

ASSESSING TRANSPORT INFORMATION SYSTEMS POLICIES: A FRAMEWORK

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SUMMARY

The integration of information and communication services in transport can be a powerful opportunity to achieve a EU or Common Transport Policy. To ensure maximum benefit from these opportunities offered by information and communication services there is a need to create the conditions for adequate and widespread use of these services in transport. To support policy makers in the identification of policy requirements, i.e. necessary policy actions and measures, a policy assessment framework has been developed and applied. The framework is based on a 'stagist' model in which the analysis of complex relationships between transport, information technology and policy is split into ten steps. In each step the framework addresses the most important aspects and mechanisms to be taken into account when defining policy for the integration of information and communication services.

1. INTRODUCTION

Information and communication services can contribute significantly to a safe, efficient and effective transport system¹. Through these services users will receive more reliable, complete and up to date information, allowing them to improve or extend current transport operations and processes. To ensure maximum benefit from the opportunities offered by information and communication services, conditions for adequate and widespread use of these services in transport have to be created. From a policy perspective, integration of information technology (IT) and transport can be seen as an instrument that the national government can use to achieve objectives of

¹ In this paper, the transport systems refers to all facilities (infrastructure, equipment), organisations and services used for provision of mobility of people and goods. It includes all modes of transportation.

the transport policy. In the TRANSINPOL-project, funded by the European Commission for DG VII², conditions for such an approach were assessed.

The identification of the needs for favourable conditions and defining effective policies is, however, difficult because of the following factors (TNO et al., 1999):

- The pace of development of information technologies is very high: there is gap between state-of-the-art IT and the level of IT used by the transport sector;
- There are many actors and stakeholders in the transport sector as well as in the IT-industry: there is no powerful actor forcing other actors into a specific direction;
- Most of the developments in information and communication technology take place outside the transport sector and can hardly be influenced;
- The conditions should not only fulfil current needs of specific actors or systems in the transport sector, but also should contribute to a more efficient and effective transport system in the long term and therefore also assist future transport policies and options.

In the recent literature on policy analysis of transport and IT two basic approaches can be observed. In the first approach, impacts of different IT applications on safety, efficiency and the environment are evaluated. This research is technology-oriented and focuses on legal and institutional issues and societal objectives that have to be met by these applications (Caubet et al., 1997; ECMT, 1996, 1995^a, 1995^b; Guerri and Marcolongo, 1997). In the second approach, transport policy and IT are analysed from a micro-economic perspective (Emmerink and Nijkamp, 1999, 1995; Verhoef and Bergh, 1995). In this approach, abstract micro-economic pricing and decision models are used to analyse the role of information in transport.

Our contribution to the policy analysis of transport and IT is a systematic approach to the policy analysis of transport and IT. In this way knowledge *of* the policy-making process of IT in transport is developed by introducing a conceptual framework (Dunn, 1994; Lasswell, 1970). This framework addresses the most important aspects and mechanisms to be taken into account when defining policies for the integration of information and communication services from a transport perspective. Basis for this framework is a 'stagist' model in which the policy making process is divided up in several steps or stages (Easton, 1965; Parsons, 1995).

The framework has been developed and applied in the TRANSINPOL-project (TNO et al., 1999). By applying this framework, the most pressing policy requirements have been identified. The aim of this paper is to discuss the elements of the framework. The outline of this paper is as follows. First, the theoretical background of 'stagist' models and their use for transport policy is discussed. Second, the conceptual framework and its components are presented. Third, the multiplicity of relations between transport, information technology and policy are analysed. Then, the application of the

2 The TRANSINPOL-project was a Strategic Research Project within the 4th Framework Programme of the European Commission. Strategic Research is one sector of the Transport Research and Technological Development Programme of the European Union. The goal of this sector has been to develop an analytic capability to support the Commission's long and short term policy development processes.

framework in the TRANSINPOL-project is discussed. Concluding remarks are presented in the final section.

