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SCENARIOS FOR ITS TELECOMMUNICATIONS TECHNOLOGIES DEVELOPMENT IN POLAND FOR THE YEARS 2007-2013

Summary. The article shows four scenarios for the development of ITS communications technologies in Poland for the years 2007-2013. Global Business Network methodology is used to make up the scenarios. The basic dimensions of the scenarios are (a) type of sectors in the national economy (public vs. private), (b) type of communications technology (wireline vs. wireless). The scenarios present possible futures.

SCENARIUSZE ROZWOJU TECHNOLOGII INTELIGENTNEGO TRANSPORTU W POLSCE W LATACH 2007-2013

Streszczenie. W artykule przedstawiono cztery scenariusze rozwoju technologii inteligentnego transportu w Polsce w latach 2003-2013. Do ich opracowania wykorzystano metodologię firmy GBN. Podstawowymi wymiarami zastosowanymi do budowy scenariuszy są: (a) rodzaj sektora gospodarki narodowej (publiczny – prywatny), (b) rodzaj łączności (przewodowa – bezprzewodowa). Scenariusze przedstawiają możliwe warianty przyszłości.

1. INTRODUCTION

Such European countries as Germany, France, Italy, the UK, Finland etc. may be categorized as ITS-developed countries. Poland belongs to the category of ITS-developing countries in Europe as compared to the ITS deployment in other European countries. Besides, it seems that Poland is at an early stage in the deployment of ITS in the road transport. Generally speaking, there are several up-to-date applications of elements of ITS implemented in the Polish road transport. They are presented in the Polish literature [1]. Not going into detail, the current situation is going to be changed for better within the time period 2007-2013. The expectations refer in some degree to a document approved by the Polish Council of Ministers on 29 November 2006, entitled: Operational Programme INFRASTRUCTURE AND ENVIRONMENT. It contains a number of priorities referring to transport, especially Priority Axis: VI, VII, VIII, IX. For example, the Priority Axis VII supports the projects regarding the development of Intelligent Transport Systems, in particular traffic management systems.

Regardless of the future achievements in the field resulting from the above mentioned initiatives, we may separately discuss future scenarios for ITS deployment in Poland in the next few years. The scenarios for deployment of ITS in Poland that will be here presented are confined multifold. We will be interested only in ITS telecommunications development in Poland and we look at them from the point of view of public and private users of future ITS systems and services. GBN (Global Business

Network) method of building alternative scenarios will be applied to support our consideration. The scenarios will have to show the complex nature of relations between the development of ITS communications technologies and roles of public and private sector organizations in Poland as ITS users and ITS stakeholders in the ITS development process within this time period.

2. BASIC NOTIONS AND ASSUMPTIONS

It is commonly accepted that the word "ITS" refers to the application of computer, telecommunications, sensor and other technologies (techniques) for solving numerous problems of existing transport systems. Sensor technologies are used in ITS system for collecting data, telecommunications technologies are applied to transmitting data, and the main function of computer technologies process data and store it.

An ITS is comprised of many various elements: technical and human elements (i.e. system operators and maintenance element). The concept of ITS telecommunications technologies development may be well understood by studying the so-called ITS telecommunication architecture. A good example is the USA National ITS Architecture Communications Sausage Diagram. It comprises four basic parts: Travellers, Centers, Vehicles and Roadside. They are treated as physical objects connected with data flows using various telecommunications technologies.

Travelers, Centers, Vehicles and Roadside modules represent the end users of ITS system. Calling them end users, we want to refer to the definition of ITS user (ISO 14813-1) where ITS user is someone who directly receive and can act on ITS data.

There are four generic types of telecommunications technologies: Vehicle-to-Vehicle; Dedicate Short Range Communications (DSRC); Wide Area Wireless and Wireline (Wired).

