MAIN ACTIVITIES IN LATVIAN TRANSPORT SECTOR OF THE INTELLIGENT TRANSPORT SYSTEMS PROGRAMS

The Integrated Model of Information Infrastructure for National Multimodal Transit Transport System

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Beneficial geographical location of Latvia in the point of European transit crossroads (East-West and North-South directions) activated intensive development of the Latvian transport system. Information infrastructure is one of the major components of the national transportation R&D plan. Topic identified for priority attention includes the following: concept of Intelligent Transportation System (ITS); integrated model of transport information and statistic systems; intermodal modeling and simulation tools, such as ITS-oriented planning. The problems of development and validation of the new models and simulation tools for multimodal transit transport system are discussed.

1. Introduction

The creation of a united European transport market without restrictions or barriers to access, based on harmonized conditions of competition, is becoming one of the principal objectives of common transport policy in Europe.

Today's traditional understanding of "travel" and "transport" is changing rapidly mainly by the evolution of the information society. The use of information technology to replace the need for physical movement of people and goods can be called "virtual transportation", and the potential of its existence calls for everyone engaged in transportation, in both the public and private sectors, to take into account when preparing future plans.

The "intelligent" use of transport systems and the development of the Trans-European Networks open the way for the implementation of information and telecommunication technologies in the field of transport to support the goal of sustainable mobility. The so-called Intelligent Transport Systems (ITS) or transport telematics applications, including navigation systems and related services, make use of technology to improve the movement of people and goods. They offer significant opportunities in terms of increased transport efficiency, better safety, improved comfort for travelers and less pollution for the environment.

Beneficial Latvian Republic geographical location in the point of European Transit crossroads East-West and North-South directions activated intensive development of the Latvian Transport infrastructure.

In the recognition that a modern transport system is of exceptional national an economic importance, the Latvian government has elaborated the National Transport Development Program (1996-2010) [1]. This program contains the main strategic guidelines for the planning of an efficient transport system to satisfy the continually growing demands of the national economy.

Among the main tasks for reaching this goal are:
- development of international transport operations (export, import, transit);
- development of freight terminals, establishment of freight distribution centers and warehousing,
- cooperation between them and development of logistics;
• development of intermodal modeling and simulation tools, such as ITS-oriented planning and impact assessment models, management and control algorithms for total system optimization; development of education and science in the field of transport.

Intermodal transport is objectively at the meeting-point between technological and organizational systems. Many questions such as development of transport corridors, transport logistics and telematics, development of transport terminals and so on closely linked to the problem of intermodalism. These problems are often discussed in different ways even at the level of the terminology used. At the same time each group of researchers, as well as any department or company ordering development work, see only that part of the problems which directly concerns it or which it is more familiar with.

Therefore we suggested that the first and essential step towards scientific cooperation in the field of ITS-oriented intermodal systems might be a precise structuralization of the problem, picking out individual strands, tasks and sub-tasks, and bringing the conceptual setup and terminology into the line.

2. System approach for the design of information infrastructure model for the multimodal transport system

For the decision of this global task of coordination the Latvian Transport Development and Education Association (LaTDEA) was established. It is non-governmental, non-profit organization under Latvian Legislation. The members of the Association are:
• Riga Aviation University;
• Latvian Maritime Academy;
• Riga Technical University (Railway Institute, Automobile Department, Road Building Department), Latvian Agriculture University (Transport Department);
• Transport enterprises representatives (Latvian Air Navigation Service, Latvian Railway State Company, Riga Commercial Sea Port, Ventspils Commercial Sea Port and others).

LaTDEA coordinates research and educational programs in Latvian transport area in accordance with the Agreement between Association, Latvian Ministry of Transport and Latvian Ministry of Science and Education.

The main activities of the Association are:
• preparation of concepts and strategy of education and training;
• assistance in transport training centers development;
• promotion of fundamental and applied transport research projects, cooperation with national and international institutions in order to:
  a) promote the development of the Latvian transport system and it's integration into the international transport network;
  b) assist in adaptation to international standards, practices and new technologies;
• promotion of international (export, import, transit) transport, development of transport corridors and multimodal transport.

The R&D under Association are sponsored by special grant of Latvian Council of Science named "Optimization of Latvian Transport System" (1997-2002).

LaTDEA is the general executor of this research. The final goal of the program is development of “intelligent” national transport system in Latvia.

Three main directions of this optimization program have a highest priority:
• Transport Information Systems, Transport Telematics and Logistics,
• Transport Quality Management Systems,
• Harmonization of Transport Science and Education.

The first direction is the most interesting in the context of this paper. The research and development activities of this direction are [2]:

Information Technology - to develop models of transport integrated information and statistic system that could enable to provide all transport service providers and customers with operative information, that could enable all transport related institutions and organizations to utilize these data in analyzing, planning, forecasting and making decisions with regard to transport operations.

Traffic Engineering - to develop predictive models for better traffic management and traffic safety.

Infrastructure Management - to develop management decision-making models for local application and to identify new conditions suitable for the development of transport network in Latvia.
Transportation Systems and Logistics - to develop analytical models for analysis and design of logistics and transportation systems, with special focus on container terminal operations, warehousing and distribution center management.

Vehicle Routing and Scheduling - to improve productivity in the transportation industry by means of developing computer models and software packages, and promoting their application in solving transportation problems.