2. THE STAGIST APPROACH TO POLICY ANALYSIS

The major purpose to develop a conceptual framework for policy assessment is to give insight on the one hand in the drivers of the integration of IT in transport, and on the other hand how integration can be influenced by the public sector and in particular by the EU. For this purpose, a classic tool from the field of policy analysis, the 'stagist'-approach, is used in this study. This approach views the policy-making process as composed of a series of steps or sequences (Easton, 1965; Parsons, 1995). The major strength of the stagist framework is its possibility to reduce complexity to a manageable form. This reduction is necessary because a transport information systems policy has to consider wider contexts of problems, social processes, values and institutions within which policy-making and policy analysis takes place. For that reason, the theoretical starting point for developing a framework for a transport information systems policy is the multidisciplinary, contextual 'stagist' approach.

The 'stagist' approach analyses policy in terms of a process beginning with an objective setting activity. The next step is to identify an exhaustive set of alternatives that can attain the policy goal. Once a set of alternatives has been selected, each alternative is evaluated as to how well it meets the policy objective or satisfies social requirements. Given the cost (time, money, energy, etc.) and effectiveness of the alternatives, it is then necessary to evaluate the barriers of the implementation of the alternatives. The results should provide the policy-maker with a full range of possible means for achieving a defined social goal and estimates of the feasibility of implementing the alternatives (Baker et al., 1975).

Despite the fact that this dominant framework of policy analysis has been heavily criticised, the rational decision-making or stagist approach continues to be the basis for the analysis of policy processes (Parsons, 1995). Critics argue that the stagist model creates an artificial view of policy-making (Sabatier and Jenkins Smith, 1993). The real world, critics maintain, is far more complicated and not composed of tidy, neat steps, phases or cycles. It is clear that the stagist model is an abstraction of the policy analysis and development process. Breaking down the making of transport policy into phases, which begins with defining needs and objectives and end with implementing and evaluating, may well be to impose stages on a reality that is infinitely more complex (Parsons, 1995). However, the idea of analysing policy-making in terms of the 'stagist framework' is not without its advantages. The strength of this framework is that it affords a rational structure within we may consider the multiplicity of reality.

3. A FRAMEWORK FOR ASSESSMENT OF TRANSPORT INFORMATION SYSTEMS POLICIES

An outline of the 'stagist' or conceptual framework as it has been developed in TRANSINPOL is shown in Figure 1. The objective of the framework is twofold. On

the one hand the framework provides an overview of the factors and elements that influence the integration of information and communication services and to provide insight in the relation between these factors. On the other hand it indicates from what points of view a policy maker can approach these relations in order to identify policy requirements.

The framework makes a distinction between the strategic issues related to the integration of IT in transport opposed to the more or less operational issues.

Steps one to six in Figure 1 take into account the first part of the framework: long term needs of the transport system and technological trends to identify the needs for integration and the opportunities offered by the integration. From these steps a set of services and technologies that are relevant for the transport sector follows.

