Intelligent Transport Systems in the Minds of Georgian Engineer and ITS Market Today

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Abstract—**Positive changes in the appearance of the global transport on the eve of XXI century accompanied with a number of negative consequences, such as unacceptable level of casualties , increased consumption of non-renewable energy sources and the negative impact on the environment , constantly growing delay of people and goods across all modes of transport. Solution was found in the creation of intelligent transport system(ITS) that uses innovative developments in the modeling of transport systems and regulation of traffic flow, that provides finish users more simple and safe. As for Georgia, at this moment actively developing the individual disparate elements of ITS, which is dictated by the current needs of the market and not the long-term strategy. Present day market situation of ITS in our country distinguishes fragmentation, lack of national standards, non-system contacts (and virtually lack thereof) with the International Association of ITS. Spontaneous development of local and corporate systems generates environment, when integration into a single intelligent transport system would technically impossible. There are also external threats - existing projects of the disparate elements of Georgian Intelligent Transport systems, due to inconsistency with international standards can trigger switching international transit traffic to bypass the country. Experience of the EU countries, USA, Japan, China and other countries in the promotion of ITS projects shows that in a market economy only a single state policy brings together government, all levels of business and sectors of economy in addressing national objectives in the transport sector.**

Index Terms—**Intelligent transport systems, georgian engineer and ITS, ITS today, ITS standardizations, state's role in standardization of ITS, transport scenarios**

I. Introduction

Positive changes in the appearance of the global transport on the eve of XXI century accompanied with a number of negative consequences, the scope and significance of which provide a basis to assess their strategic challenges as national and even continental scale. Among them are an unacceptable level of casualties , increased consumption of non-renewable energy sources and the negative impact on the environment , constantly growing delay of people and goods across all modes of transport, associated with both objective disadvantage transport infrastructure capacity and low- traffic control.

By the world transport community solution was found in the creation of transport systems in which means of communication, command and control was originally built into the vehicles and infrastructure, and management capabilities (decision) based on the resulting real-time information available not only to transport operators, but and all users of transport.

The problem is solved by constructing an integrated system: people - transport infrastructure - vehicles, with the maximum use of advanced information and control technologies. Such "advanced" system and became known as intelligent.

Many think improving a country's transportation system solely means building new roads or repairing aging infrastructure. But the future of transportation lies not only in concrete and steel, but also in the implementation of technology, specifically a network of sensors, microchips and communication devices, that collect and disseminate information about the functioning of the transport system. Transportation systems are really about networks, and much of the value of a network is contained in its information: For example, whether a traffic signal " knows" there is traffic waiting to pass through an intersection; whether a vehicle is drifting out of its lane' whether two vehicles are likely to collide at an intersection; whether a roadway is congested with traffic; what the true cost of operation a roadway is, etc. What intelligent transportation systems do is empower actors in the transport system- from commuters, to highway and transit network operators, even down to the actual traffic lights themselves - with actionable information (or, intelligence) to make better-informed decisions, whether it's choosing which route to take; when to travel; whether to mode-shift (take mass transit instead of driving); how to optimize traffic signals; where to build new roadways; what the true cost of roadways are and how best to price their use; or how to hold providers of transportation services accountable for results. The big opportunity at hand is to bring information to ear on transportation networks, transforming them into truly intelligent transportation systems.[1]

The ability of transport systems to respond to mobility needs of citizens and goods is hampered by a continuous increase in traffic demand as a result of higher levels of motorization, urbanization, population growth and changes in population density. The resulting traffic congestion reduces the efficiency of mobility systems, increasing travel times, air pollution and fuel consumption.

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Addressing traffic congestion was one of the initial motivations to look at intelligent transport systems solutions for a better utilization of transport capacity though the exchange of real-time information on infrastructure and traffic conditions. Since then, new transport application based on information and communications technologies (ICT) have emerged and continue to emerged, ranging from basic traffic management systems (e.g. navigation, traffic control) to management of containers; from monitoring applications such as closed-circuit television security systems to more advanced applications integrating live data and feedback from a variety of information sources (e.g. parking guidance, weather information) [2].

