the scope of this analysis.

Indicator; Level CroBIT	CroBIT Functionality corresponding to Indicator
Real-time information available on freight movements and transport situation available for IMs and authorities	Message input from various Partners (e.g. RU, IM, Fleet manager) Ability to integrate existing application data, respecting the current capabilities of the stakeholders and making it easier to establish connections.

CroBIT's potential functionalities of making the management and control of dangerous goods more efficient and more on real time would significantly reduce the risk of serious accidents and improve the reaction time in case of accidents or security endangering acts. However, CroBIT's reduced scope does not directly contribute to this benefit and policy objective.

The assessment of CroBIT process (the project carry-out) and its contribution were verbally assessed in chapter 5. One could say that the project is one small step towards policy goals, such that can be reasonably expected from one individual project.

7 Overall Assessment, Sum-up

The overall contribution to European Common Transport Policy - bearing in mind that we are looking at one single project - of CroBIT is good. The main explanation is that since CroBIT realizes TSI / TAF requirements to a reasonable extent and because the benefits of TSI / TAF are substantial, the end result for CroBIT is very positive. The project idea was sound, based exactly on policy targets.

As to successfulness of the process (carry-out of CroBIT project), the lack of larger scale *in situ* demonstration is a minus for the project, although the basic idea of the project remains intact. Therefore, the true proof of CroBIT's benefits is based on reasoning and logic, and not so much on witnessed empirical experiences. Whether one weighs more the former (reasoning) or the latter (experiences) does not deteriorate the need for CroBIT project. From demonstration viewpoint this is a clear deficiency.

We should distinguish at least the following scenarios when assessing the contribution of CroBIT for European policies and strategies:

- CroBIT as it stands right after (and during) the project
- CroBIT as it could be after some time and further efforts
- CroBIT's full potential (full-scale and wide implementation).

The previous parts of the contribution analysis assumed the last scenario.

CroBIT's reduced scope, i.e. leaving out the infrastructure managers' functionalities, somewhat diminishes the contribution. However, TSI / TAF benefits are mainly directing to RUs and freight customers and thus this reduction of scope is not perhaps so decisive.

The sum-up table for CroBIT's (as a system providing functionalities) contribution with different scenarios is shown the next page. The assessment is verbal, without any specific scaling. When looking at the table, it has to be remembered that CroBIT project's inability to implement and demonstrate the system was because of external reasons – mainly the reluctance of RUs to provide the information necessary for demonstration. Therefore, a fair assessment lies "between" the first two scenarios: "CroBIT as it is" and "CroBIT as it could be".

CroBIT process from different viewpoints is also shown on the next pages.

Policy / Strategy	CroBIT in different scenarios; level of contribution		
	CroBIT as it stands	**CroBIT as it could be**	**CroBIT's full potential**
Enhanced competition in intra-EU freight and cabotage	**Moderate**	**Good**	**Very Good**
Interoperability of rail systems	**Good**	**Very good**	**Excellent**
Enhancing cross-border information services and transactions	**Moderate**	**Good**	**Very good**
Enhancing Intelligent Transport Systems	**Not particularly significant**	**Moderate**	**Good**
Enhancing rail and intermodal freight	**Moderate**	**Good**	**Very good**
Improving reliability of supply chains within Europe	**Moderate**	**Very good**	**Excellent**
Enhancing safety and security	**Poor**	**Very good**	**Excellent**

Viewpoint	Assessment of CroBIT's contribution
CroBIT process as contributor to policies and strategies	**Very good** – mainly because the difficulties encountered by the project showed pitfalls in the policy/strategy implementation. Whether these pitfalls are "visible" or "hidden" is outside the scope of this assessment. Nevertheless, the CroBIT process gives indication that there is a need to consider HOW we are trying to achieve transport and rail policy goals in Europe.
CroBIT's ability to proof the benefits	**Moderate** – all the studies and logic shows that substantial benefits exist. However, larger scale demonstration was not enabled.
CroBIT's identified benefits	**Very high** – and most of it is directing to RUs and freight customers.
CroBIT's realised benefits	**Poor –** the project was unable to realize any visible benefits.
CroBIT process as a catalyst for larger scale implementation of CroBIT or similar systems	**Moderate** – CroBIT was discussed in many occasions and venues and it surely was not unnoticed; however, an eagerness to employ CroBIT seemed to be lacking.