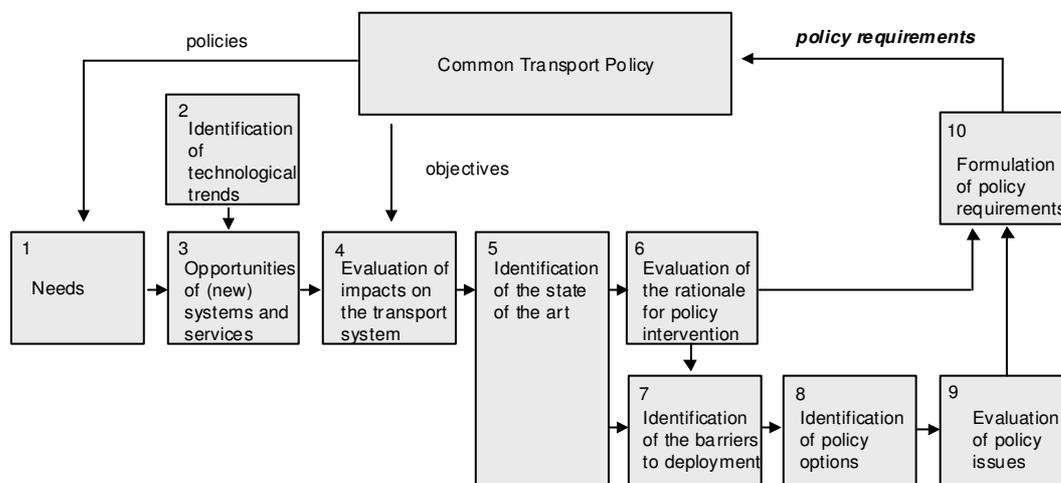


Figure 1: The ‘stagist’ assessment framework

Steps seven to ten of Figure 1 focus on creating the service environment facilitating the integration of these services and systems in transport. The advantages, drawbacks and limitations of policy options and instruments have to be evaluated and compared. Because barriers are in many cases related to each other and policy options may affect various actors, a complex set of impacts and interrelations gives rise to major evaluations, dilemmas and trade-offs that have to be considered by policy makers. The evaluation of barriers, options and policy issues results in operational policy requirements. These requirements specify the need for policy intervention to ensure that the impacts of the integration contribute to the achievement of the CTP objectives. In other words, the focus in the second part of the framework is on the question how the use of these services and technologies can be stimulated

4. TRANSPORT, IT AND TRANSPORT POLICY

The framework developed in TRANSINPOL is based on the main elements for policy assessment in the field of transport information and communication technologies and relationships between them. These elements and relations are discussed in this section.

The following five main elements have to be considered by policy makers in the field of transport information and communication technologies (TNO et al., 1999):

- *the transport sector*, characterised by a wide variety of actors and markets. Each group of actors has typical needs for integration of information and communication technologies, that results from the objectives of the actors and the dynamics of the markets in which they are operating.
- *information, communication and navigation technologies*, the development of these technologies is generally driven by non-transport markets, resulting in new generic products in terms of systems or services which can be used directly or indirectly for transport purposes. Trends in availability, performance, reliability, costs, sustainability and basic functionality of these technologies are of particular importance for the assessment of policy requirements.
- *generic transport telematic services* group together telematics systems and services that have the same transport functionality. All possible services are reduced to seven categories of generic transport telematic services (see Figure 2). Approaching the subject through services is considered to be an important step, since it emphasises functions and actors instead of technologies.

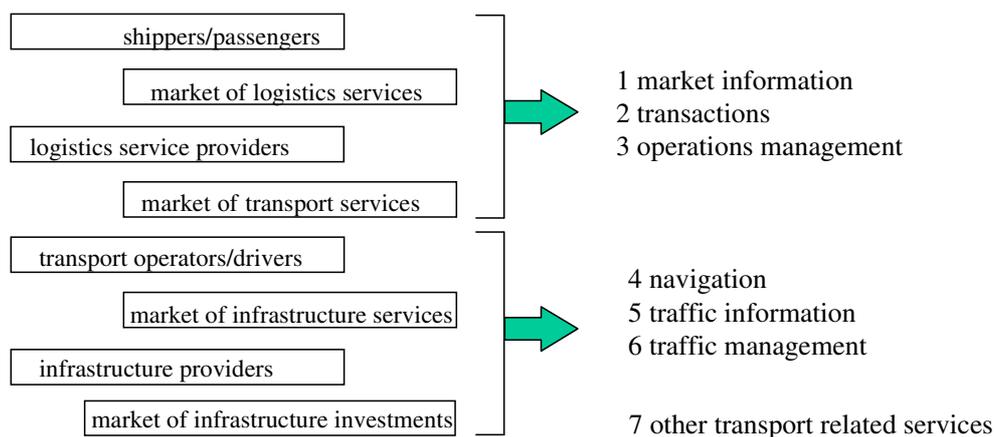


Figure 2: Generic Transport Telematic Services

- *Common Transport Policy (CTP)*: the relevance or impact of the integration of information and communication services is determined by evaluating the contribution to the CTP objectives safety, efficiency and sustainability.
- *Integration*: integration is defined as the introduction and wide spread use of information and communication services, systems and technologies in transport. Integration can be defined at two levels: technology integration, i.e. how can new technologies be used to improve existing services or develop new ones, and deployment, i.e. the use of these services by actors in transport

The five elements are correlated. Changes or developments occurring in one element will generally impact the other elements. It is therefore essential for the assessment of policy requirements to be aware of what is going on in these elements, to capture signals indicating changes and to consider the relations between these elements. The relations that need to be considered are:

- IT trends and developments;
- needs of the transport system;
- information needs of actors;
- opportunities for new services;
- barriers to deployment;
- state of the art;
- policy options and policy issues;
- impacts or contribution to the CTP.

