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DATABASES AND STATISTICS IN THE EUROPEAN TRANSPORT AREA

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The article examines the vision of the EU for a competitive and sustainable transport system, building the single European transport area by using information technologies in transport. It deals with the use of databases and statistics in a road accident reducing strategy, with the development of the National system of traffic information in the Slovak Republic and with databases for the optimisation of road freight transportation. The paper makes use of a survey related to using international transport databases realized in some of small and middle transport enterprises in transport area in Slovakia.

Keywords: transport, databases, statistics, road safety, information technologies

1. Transport and Transport Data Assimilation

The European White Paper on transport, representing a plan of the single European transport area and competitive transport system, claims that transport is fundamental to our economy and society. Mobility is vital for the internal market and for the quality of life of citizens as they enjoy their freedom to travel. Transport enables economic growth and job creation: it must be sustainable in the light of the new challenges we face. Transport is global, so effective action requires strong international cooperation. The future prosperity of our continent will depend on the ability of all of its regions to remain fully and competitively integrated in the world economy. Efficient transport is vital in making this happen [1].

Specifically, it stresses the need to create new transportation models allowing for transport of higher volumes of both cargo and passengers as efficiently as possible [1]. The use of information technologies is highly relevant for this process.

The continued development of this vision must be based, inter alia, on a more efficient use of transport and infrastructure through improved traffic management and information systems, for example, ITS (Intelligent Transport Systems), SESAR (Air Traffic Control), ERTMS (European Rail Traffic Management System), SafeSeaNet (Maritime Surveillance System), RIS (River Information Services), etc. Online reservation and information systems and electronic payment systems, covering all means of transport, should facilitate the multimodal travel.

Performance optimisation of multimodal logistics chains, increasing the efficiency of transport services and infrastructure through the use of information systems are among the declared objectives of a competitive transport system [2]. One of the objectives is also to reduce the number of fatalities in road transport by 2050 nearly to zero. In accordance with this, the EU already aims to reduce traffic accidents by 2020.

Large amount of data is produced in the transport process. Databases are the most suitable information tools for inputting, storing, retrieving, and managing that information. A database is an organized collection of data, storing organized information. Most databases contain multiple tables, which may each include several different fields. For example, a company database may include tables for products, vehicles, employees, and financial records. Each of these tables would have different fields that are relevant to the information stored in the table. The data are typically organized to model relevant aspects of reality in a way that supports processes requiring this information. Database has two parts: data and database management system. Data can be of different types: number, text, date, logical, and many others, and they are set in data records. It defines data structure for a database. Database management system is a set of commands specially designed to interact with the user, other applications, and the database itself to collect, store and analyse data [4]. A general-purpose database management system is a

software system designed to allow the definition, creation, querying, update, and administration of databases.

There are many kind of databases utilized in transport area. This contribution deals with some of them: international road accident databases, national systems of traffic information and international road freight transport databanks.

2. Traffic accident databases

The road-crash databases present specific information, such as the time and place of each accident, severity of accidents, type and number of road users' involved, direct causes and consequences covering a long enough time periods, at least five years, providing information at the local, regional, national or international levels. It is important to analyse the statistics over a sufficiently long time period in order to determine whether the accident rate remained stable, increased or decreased.

Using and evaluating road crashes databases enables identification and quantification of road safety problems and evaluation of the efficiency of road safety measures.

The EU-funded projects are developing new technologies to improve the safety of all categories of road users: car occupants, pedestrians and pedal cyclists, motorcyclists and truck occupants. To achieve this, researchers using statistics and road-crashes databases are developing new injury criteria, innovative mathematical models, and intelligent safety systems based on enhanced virtual testing technologies.

Transnational cooperation is needed among other areas in the number of traffic accidents on European roads reduction strategy. The EU supports a number of programmes aimed at the collection and processing of data on road traffic accidents. These data are processed into the database using the modern tools for powerful servers, for example, the output of charts and graphs, which serve as a source of information for the preparation of a policy to promote road safety and reduce traffic accidents [6].