II. Intelligent Transport System in the Minds of Georgian Engineer.

In the presence of some differences in the interpretation of the concept of ITS in different countries, may be generalizing definition: "ITS -is an intelligent system that uses innovative developments in the modeling of transport systems and regulation of traffic flow, that provides finish users more simple and safe, as well as qualitatively high amount of interaction between participants motion as compared with conventional transport systems".

The above definition contains everything necessary for a proper understanding of the issue. The only thing that hinders Georgia understand it correctly and do the right thing - it's our traditional perception. Please take this idea seriously, we have all that is needed for the case, except for the right way of thinking! In this context, the "correct" way of thinking is understood as a way of thinking, sufficient for understanding the western approach to the subject and for use the available tools for solving problems, not more.

West engineer thinks with functions, it is primarily focused on *what* the system should do. In our (Georgian) thinking recorded an object representation of the world, for us is important real objects, that is, we think primarily about *how* the system will work. This difference is not as elusive as it may seem at first glance.

Here is an example. The word "server" for the western engineer means something that provides services. That is, the function. For our engineer "server", in the first place, is a metal box with lights, that is, an object. To make sense, we have to use a variety of meaningful additions: "server application", "mail server", etc. Still, even with them we have a hard time - at the words "mail server" we still seem box with lights that sends mail.

All this is not a joke. Think with the real world objects, of course, possible. But it is the privilege of the highest professionals, who so masterfully own functional decomposition that an outside observer it becomes unnoticeable. Looking at the circus jugglers can also seem like throw and catch objects is the easy thing. But rarely does not understand that can not repeat tricks of a juggler without education and training. Unfortunately, that's obvious to everyone in the circus, is not evident in all technologies.

One of the most painful problems in the design of information systems in Georgia is the domination of objects and tools over functionality. Many customers sincerely believe that information systems solve problems. Whereas in fact information systems allow to solve problems. We say "electric drill drill hole." And in fact, "electric drill allows to drill hole." Getting into the semantic trap, we subconsciously believe that the purchase is equal an electric hole in the wall. And then it turns out that you need to know, how to use a drill, that drills need electricity, you need tempered drill with the certain diameter, there would be noise and dust, etc. And if in the example of a drill we imagine about the work process and can guess that it is necessary to have, other than buying a tool, in the case of more complex systems, we can stay in the sweet illusion until the end of the project.

Let us now turn to the definition of ITS and look at it in a new light. ITS, as mentioned earlier, is based on the modeling of transport systems and regulation of traffic flow. "Our man," read the definition, immediately concludes that he needs:

1) System for transport modeling;
2) Means to regulate traffic flows.

"Our engineer," writes theoretical task, in which he describes the detailed requirements to the systems of modeling and tools of control traffic flows. He can study well systems on the market, describe them in detail. These systems will bring, deploy and connect. Now have we Intelligent transport system? Our man unequivocally answer "yes." Western man unequivocally answer "no." Because our people assesses the availability of equipment, and Western man assesses implementation of the relevant functions.

Ask our man exactly how purchased equipment will contribute to the objectives (see the definition of ITS) to improve information content, security and improving information interaction? Most likely, the answer will not be. Because the answer lies in the field of functional decomposition, which allows to move from goals to the functions of the future systems simultaneously meshing everything you need from the adjacent areas.

Question of the application of certain elements of ITS in the city is closely linked with the exactly understanding, how we plan to achieve goals. And move on to the technical characteristics of the equipment need only after we define the basic ways of solving problems.

III. Intellegent Transport Systems Today

Implementation of ITS in the global scale made possible only under the conditions of the saturated communication space, when there are no problems with cheap transfer of substantial quantities of digital information in real time at any point in the transport network.