The first three of them are often called wireless telecommunications technologies. In the literature on ITS telecommunications technologies we can easily find a listing of currently applied technologies. For example, in the KAREN project documentation on Communication Architecture the following categorization of ITS telecommunication technologies is applied: Wireless Technologies (Short Range Communication, Long Range Communications, Broadcast, Positioning), Wired Technologies (Telephone, Digital Subscriber Line, X.25, Frame Relay, ATM, Internet), and Optical Networking. Not going into detail, we may state that those specific telecommunications technologies have been constantly changing; it means that new ones are emerging and some of the technologies become out of date [2,6,8].

There is a continuously increasing demand for exchange of voice, data, and video information, however, the needs for data exchange seems to be the largest in ITS-developed countries. From a technical point of view, voice, data, and video transmissions have different requirements. Wireless telecommunication technologies are regarded as a prerequisite for information exchange between objects in motion and stationary facilities. This kind of technologies is primarily based on using electromagnetic waves; however, it includes infrared communications as well. The technologies may be divided into, for example, communications bandwidth: narrow vs. medium vs. wide bandwidth. Currently, the application of broadband telecommunications technologies is strongly developing in many countries, including Poland.

However, in the article we are more interested in practical ITS users issues. It is obvious that existing wireline networks can meet ITS communications needs in most metropolitan and urban areas, but there are situations in which wireless communications is preferred. For example, the best way of transmitting numerous data on traffic from Roadside to Centers is probably with the help of wireline technologies. As well, Optical Networking technologies are commonly applied for transmitting date along motorways.

The issue of choosing the best technological technologies for a large ITS system is a complex one. It depends on many factors, among them, the preferences of users of ITS systems and the interests of ITS stakeholders. By ITS stakeholders, according to ISO 14813-1, it is accepted to conceive people or organizations that are involved in some way in the deployment of ITS. Users and stakeholders may have different expectancies as to the best ITS technology in an application case. Users prefer, for example, convenience and effectiveness of usage, but some ITS stakeholders may prefer high

profitability of applied technology. Such an approach is usually taken by private sector organizations. Public sector stakeholders, for example, ministerial or local authorities, may want to archive some political or social aims by using such-and-such ITS technologies in an application area. Finally, it must be assumed that the notions of users and stakeholders overlap, it means that there are users that are not stakeholders and vice versa.

3. USER NEEDS REGARDING COMMUNICATIONS

The findings of the KAREN project have been commonly accepted in Europe [3]. In the KAREN project documentation (D3.1), there is the list of specific user needs regarding communication. It contains nearly fifty items referring to ten categories of user needs. a number of them is for: management activities (3), policing/enforcing (1), financial transaction (1), emergency services (3), travel information (3), traffic management (5), in-vehicle systems (2), freight and fleet operation (26), public transport (4). Moreover, the specific user needs items refer to seven categories of users.

It seems that the most interested in exchange data are users of commercial vehicles, if we take into consideration a number of the items. The second place is taken by traffic management.

A deeper analysis of the list would show some "weaknesses" as to the fullness of ITS communications user needs. From this point of view the KAREN list is out of date partly today. However, it may be used for general consideration, especially at the level of the so-called KAREN Groups and ISO TICS Fundamental Services.

4. SCENARIOS USES AND MISUSES

The uses and misuses of the word "scenario" in various contexts have a long and complicated history. It is useless here to discuss them. There is a large literature on it and methodology of building scenarios. The conception of scenario used in the article is based to some extent on the GBN (Global Business Network) methodology as a practical and proved tool for creating scenarios [4].

It seems that scenario methodology is a powerful tool for thinking through the implications of strategic choices. Scenarios offer a range of possible outcomes used less as predictions, they are not a kind of "official future". A scenario is one of the set of possible futures. In other words, it describes a future that could be rather than a future that will be. Form this point of view, if the built scenario is treated as a prognosis in the traditional sense of the word such a scenario is misused.

According to the GBN methodology, a typical way of building scenarios requires choosing two variables (dimensions): one of them expresses uncertainty and the other importance. It helps to construct a framework for four alternative scenarios. Each of them is a kind of story that is told on the basis of taken assumptions, qualitative and quantificative understandings of the development of the system, and imaginative thinking.