The most widely used databases:

- CARE (Community Road Accident Database)
  http://ec.europa.eu/transport/road_safety/specialist/index_en.htm
- ERSO (European Road Safety Observatory)
  http://ec.europa.eu/transport/road_safety/index_en.htm
- DaCoTA ((Data Collection, Transfer & Analysis)
- CRASH TEST DATABASE
- PENDANT (Pan-European Co-ordinated Accident and Injury Database)
- VERONICA (Vehicle Event Recording based on Intelligent Crash Assessment)
- SAU (Urban Accident Analysis Systems)
- STAIRS (Standardisation of Accident and Injury Registration Systems)
- and many others, see online
  http://ec.europa.eu/transport/road_safety/specialist/projects/sorted-by-keywords/index_en.htm#0801262487ec0037

For example, CARE is a European centralised database of data on road accidents resulting in death or injury. Includes detailed data collected by the Member States since 1993. The key objective of the CARE is

- Identification and quantification problems of security in road transport;
- Evaluation the effectiveness of the measures in the area of security;
- Analysis on the determination of the relevance of the actions of the EU and to facilitate the exchange of experience between Member States in this field.

Each participating Member State has its own standards, as well as statistical formats. System of CARE is developed for analysis of the transformation of the original structure and the definition of rules of local data and ensures compatibility indicators and values in order to harmonise statistics in the Member States of the EU, which allows international comparisons and exchanges of experience. The database contains data from all Member States since their accession to the EU. One of the outcomes of the CARE is presented in table 1.It shows the trend of road fatalities in the Member States of the EU.

Table 1. Road fatalities in the Member States of the EU [8]

European Commission - Directorate General for Mobility and Transport

March 2013

EU road fatalities

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011 (provisiona/ estimated)	2011 - 2012	period
Belgique/België	1,486	1,306	1,214	1,162	1089	1069	1071	944	944	840	858	-12%	1/2012 > 12/2012
България (Bulgaria)	1,011	959	960	943	957	1043	1006	1061	901	776	657	-8%	1/2012 > 12/2012
Česká republika	1,333	1,430	1,447	1,382	1286	1063	1221	1076	901	802	772	-4%	1/2012 > 12/2012
Danmark	431	463	432	369	331	306	406	406	303	255	220	-18%	1/2012 > 12/2012
Deutschland	6,977	6,842	6,613	5,842	5361	5091	4949	4477	4152	3648	4009	-11%	1/2012 > 12/2012
Eesti	199	223	164	170	170	204	196	132	98	78	101	-14%	1/2012 > 12/2012
Ireland	412	376	337	377	400	365	338	280	238	212	186	-12%	1/2012 > 12/2012
Ελλάδα (Elláda)	1,880	1,634	1,605	1,670	1658	1657	1612	1555	1456	1258	1141	-10%	1/2012 > 12/2012
España	5,517	5,347	5,400	4,749	4442	4104	3823	3100	2714	2479	2060	-9%	1/2012 > 12/2012
France	8,162	7,655	6,058	5,530	5318	4709	4620	4275	4273	3992	3963	-8%	1/2012 > 12/2012
Italia	7,096	6,980	6,563	6,122	5818	5669	5131	4731	4237	4090	3860	-2%	1/2012 > 12/2012
Κύπρος (Kypros)/Kibris	98	94	97	117	102	86	89	82	71	60	71	-28%	1/2012 > 12/2012
Latvija	558	559	532	516	442	407	419	316	254	218	179	-2%	1/2012 > 12/2012
Lietuva	706	697	709	752	773	760	740	499	370	299	296	2%	1/2012 > 12/2012
Luxembourg	70	62	53	50	47	43	46	35	48	32	33	3%	1/2012 > 12/2012
Magyarország	1,239	1,429	1,326	1,296	1278	1303	1232	996	822	740	638	-5%	1/2012 > 12/2012
Malta	16	16	16	13	17	11	14	15	21	15	21	-48%	1/2012 > 12/2012
Nederland	993	987	1,028	804	750	730	709	677	644	537	546	-1%	1/2012 > 12/2012
Österreich	958	956	931	878	768	730	691	679	633	552	523	4%	1/2012 > 12/2012
Polska	5,534	5,826	5,642	5,712	5444	5243	5583	5437	4572	3908	4189	-13%	1/2012 > 12/2012
Portugal	1,670	1,655	1,542	1,294	1247	969	974	885	840	845	891	-16%	1/2012 > 12/2012
România	2,450	2,411	2,229	2,442	2629	2587	2800	3061	2796	2377	2018	1%	1/2012 > 12/2012
Slovenija	278	269	242	274	258	262	293	214	171	138	141	-13%	1/2012 > 12/2012
Slovensko	614	610	645	603	606	614	667	622	380	371	324	-9%	1/2012 > 12/2012
Suomi/Finland	433	415	379	375	379	336	380	344	279	272	292	-11%	1/2012 > 12/2012
Sverige	583	560	529	480	440	445	471	397	358	266	319	-7%	1/2012 > 12/2012
United Kingdom (*)	3,598	3,581	3,658	3,368	3336	3298	3059	2645	2337	1905	1960	-12%	1/2012> 9/2012
	54,302	**53,342**	**50,351**	**47,290**	**45,346**	**43,104**	**42,540**	**38,941**	**34,800**	**31,000**	**30,300**	**-9%**	
annual evolution		-2%	-6%	-6%	-4%	-5%	-1%	-8%	-11%	-11%	-2%	-9%	
evolution since 2001		-2%	-7%	-13%	-16%	-21%	-22%	-28%	-36%	-43%	-44%	-49%	