Information infrastructure is a major component of the above mentioned factors. The design process of information infrastructure model for multimodal transport system may be presented by five-level hierarchical structure:

1. **1 level** - the system concept for general model of integrated transport information infrastructure. (The development of appropriate system approach in modeling will be a key topic of research and linked with the areas of investigation mentioned above to ensure harmonized models and methodologies at the state level);

2. **2 level** - the development of external scenarios and models to describe the causal relationships between external factors and mobility and for presentation of mobility patterns, transport flows and scenarios;

3. **3 level** - the development of macro-level models served for representation of the whole traffic structure that combines the four transport modes in Latvia: road, railway, water and air systems;

4. **4 level** - the development of micro-level models represented logistics processes at the specific points of the Latvian transfer corridor: the border crossing places, air and sea ports, railway stations and customs’ warehouses;

5. **5 level** - the assessment of transport policy requirements for the integration of information, communication and navigation technologies.

3. The main activities in transport sector of the Intelligent Transport Systems programs

The projects in the transport sector of the Intelligent Transport Systems program develop and validate telematics applications which provide enhanced services to transport users through improved efficiency, safety and environmental quality, taking into account European policy objectives. Particular attention is given to the needs of users (transport operators and travelers) and emphasis is given to research into telematics tools common to several transport modes. Importance is given to the need to facilitate the integration of transport services for both freight and people and to the development of interoperability to support the emergence of multimodal transport services.

Telematics applications in intermodal transport can be structured in the following three areas:

- vehicle and load unit systems;
- transport organization and management systems;
- infrastructure-related systems.

Decision-making on national transport often suffers from insufficient knowledge on the understanding of mobility, logistic requirements and the affects of various policy tools. Thus it is necessary to provide statistics about the transport system and its environment and establish scenarios for the transport sector and factors influencing it. The transportation information infrastructure designed for transportation system has a number of attributes and components, some of which will be provided by private transportation companies and some of which must be provided by the public sector.

The national R&D program defines the following research tasks in this area [4].

1. **Basic concepts and standards for transport information system:**

   - needs and purposes of the information system;
   - common definitions and standards;
   - specification of data requirements.

2. **Analysis of existing transport data:**

   - aggregation and harmonization of existing data;
   - applicability of existing methods of data collection on transport flows;
   - data on transport flows (including flows along pipeline and dangerous goods);
   - data on determining factors of transport patterns and demands;
   - transport network data;
   - guidelines for data structures and maintenance.

3. **Scheme for certain immediate actions of data collections:**

   - goods and passenger flows into and out of the state;
NEW TECHNOLOGIES

- long distance goods and passenger movements between regions within state;
- major infrastructure projects and their effects on traffic induced by network enhancement;
- data on intermodal transport.

4. **Methodology for establishing general databases on transport flows and socio-demographic data:**
   - zoning system and definitions;
   - demographic data;
   - socio-economic data;
   - transport volumes and values, traffic flows (including modal split and mode specifications);
   - data presentation (including flows, time series and cross-sections);
   - integration of user requirements.

5. **Methodology for establishing databases on transport infrastructure networks:**
   - geographical structure;
   - definitions and standard indicators;
   - physical data;
   - performance data, others;
   - integration of user requirements.

6. **Methodology for collecting specific data sets for modeling, methodologies, scenarios and assessment:**
   - externalities;
   - factors affecting demand and supply of transport (including logistical data);
   - modal choice and modal split;
   - inventory of state aid;
   - others (databases of transport studies and experience, of areas affected by transport, of people with mobility handicaps or special mobility needs etc.);
   - integration of user requirements.

7. **Methods of data analysis:**
   - analysis requirements;
   - identification of appropriate methods for various types of data (generalized linear models, spatially auto-correlated data, correspondence analysis etc.);
   - recommendations and guidelines.

8. **Methods to obtain transport data cost-efficiently:**
   - collection and measurement methods (considering the differences between modes in terms of data availability and the use of new technologies);
   - methodology approaches (for distinction between transit flows and regional flows etc.);
   - costs of alternatives.

9. **Structure and maintenance of the transport information system:**
   - database principles (updating period, accessibility etc.);
   - data presentation technique (including information linked to the data);
   - application and suitability of new technologies for automatic data collection, processing and presentation;
   - human organization, institutional requirements and coordination aspects (exchange and dissemination of information).

The Intelligent Transport Systems or transport telematics applications, including navigation systems and related services, make use of technology to improve the movement of people and goods. They also provide the means for:
- better management of existing transport networks;
- integrating different transport modes and services;
- improving traffic flows and data exchange;
- enabling the provision of high quality added value transport services.

The main problems in intermodal transport telematics are:
- the complexity of information flows between the different operators in the logistics chain, who have different information needs, e.g. road haulers, shippers, authorities, etc;
- the development of hitherto separate and incompatible information and telecommunication systems for different modes of transport;
- lack of appropriate standards (e.g. message protocols, interface standards, common architecture) across modes.
Possible areas of telematics development/support are:

- tracking & tracing systems (of loading units, with fixed or mobile stations) - extension of single mode telematics systems to multimodal ones;
- integration of user oriented service-related systems with traffic management infrastructure systems;
- harmonization of electronic message and document formats across modes;
- harmonization between different national approaches and EU-wide measures.

These areas can only be developed on the basis of cooperation between the various parties involved.

4. Conclusion

The concept of the Information Society has now been generally accepted by governments worldwide. The above-mentioned complex integrated model of information structure for national multimodal transport system is designing in the frame of this general concept.

Of course there are many problems in this area. In practice we are forced to combine:

- systems from previous generations with state-of-the-art ones;
- local systems made at a different time, in different countries and often in accordance with different standards;
- multifunctional control and information systems with different purposes.

The real joint achievements in the field of the development of smart information system in transport can be achieved only by route of gradually overcoming of these practical obstacles. Methodological approach for the modeling and harmonization of integral system mentioned above is one of the ways for decision of this problem.

References


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