Today, the most actively developing core technologies for the transport infrastructure and vehicles:

1) Intelligent systems for infrastructure:
   - Traffic management on motorways;
   - commercial trucking;

- Prevention of collision of vehicles and the safety of their movement;
- Electronic payment systems of transport services;
- Control under extreme circumstances;
- Management of traffic on the main street network and the elimination of accidents;
- Information management;
- Intermodal freight transportation;
- Control over the weather on the roads;
- Maintenance of roads;
- Management of public transport;
- Information for road users.

2) Intelligent systems for vehicles:

- Collision avoidance systems;
- Collision notification systems;
- Driver assistance systems.[3]

One of the main directions of development of ITS in Europe, USA and Japan, which actively promoted the last 15 years - the realization of the concept of intelligent vehicle. Operates an international program "Vehicles with Advanced Security". The first experiments of use on-board intelligent systems have shown that they are able to reduce the number of accidents by 40%, while the number of fatal accidents by 50%.

Interaction of the state, industrialists, private businesses, academia and users provided by the establishment of national and continental societies (associations) such as ITS America, ERTICO (ITS Europe), ITS Japan, etc.

Important role in the dissemination of knowledge and experience in the development of ITS, establishing global contacts in the ITS community play annual global and European ITS Congresses accompanied with the exhibitions and educational programs.

As for Georgia, at this moment actively developing the individual disparate elements of ITS, which is dictated by the current needs of the market and not the long-term strategy. Observed the following processes associated with the development of ITS:

- Development by the various businesses and organizations their own models of ITS;
- Adaptation of the foreign and domestic electronic equipment;
- Provision of local services (mainly monitoring and remote protection vehicles) based on developments of foreign firms;

Present day market situation of ITS in our country distinguishes fragmentation, lack of national standards, non-system contacts (and virtually lack thereof) with the International Association of ITS. Spontaneous development of local and corporate systems generates environment, when integration into a single intelligent transport system would technically impossible. There are also external threats - existing projects of the disparate elements of Georgian Intelligent Transport systems, due to inconsistency with international standards can trigger switching international transit traffic to bypass the country.

Increase the volume of cargo traffic inevitably leads to an increase in global issues:

- A high level of accidents and number of fatalities in transport;
- Unacceptably high load on the environment;
- A sharp decrease in the efficiency of transport ("plug", delay);
- Reduce the effectiveness of combined transport.

To avoid all of the above, at the global level is actively ongoing activities of standardization ITS (ISO) and at European level -in the European Committee for standardization (CEN). Currently the main part of processes, functions, interfaces, communication protocols, hardware requirements, and other aspects of the ITS in general terms already standardized on an international level, and in developed countries - and at the national level.

ITS standardization is considered not only as a means of harmonization of technical solutions, but also as a means to support a competitive environment, where the consumer is not tied to a particular vendor of standardized hardware or software and can choose on market the most advanced solutions. Actions to develop standards of ITS determined by the structure of the national architecture of ITS.

In Georgia intelligent Transport System is currently not regulated by any state standard. There is absolutely no standards that regulate relations in the field of information, communication and control systems of ground vehicles in the city and in rural areas, including traffic management, public transport, commercial transport, emergency services and commercial services in the field of ITS.

IV. Role of Standards and State in the Developing Intelligent Transport Systems

Experience of the EU countries, USA, Japan, China and other countries in the promotion of ITS projects shows that in a market economy only a single state policy brings together government, all levels of business and sectors of economy in addressing national objectives in the transport sector.

State exercises strategically innovative feature - support basic technological and economic innovation, giving them the initial momentum.