Source : CARE (EU road accidents database) or national publications

(*) Year-ending December for Northern Ireland and year-ending September for the rest of the country

3. National System of Traffic Information

Traffic data and traffic information are created and used in many subjects, e.g. the police corps, fire and Rescue Brigade, in the integrated emergency system, administrators of transport infrastructure and others. Each of these subjects has their own standards and databases formats. These data could be integrated in one information system and could be utilised highly in the public interest. In accordance with the European transport policy, the Government of the Slovak Republic approved the "Programme to Promote the Development of Intelligent Transport Systems – National System Of Traffic Information (NSDI – Národný systém dopravných informácií)" [3].

NSDI will be supported in the future by the European satellite navigation system Galileo, which will be used in the transport sector, in particular in applications subject to information on the geographic location. It will be able to prevent critical situations in traffic (congestion, etc.) through the use of position data to online information on the traffic situation of vehicles or in the management of the road [3].

This system integrates information systems and telematics applications in the newly created National Transport Information Centre (NDIC – Národné dopravné informačné centrum). It is created of as follows:

- information systems (e.g. the police corps, Fire and Rescue Brigade, of the integrated emergency services, communications and transport authorities, administrators, etc.),
- telematics applications (e.g. traffic management, management centres, tunnels and sections of the liner to the highways, electronic tolls, ITS cities, etc.),
- cross-border exchange of information with the countries of the EU and third countries.

The Slovak Republic is faced with a lot of traffic problems, which do not result only from the still incomplete transport infrastructure, but also touch several areas such as transport safety and security, the impact of transport on the environment, or the quality of services, which have not been sufficiently ensured in the past. The proposed programme to encourage the development of intelligent transport systems - National Traffic Information System - represents a comprehensive solution for intelligent transport systems based on information and communication systems and technologies in road transport in Slovakia. It is oriented to the use of a uniform system for collecting, processing, sharing, distribution, and use of means of information, in particular information, management and telematics applications [3].

