PUBLIC TRANSPORT AS AN IMPORTANT ELEMENT IN THE DEVELOPMENT OF THE REGION

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Abstract: *Communication and public transport are factors that affect business relationships, private and urban and neighborhood development, and providing the right transport links, at the right level, is becoming a challenge for urban authorities and the development of the region. The aim of the article was to evaluate the performance of Intelligent Transport Systems in the city of Bydgoszcz. The population of Bydgoszcz was surveyed by a questionnaire. According to the respondents the Intelligent Transport Systems, allow to reduce travel time, improve road capacity, improve the quality of the environment, and improve the comfort of travel and communication in the city.*

Key words*: public transport, urban transport, transport system*

INTRODUCTION

Communication and public transport play an important role today. These are factors affecting business relationships, private and the development of cities and settlements. Fast and efficient commuting to work or school, affects the urban planning of settlements. Nowadays, the construction of housing estates which do not have convenient public transport connections is pointless. No person, does not want to live in a place where he must worry about connections to the city center. The lack of access to communication links causes the following problems: finding a job, engaging in the cultural and social life of a city. In addition to the adequate number and completeness of public transport lines, quality is of vital importance. The most important factor influencing the evaluation of urban transport is its punctuality. In the time of passing time, people want to spend as little time as possible to move from one place to another. Ensuring adequate communications at an appropriate level is becoming a challenge for municipalities and the development of the region.

In 1999, the project of the Local Government Analysis System (SAS) was implemented, where data on public services in municipalities were collected and analyzed. The SAS Project was designed to demonstrate the relationship between social needs and the efficiency of their meting. The implementation of the project allowed, on the basis of the obtained data, to make appropriate organizational and legal decisions in the examined municipalities. [5] SAS has the following assumptions:

A) research methodology has been developed in five areas of urban life (road and public transport, education, health care, social welfare, culture);

(B) Results have been obtained which could have been effective in seeking appropriate legislative and financial solutions [4].

The results of the SAS study show that only in some cities were conducted studies of transport behavior of residents. Decision making was lacking in assessing the level of satisfaction of transport needs. As a result of lack of assessment of the level of satisfaction of transport needs, it is impossible to follow the principles of sustainable transport. [7]. During the implementation of the Local Government Analysis Project, one basic proposal was drawn up. This proposal concerned that the standard of passenger transport services in

Polish cities can not match the standards of individual transport. In contrast, in the EU countries the situation is reversed.

In European countries, public transport services are higher than private transport [9].

One of the main factors that affect the level of economic development is transport. [12] Transport in the city ensures the movement of people and the transport of goods at a distance. [17] The distribution of population, jobs and learning, and the distribution of commercial and industrial functions have a major impact on the number of communications in the city [19].

The collection of equipment and the clear way of organizing the movement and disposals of the operation, the purpose of which is to move people and cargo, is called the city's transport system. [2] The flow of goods, services and information within the city is the subject of urban logistics. [11] The goal of urban logistics is to effectively manage resources within the city and meet the needs of city users. [19]. Urban transport can be treated as a collection of elements, including:

- road network,
- public transport,
- traffic management,
- parking and management of the whole. [8]

Urban transport infrastructure consists of:

- roads and streets,
- tracks, subways and trams,
- metro power lines, trams,
- stops and interchanges,
- Bus and tram depot,
- car parks. [16]

The supra-local city transport subsystems include:

- individual transport (road network, car parks),
- collective passenger transport (line layout, stations, stops, technical facilities),
- walking and cycling,
- rail, water, aviation and infrastructure [7]

Communication needs are contemplated in two dimensions:

A) quantitative dimension (number of travel, trip length),

B) spatial dimension (date of travel, time of travel, time distribution of journeys) [1].

There are four determinants in the literature that describe the degree of satisfaction of communication needs. These parameters determine the availability of external and internal traffic conditions. [12] The parameters describing the degree of satisfaction of communication needs include:

- accessibility (easy access to the city center from any area of the city);
- accessibility (capacity of traffic routes to the city center),
- compactness (this parameter is measured by the inverse of the average length of displacement),
- the absorption (traffic area and speed of traffic in the city center affects the traffic of passenger cars).[10]

Communication burden on urban infrastructure causes negative social effects. Discontent, impatience, driving discomfort, general deterioration of quality are considered to be negative social consequences. [20].

The public's interest in public communication can be gained through actions leading to changes in their preferences, habits and mentality. [19] The availability, quality

and functionality of bus transport is also affected by the efficient movement of people. [17].