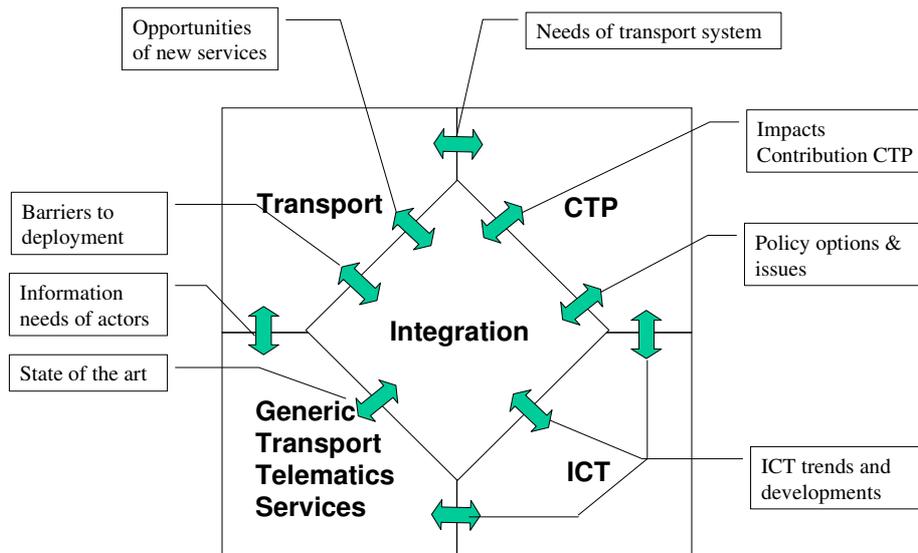


Figure 3: Important subjects and relations

The main issue for policy makers is how to deal with relations between these elements. For that reason, these relationships are the basis of the policy assessment framework (compare Figure 1 and 3). Policy makers have two major tasks to fulfil. First, what services and technologies used are relevant for the transport sector and second, how can the use of these services and technologies be stimulated. In a complex environment with many actors and many fast and simultaneous developments policy makers need a tool to help them to gather and structure the relevant information in each step of the policy development process.

5. APPLICATION OF THE FRAMEWORK

Apart from this more methodological approach the TRANSINPOL-project also identified actual themes, that are relevant for the current policy making at the EU level. Thus the framework has been applied to several important areas for policy attention. These topics were identified and prioritised during the TRANSINPOL workshops and a survey (FDC et al., 2000) (see Figure 4). In the survey, 700 questionnaires have been distributed among experts on IT in transport in Europe. These experts include policy makers, transport operators, IT services and industry. In total 132 respondents have returned the questionnaire.

Areas for policy attention	Survey score
▪ Integration of information services between transport modes and transport operators	3.53
▪ Use of information and communication services to influence mobility behaviour	3.47
▪ Exchange of data between different types of transport information services	3.38
▪ Use of IT in optimisation of infrastructure utilisation, i.e. traffic management	3.33
▪ Harmonisation and standardisation	3.11
▪ Information Society as major influence on the dynamics in transport demand patterns	3.08
▪ Use of IT for transport safety	3.00
▪ Shared use of communication services, technologies and platforms	2.93
▪ Implementation of policies and the timing of policy actions	2.81
▪ Integration at the application level, development of commercial services and human machine interfaces	2.74
▪ High level architectures, harmonisation of information services	2.55
▪ Geographical boundaries, areas, networks etc., i.e. coverage, regions, locations	2.51

Figure 4: Prioritisation of twelve areas for policy attention

The conceptual framework was used to define what needs have to be addressed within each of the above-mentioned area for policy attention. As an example, we will apply the framework developed to the most important area of polic attention according to the survey: *Integration of information services between transport modes and transport operators*.