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Appendix 1:

Assessing the impacts of CroBIT's functionalities:

- Ability to offer visibility on several different levels (i.e. consignment, wagon/container and train).
- Ability to provide ETA's, trip/timetable monitoring and exception event reporting to the stakeholders.
- Ability to offer messaging support, translation services and data validation to ensure high level of data quality.
- Ability to integrate existing application data, respecting the current capabilities of the stakeholders and making it easier to establish connections.

ECORYS & VTT & SCI (2004, p 58) identified the following items in TSI Telematic Applications for Freight (TSI / TAF):

1. **Consignment Note data** (All information needed to carry a consignment from the consignor to the consignee);
2. **Path Request** (Main path data: identification (path number), departure and destination points, journey description);
3. **Train Preparation** (For the preparation of the train, the RU must have access to the infrastructure register, to the dangerous goods reference file, to the technical wagon data and to the current, updated information status on the wagons. This refers to all wagons on the train. At the end the RU sends the train composition to the next RUs and to all IMs with whom he has booked a path section.);
4. **Train Running Forecast** (The messages which must be exchanged during the normal running of a train);
5. **Service Disruption Information** (If the train is cancelled the relevant IM issues a message to the neighbouring IM and to the path contracted RU);
6. **Train Location** (The tracing possibility to get information about train location);
7. **Wagon Movement. Interchange reporting** (This information is based on storage and updating of trip plans and wagon movements information. This is done at the RU /LRU level. IMs monitor trains. The wagon related ETA and ETI are also the basic information exchange between the LRU and involved RUs);
8. **Data Exchange for Quality Improvement** (To be competitive the European Railway Industry must deliver service quality to its customers. LRUs, RUs and IMs must measure the quality of service components that in total make up the product delivered to the customer. It is based on messages that are used in all phases of service.);
9. **Infrastructure and Rolling Stock Registers**. (The infrastructure register will cover the general description of the line and details of line segments for both the conventional and high-speed network. The rolling stock register shall contain all items for its identification, assessment of its compatibility with the infrastructure, loading characteristics, brake characteristics, maintenance history, and environmental characteristics.);
10. **Various Reference Files** (Files which are necessary to run freight trains in Europe)
11. **Electronic Transmission of Documents** (Description of the communication network to be used for data exchange);
12. **Networking & Communication** (There are hundreds of stakeholders (Participating actors) which are co-operating & competing in rail freight business in Europe. To support this community a common Information Exchange Architecture is necessary).

CroBIT functionalities in question clearly can be associated at least with TSI / TAF items no 1, 6, 7, 8 and 12 out of the total items, i.e. about 40% of items. The biggest impacts of TSI / TAF concern railway undertakings and freight customers and other operators due to time savings at borders. Altogether, these savings yield to total of approximately 15 billion EUR when TSI / TAF are fully

implemented (ECORYS & VTT & SCI, 2004, p 69). The total net benefits of TSI / TAF yield to 18 billion EUR, including benefits for other stakeholders and external parties. A very rough estimate then would be, assuming that CroBIT could contribute e.g. 10% to TSI / TAF that the benefits for RUs and freight customers and other operators would be in the neighbourhood of

0.1 x 15 000 million EUR = 1 500 million EUR

This figure assumes 100% full-scale implementation throughout Europe (EU 25). The level of usage and penetration of CroBIT is somewhat linearly correlated with achievable benefits because the fixed costs of CroBIT are not assumed to be significant at the wider perspective (i.e. EU 25). As far as marginal net benefits are concerned, when fixed costs are noteworthy the level of usage and penetration are crucial in the realisation of benefits. For example, an analysis of benefits of Finland's PortNet system showed that in order to achieve net benefits required approximately 90% or more usage level (Hautala *et al*, 2003). After that penetration level, the benefits started to accrue, applying normal net present value calculations. This analysis was done in the context of one country only.

For CroBIT to achieve net marginal benefits, we can assume, being fairly sure on the safe side, that if CroBIT is used by two moderate size RUs for all their international traffic, net marginal benefits are positive. And after this, the more CroBIT is used, the greater the benefits.

In sum, the benefits of CroBIT (or similar systems) in this respect can be expected to be substantial, even based on elementary mathematics. It is a question of hundreds of millions of euros, in minimum, for the European Union's RUs and their customers.