The functioning of urban transport is reflected in the concept of a civic network. The concept of the Citizens' Network is contained in the 1996 Green Paper "Citizens Network". The Green Paper is an EU Urban Transport document. [5] This concept includes:

- local transport networks connected to transport networks that support further relationships,
- creating connections to enable passengers to move to public and private transport vehicles,
- an offer that will include, for all passengers, system availability, adapted vehicles and infrastructure, and adequate charge levels,
- creating an attractive alternative for people using private transport. [6]

The Green Paper also covers the integration of urban transport in terms of tickets, timetables, information, park & ride nodes. The Green Paper also includes measures to prioritize road traffic for public transport. [12] For the purpose of improving the quality of public transport indicated in the Green Paper, it includes, among others: high reliability, frequency of connections, attractive travel time, travel comfort, up-to-date information, convenient ticketing systems and flexible public transport. [14]

The Park & Ride (Park & Ride) system can be used to enhance the attractiveness of public transport. The system built in interchanges would be based on multimodal modes of travel. [19] The concept of P & R is based on the construction of near parking system stops. Travelers traveled from their own (left on car park) cars to public transport. [19] To achieve the P & R concept, there must be a sufficient number of car parks and availability for public transport. While increasing the popularity of this concept, the reliability, complexity and quality of services provided by urban transport are important. [3]

To benefit from the implementation of Park &Ride:

- reducing the cost of transport processes,
- improving the quality of the environment,
- increased safety of moving around the center,
- reducing the share of car transport in urban logistics,
- easier to navigate the crowded city. [4]

With P & R, prior education about multimodal travel is important and the need to implement such solutions is important. Park & Ride (P & R) also has an electronic ticket concept. An electronic parking ticket at the P & R stop, allows you to use public transport at no extra cost. [10]

In order to be able to work efficiently, technological solutions in the field of telematics should be used. [11] Telematics is a telecommunications and IT solution and automation solution, tailored to the needs of the physical systems used (resulting from their tasks, infrastructure and organization and management). [12] The telepathic systems use:

- Intenet,
- GSM cellular networks,
- geographic databases (GIS);
- road database,
- satellite navigation systems (GPS),
- sensors, cameras, radars for traffic monitoring,
- variable light boards. [4]

Examples of telematics solutions:

- illuminated signs informing about upcoming connections, located near the interchanges,

- light boards informing about delays,
- light boards informing about substitute communication,
- ticket fee in electronic way,
- integrated traffic management system in the city [traffic coordination; "Green wave" for public transport; Direct insight into the situation in the city (accidents, vehicle breakdowns). [8]

Another example in the development of collective transport is ITS (Intelligent Transport Systems) - Intelligent Transport System, which refers to all works aimed at improving the functioning and development of transport through the implementation of information technology. These actions aim at removing such negative phenomena as accidents, environmental pollution and traffic loads [13]. ITS systems demonstrate a user-driven structural approach and are implemented by integrating technology development opportunities into a variety of application areas such as surveillance, planning, control, management, intelligent vehicles and intelligent infrastructure. These systems create great opportunities to enhance transport features such as accessibility or mobility, while reducing its damaging effects on congestion, the environment, infrastructure construction, energy consumption. ITS is currently being used as an integrated approach to address transportation problems in major cities1. Initially, the ITS system was primarily geared toward roadside obstacles. Still, activities on this plane are the most developed. At present, however, works are carried out to combine all modes of transportation: road, air, rail and water2. Currently in Poland, ITS is being implemented in many cities in Poland. Among them are: Krakow, Łódź, Szczecin, Gliwice, Wroclaw, Bydgoszcz or Bialystok. In each of these cities, the development of the ITS system is on a different level, but work is underway to deepen the system. This is a problematic issue, due to the regulations in force in our country, which prevent the full introduction and operation of ITS in Polish cities. The provisions contained therein apply equally to the deployment and operation of the ITS. There are so many rules that do not cause problems. At the same time it should be noted that the law in Poland does not go beyond EU law and technological progress [16]. The Intelligent Transport Systems architecture is the basis of the structure of this system. This is a set of general principles that are the basis of the system. They take into account the individuality of the country and its transport system [17].

As defined in the Directive 2010/40 / EU of the European Parliament and of the Council of 7 July 2010, "architecture" means a conceptual project that defines the structure, behavior and integration of a given system in the context surrounding it "[12].

ITS Architecture is to provide a common philosophy for planning and preparing intelligent transport systems. It defines a framework where you can expand the various project approaches, each of which is tailored to your specific needs. The architecture also characterizes the functions required to implement the recipient's service. It also establishes physical units or subsystems where functions are stored, the flow of relationships within the subsystems and the communication conditions necessary to guarantee the flow of information. It also further refines and identifies criteria for standards that are necessary to guarantee regional and national interoperability and the product standards needed to ensure the economics of the system deployment.