Conceptually, it is important to emphasize the four basic, public areas:

- Organizing and coordinating role in the creation of an institutional framework for the development of a national ITS architecture and coordinating development plans;
- Regulating role - creating the legal framework, standardization parameters in the field of safety and technical compatibility;
- Stimulating role - supporting research and outreach projects of ITS in the field of public transport and emergency services;
- Investment role - development and implementation of ITS projects, solving problems

of security and performance, which can be created and maintained with private capital on public-private partnership.[4]

Experience gained with existing ITS deployments and current developments shows that they can provide concrete solutions to many of the mobility needs for people and goods. However, to realize their full potential, a number of research areas merit continued attention and effort, notably:

- Development and validation of the "connected traveler" concept, though pilot and demonstration projects;
- Construction of an e-marketplace in traveler services (predictive traffic management, real-time multimodal traveler information, demand and access management...), based on open platforms to collect, aggregate and exchange traffic and transport data from various sources, with an emphasis on quality, standardization and cost-efficiency;
- Creation of seamless and ubiquitous connected services (simple, upgradable and scalable) via low-cost universal devices;
- Development of demand-driven, easy to use and affordable services for all users, learning from the success of portable navigation systems and web 2.0 social networks;
- Enhanced geo-localization and guidance, also able to function in indoor/underground areas where satellite positioning is not available;
- Management of recurring or temporary peaks in demand, e.g. for peak-hour commuter travel and large-scale events;
- Pursuit of behavioral studies to understand and improve user acceptance and response to the potentially complex offerings of new mobility services, combining multimodal traveler information with options such as demand-responsive transport and car sharing or pooling;
- Exploration of the possibilities offered by new-generation fully electric vehicles, especially in cities, to support more sustainable mobility behavior;
- Boosting infrastructure capacity by reorganizing and up-scaling transport flows, to increase load factors by up to 80 %;
- Establishment of green corridors and supply chain management methods to create a solid European e-logistics framework based on ICT applications.[5]

V. The Main Conclusions

1) In world practice, ITS recognized as a common transport ideology of integration telematics' achievements in all transport activities for solving problems of economic and social character - reduce accidents, improve the efficiency of public transport and freight, to provide general transportation security, improve environmental performance.

2) Development and deployment of ITS is a potentially effective, competitive and innovative business and incentive to develop new high-tech industrial sector, which is an important factor in crisis management

3) Implementation mechanisms differ in different countries, but the key components are the same everywhere. In the presence of the world's proven total concept of ITS development, all countries have their own national vision and priority programs ITS deployment that is fixed in a particular state document.

4) Implementation of ITS has a strategic character and determines overall competitiveness of each country on the world market and due to the capital intensive can not be implemented without the direct involvement of the state. Coordination and promotion of national programs of ITS carried out by the authorized state body - a leader in the development of general policy and system-architecture solutions, technical and functional standardization.

5) The partnership of government, business, science and the public are key to the successful development of ITS. This is implemented by creating societies, such as "ITS Japan", "ITS America", "ERTICO" in Europe and so on. Serious emphasis is placed on demonstration projects of ITS for their population in society and marketing of opportunities of industry.[6]

VI. Transport Scenarios

To summarize the foregoing pages, ITS will play a prominent part in securing the future of sustainable mobility against a background of mounting economic, environmental and societal pressures.

Cities will be obliged to apply ever-stricter air quality legislation, and to reduce transport-related CO2 emissions in line with increasingly stringent European and global targets.

Greater priority will be placed on policies for the prevention and avoidance of congestion, which will inevitably include measures such as access control and road charging to manage the level of demand. Incentives and sanctions will favour low-impact collective and individual modes of passenger transport, while special attention will be paid to goods delivery, with new provisions for truck routing, loading, parking and the associated logistics services.

On the positive side, ITS will enable connected vehicle-infrastructure communication systems to deliver real-time and context-sensitive information to enhance safety, improve the efficiency of road usage and reduce environmental impact. New generations of traffic management systems will integrate data from vehicles, to provide dynamic, predictive and adaptive control of traffic flows.

The evolution of mobile communication networks to 4G and beyond will deliver continuous connectivity to vehicles and travelers, giving access to on-line services via mobile Internet links. Multimodal traffic and travel information services will grow in quality and quantity – with mobile handsets becoming increasingly powerful personal mobility terminals. Travel guidance, on-line

booking and payment facilities will be combined with location-based Web 2.0 applications to facilitate ride-sharing, data collection and information exchange via mushrooming social networking websites. [6]

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