This system is being built as an open modular system, integrating the data information systems entities which have built their own information systems (e.g., communications managers - national highway company (NDS – Národná diaľničná spoločnosť), Slovak Road Administration (SSC – Slovenská správa ciest), police force (PZ – Policajný zbor), Fire and Rescue (HaZZ – Hasičský a záchranný zbor), Integrated Rescue System (IRS), Electronic Tolling, Regional and Urban Information Systems, etc.) and including gradual building of the universal or specialized applications for the collection and processing of information from the entities without their own information systems. The provision of traffic information as a public service is available in the basic form for free to anyone who will ensure their further spread, or use for the benefit of road safety and traffic [7].

NSDI will be realized in the following basic areas:

- Transport information about the current traffic situation on the roads and traffic (agenda systems and drivers);
- Traffic data from intelligent transport systems and information systems in transport (telematic systems)
- Control centres or intelligent transport systems.

Traffic data and traffic information will be kept and processed continuously in content management system, which consists of several subsystems [3], for example, subsystem for collection of traffic information and traffic data, subsystem for processing and evaluation of data, subsystem for the provision of transport information. Considerable role has the subsystem of applications for traffic engineers, which provides statistics, traffic analysis, exports for transport, modelling, the exact location of the accidents, etc.

At the moment, the system is in its preparatory stage, which included adoption of the act on NSDI and creation of working groups of experts from all institutions concerned. Such a complex project will require considerable time before manifesting expected benefits.

4. International Transport Databank

Another example of the creation and use of databases in transport are international transport databanks.

European transport companies in the field of road freight transport services have the possibility to use multiple means of databanks, in which a large amount of information on the availability of transport capacity is concentrated. Access to the databank allows them to use their means of transport carriers more efficiently. Production and marketing companies are able to secure more efficient transportation for their goods as well [6].

In Europe, there are a number of international means of databanks:

- TimoCom (www.timocom.sk)
- TRANS (www.logintrans.sk)
- RAALTRANS (www.raal.sk)
- E-spedice (www.espedice.cz)
- CargoAgent (www.cargoagent.net)

One of them, an international databank TimoCom has been in operation since 1997 and currently is offering up to 300 000 international tenders of free cars a day and has 85 000 users from all over Europe. In addition, it allows users to submit tenders for platform competitions, take advantage of the powerful route planner, get the address book contacts and profiles.

The use of this and similar databases is also useful for the exploration of prices on the market, reducing of costs and ensuring the certainty of planning, thanks to the long-term transport contracts.

These international databanks are operated online on the Internet, allowing instant access to updated information for all users [5].

Our research of the use of these international databanks is based on a survey carried out in four transport enterprises in the Žilina region. All of them deal with national and international cargo transportation; three years ago each of them had around 90 vehicles and the firms were comparable also in terms of amount of number of employees, transport capacity, and outputs. Nowadays, with regard of economic crisis, three of them have restricted business. However, each of them uses one of the international transport databanks. Everyday regular access to the databank represents an Internet platform for mutual information exchanges between companies looking for and those offering available transport capacities. It offers free lorries throughout Europe, available loads and traffic orders, return costs, new transport and forwarding contacts. Their programs are available in many languages.

Approximately 80-90% of business in the surveyed companies is carried out based on closed contracts. The companies don't register and so they aren't able to identify transportation that was carried out with the support of transport databases and therefore are not able to assess their economic benefits. However, they estimate that about 10-20% of their profits come from transportation supported by these databases. We found out that about every tenth journey of every single truck is carried out with their support. It is therefore obvious that the use of these databases helps to increase productivity and decrease costs, which is of course important for the companies.

5. Conclusions

The growth of the European economy and mobility requirements is associated with the increase in the volume of road transport. Processing of large numbers of transportation data and thus the use of databases is a natural need of our times. The information and communication technologies represent a powerful tool for decision-making and management support as well as for communication inside the company and with the customers. Therefore, it is necessary to follow the current trends in the development of corporate information technology; this area should not be underestimated. In the period of globalisation, it is necessary to invest in information technology with regard for planned development and for the vision of building a single European area and creation of a competitive transport system.

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