5. ITS TECHNOLOGIES SCENARIOS FOR POLAND

The result of the GBN-based scenario building process is presented in my interpretation of the dimensions in Fig. 1.

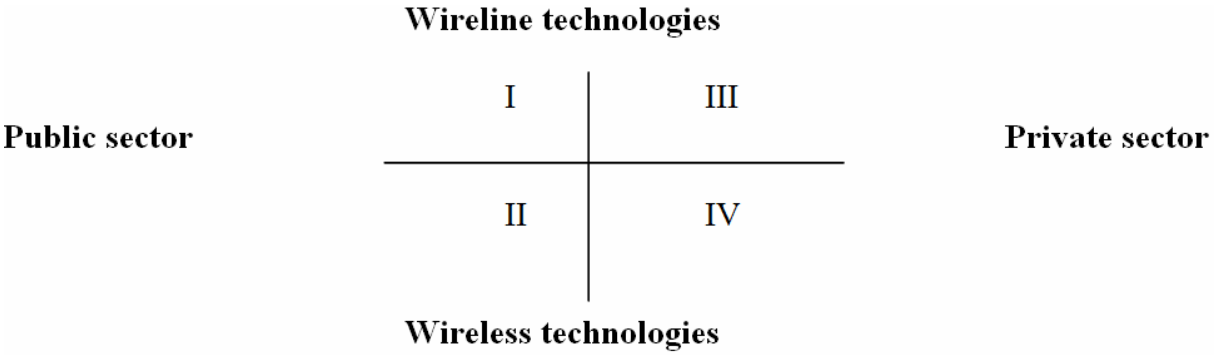

Fig. 1. The scenarios of ITS technologies development
Rys. 1. Scenariusze rozwoju technologii ITS

Some additional remarks are needed to explain the assumed meanings of two scenario axes . Public sectors vs. private sector organizations are the extremes of the horizontal axis. Wireline and wireless technologies are the extremes of the vertical axis:

- public sector organizations (transport authorities at the high level ministries and their agencies, as well regional or local authorities, for example, at the level of voivodeship, cities respectively);
- private sector organizations (transport companies using ITS, telecommunications operators, telematics services operators, commercial consumers of telematics services, producers of ITS systems and element, and software).

It should be added that many ITS users or stakeholders such as travellers and academia organizations etc. has not been taken here into account because of the limited scope of the scenarios, and modelling feature of the consideration.

Scenario I and II refer to expected activities of the public sector organizations, while scenarios III and IV take into consideration expected activities of private sector organizations in Poland in the time period. Such a way of thinking on ITS technologies development allows putting together several alternative scenarios in one framework.

Currently the public sector at the national level in Poland comprises Ministry of Transport (MT), Polish Road Directorate (GDDKiA) and other agencies, including police enforcing traffic regulators, the Secretariat responsible for safety on the Polish roads (SKRBRD). GDDKiA has been involved in the implementation of ITS elements on the Polish roads for several years and GDDKiA is the Polish participant in the CONNECT europroject.

As a potential ITS user, MT may be interested in receiving ITS information for transport planning and transport policy strategies. While as potential ITS stakeholders MT and GDDPiA could be involved in ITS deployment more widely, if they intend to use ITS technologies for satisfying some political and social aims in the development of the Polish transport system, especially diminishing external costs of transport. There are two possibilities for doing it in the time period: the first one is connected with the large programme for building a new, EU-funded, motorways and express roads and the other for meeting the enlarged traffic needs during the UEFA EURO 2012. It seems that building new motorways, equipped with ITS infrastructure elements, will greatly enlarge the current limited number of ITS elements that have been installed on the Polish roads. This will increase the application of wireline technologies, the so-called "motorways telematics", along the new or improved roads. Besides, the issue of electronic payment of motorway tolls (ETC) will become very urgent. ETC may be based, for example, on vehicle-to-road communications technologies including Automatic Vehicle Identification and Automatic Vehicle Classifications, and it may be GPS-based toll collecting system like in Germany.