- Step 1 *Need*: Realise co-operative undertakings where there is an apparent benefit for a whole mode or transport chain, not only to offer seamless transport services to passengers and freight, but also to improve efficiency of transport processes. Apart from market information, it will require exchange of information on related to transport operations (capacity of resources and equipment).
- Step 2 *Technology Trends*: Data exchange standards and formats (e.g. EDIFACT, Internet-technology); group decision tools; advanced simulation and modelling tools.
- Step 3 *Opportunities*: Tools to organise and monitor the shared use of resources and equipment; tools to exchange information relevant to integrate or link business processes in different organisations with each other; tools for objective quality control and quality management along transport chains; tools that can model co-operative undertakings and demonstrate the benefits through simulation; knowledge bases of successful co-operative undertakings (best practice).
- Step 4 *Impacts*: Improvement of chain performance and reduction of costs of non-quality in particular in intermodal and public transport; increased attraction, performance and scale of intermodal and public transport operations.

- Step 5 *State of the art*: Integration of services is extremely rare to find in fragmented transport chains and industries where there are no clear problem owners and no powerful actors.
- Step 6 *Rationale of policy*: An increase in the efficiency and reliability of intermodal transport chains is an important objective of the CTP. Disability of individual firms to initiate co-operation with others, be it due to a lack of experience or a lack of resources that are needed to prepare a co-operation initiative.
- Step 7 *Barriers*: Accommodation of interests is difficult in non-win-win situations; lack of powerful actors; lack of connectivity; lack or degree of diffusion of advanced IT.
- Step 8 *Policy options*: Stressing and demonstrating the benefits of co-operation. Provide forums and tools to initiate co-operative ventures. Provide co-operation facilitators (neutral third party that identifies opportunities for co-operation, assesses the scope for co-operation, initiates and manages the co-operation building process). Provide methodologies for the accommodation of interests in co-operative ventures.
- Step 9 *Policy issues*: Position of small and medium sized enterprises (SME's); balance between competition and co-operation in transport markets
- Step 10 *Operational policy requirement*: Need for policy to create incentives or support initiatives for co-operation between operators, especially in a deregulated and competitive environment, contributing to enlarged synergy and interoperability between transport services. Other operational policy requirements are standardisation of terminology and technology, harmonisation of transport services and quality levels, rules for liability and responsibilities in chains.

6. CONCLUSION

The objective of the European Commission is to establish and maintain an efficient, safe and sustainable transport system. The rationale to define policies for the integration of information and communication services in transport at the EU level is to ensure that collective needs from a transport or societal perspective, that can not be fulfilled by the various actors in transport and IT industry themselves, are addressed. Policy should provide guidance to long term developments and investments in transport as well as in information and communication services. The identification of necessary policy actions and measures, however is not possible without a good understanding and overview of all relevant aspects of the integration of information and communication in transport.

For that reason, a framework for transport information systems policies has been developed in this study. At the one hand this framework stimulates a common vision to prevent reluctance of investment and innovation because actors wait for initiatives taken by others. At the other hand such a framework is needed to stimulate responsibility for long-term, collective, i.e. societal goals. Basis for the transport policy framework as developed in TRANSINPOL has been a 'stagist' model in which the policy making process is divided up in several stages. The strength of this approach is that it affords a rational structure within we may consider the multiplicity of reality. The framework developed deals with the interdependencies between user needs with respect to IT deployment in transport, the Common Transport Policy

formulated by the European Commission, the techno-economic opportunities of IT to fulfil the user needs, the barriers to IT deployment, and the policy issues aimed at removing or diminishing perceived barriers.

The value of the stagist approach to the process of policy making is the systematic identification and structuring of the various steps in the formulation of transport policies. It supports policymakers in identifying relevant information for each step. It also facilitated a systematic inventory of relevant issues. Although we realise that the framework described in this paper is rather generic and policy makers have to make a translation to his own specific situation or circumstances, experiences in the TRANSINPOL-project prove the functionality and value of the framework. When users recognise the generic principles presented by the framework and the specific characteristics of their own situation, the framework provided a basis to identify and to evaluate other lines of thinking and new options.

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