At the local level, the situation is rather different. As ITS users, the local authorities in a number of cities and conglomeration should be interested in the exchange of ITS information. The main problem in several cities and conglomeration, for example, in Warsaw, is congestion. The application of new traffic management systems is the most vital. It is expected that the plans recently undertaken will be realized. The application of wireline technologies in densely populated areas seems to be social and economic viable.

In fact, traffic management will remain primarily an area of public interest, but traveller information applications, especially in cities, will start being to some intent an area of shared responsibilities of public and private organizations.

The private sector organizations as users are greatly interested in the developing such ITS systems and services as freight and fleet operations, stolen vehicles detections, vehicle navigation, etc. The needs can be satisfy mostly by using wireless technologies. Internet access is very useful. The private sector organizations will be still interested in small, local ITS projects with minimal risks.

Such telematics services as vision enhancement, automated vehicle operations, longitudinal collision avoidance, safety readiness, pre-crash restrain deployment will remain undeveloped for many reasons. They will be out of interest of public organizations and only a few private organizations will be interested in them commercially. Telecommunications operators and telecommunications industry have not noticed up to now the telematics market niche.

It is expected that in a few years the so-called e-Call rescue service will be introduced on the basis of the 112 telephone service which has been introduced in Poland recently.

Social and economic benefits from the utilizations of a wide range of existing technologies still remain unanswered for most potential ITS applications, projects, and this is a serious obstacle to choosing an ITS technology properly. Besides, the future 'convergence' between the usage of ITS-dedicated applications and general purpose telecommunications technologies such as the Internet, mobile telephone, the GALILEO programme applications for the Polish road transport require sound analysis for the time being. The initial work is being undertaken to get knowledge how to use the GALILEO signals in the Polish transport efficiently.

Poland and most of this part of Europe countries are at an early stage of ITS development and deployment. In the time period, in Poland, a number of stand-alone ITS applications will appear, undertaken by the public and private sector organizations. Some of the applications will be implemented in wireless or wireline technologies. It will depend chiefly on preferences of ITS users and ITS shareholders. The preferences of public organizations will be partly economic, partly administrative and sometimes political (telecommunications policy) [7].

At this stage of ITS development, taking into consideration the current state of ITS deployment, it is rather obvious that within several years no larger market of ITS systems and services will appear. The automotive telematics market will be very weak, limited to locations based services. The development of ITS systems and services will be technology rather than market driven. The Road Authorities in Poland will generally be concerned with ITS technologies, especially in traffic management, emergency, safety and electronic payment applications.

The key question is whether telematics applications become an integral part of the work of Road Authorities in Poland. This requires Road Authorities to be aware of the possibilities of telematics solutions in transport. They should express their transport needs in terms of telematics. If so, the future of many telematics applications will be brighter. The stand-alone ITS applications can be integrated by sharing the common data. This can allow serious thinking about the creation of the regional (voivodeship) and national ITS architectures.

Generally speaking, the model (pattern) of development of ITS technologies in Poland will be similar to some extent to these ones that happened in other ITS-developed countries several years ago.

6. CONCLUDING REMARKS

The main purpose of using here scenarios was to present four possible futures of developing ITS telecommunications technologies in Poland for the years 2007-2013. However, the scenarios are far from being prognoses, they contain some useful information about what should be taking into account while planning ITS development and deployment of ITS at an early stage.

It seems that the scenarios and the applied GBN-based methodology can be a good starting point for a deeper analysis of the ITS technologies development in Poland and other ITS-developing countries.

Choosing of telecommunications ITS technologies is not a matter of technical or economic appraisals only. For simple cases (stand-alone ITS applications), it depends on the preferences of

public or private sector organizations, but for more complex cases (co-operative ITS applications), it requires agreed preferences of various sectors. The preferences are determined by their direct needs as users and their interests as holders. The development and deployment of ITS technologies in Poland in the time period will run due to this rule. A more detailed and empirical search of the preferences is needed.

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