The creation and implementation of the ITS architecture is a task that requires knowledge of today's transportation problems and knowledge about the realities of resolving them. At the turn of 1998-2011, European ITS projects were launched. Their effect is the European Framework Architecture ITS FRAME [1].

By definition ITS architecture must be used by stakeholders as a foundation for their actions and communication. It should also be used to manage the systems that make up the infrastructure. Investors and designers should use the ITS architecture to define the

assumptions and requirements for structured systems, as well as describe how they are implemented. The centers and service departments of transport programs must suggest ITS architecture when designing and implementing systems to use, service and direct them [14].

ITS Architecture has been operating in many countries in recent years in accordance with the programs adopted there [1]. Poland has not developed its own ITS Architecture. However, we will find it in the USA, Japan, France, Czech Republic and Italy. The last three countries have created the ITS National Architecture on the basis of the European ITS Architecture [5].

One of the positive aspects of implementing road systems is broadly understood security. It is assumed that communication security should be recognized as a criterion for the success of social progress in the process of globalization change [13]. ITS is therefore the task of improving security in the streets of cities. It is estimated that this is a reduction in the number of accidents by 40-80% [20].

The most important benefit of the system, however, is the "discharge of traffic jams". This is to increase the capacity of the street network. Thus, large cities are expected to take place in less time and reduce energy consumption by 45-70%. Another important means is to improve the quality of the environment by reducing emissions. It is estimated that emissions will be reduced by 30-50% [21].

What is important is that this system was developed for drivers and residents of large cities. It is designed to facilitate and improve the comfort of traveling not only with own vehicles but also, in particular, public transport and other public transport.

The implementation of Intelligent Transport Systems is also expected to lead to a reduction in costs associated with the management of road stock and the maintenance and restoration of the road surface [21].

Intelligent Transport Systems will serve to create a coherent system that will also help to streamline traffic and improve safety [18].

Among the many advantages one should bear in mind also some disadvantages of this system. Focusing on Polish cities it is important to mention first of all that our country in the past years was not ready to implement the ITS system. This was due to the lack of appropriate architecture and standards, which made the system inconsistent. Introducing this system is a very difficult and costly project. Our country also lacked the solutions and technologies that were purchased abroad [15]. It is also often wrong to rely on only one supplier, the contracting authority is dependent on the winner of the tender, who is not always well prepared in this field [12].

However, it should be noted that the prospect for the next few years gives us a chance. Poland has received significantly higher funding for ITS development. The active role of the state will also be important in order to be able to change the country into progressive and innovative [21].

MATERIALS AND METHODS

The aim of the article was to evaluate the performance of Intelligent Transport Systems in Bydgoszcz. The population of Bydgoszcz was surveyed by a questionnaire.

According to respondents, the system performs its tasks only in a certain part, so not everyone is satisfied with its operation. After analyzing the survey, it can be stated that both residents of Bydgoszcz and other persons using Bydgoszcz road network are satisfied with the operation of Intelligent Transport Systems in the city. This confirms the benefits that the researcher perceives in the functioning of the system. However, there are also a

number of drawbacks and changes that have been noticed by public transport passengers as well as by drivers.

RESEARCH RESULTS

In the case of public transport passengers, half of respondents gave a positive answer to the question about the benefits of the system.

In Bydgoszcz. Many people have noticed the benefits of timeliness and ease of communication through dynamic stopping information. Thanks to large, illuminated data sheets, the data on the departure of public transport vehicles are easily noticeable and accessible to everyone, even to the elderly, who often have problems reading paper schedules where the font is too small. It also happens that paper distributions are destroyed or broken. In this case also the passenger information boards are a great solution. It also proved to be easier and more accessible to purchase a ticket with infokioskom with ticket function. This is not yet known device for most travelers. Only 22% of the respondents use the ticket machines, mostly young people who are often more convinced of new solutions that make life easier. Often, it is not possible to buy a ticket at the kiosks or at the drivers' disposal. Then such a solution is a great alternative. Communication passengers have better access to information, which not only allows residents of the city, but more importantly, other people to plan their itinerary.

Passengers of public transport also see defects and would like some changes to be made. Most often they saw that the system with dynamic passenger information does not display information about accidents and breakdowns, so in the event of vehicle delays, passengers are not informed and the tables show bad data. Studies have also shown that passengers would like the system to cover most parts of the city, so that more passenger information boards and ticket machines will appear.

According to the study of drivers using Bydgoszcz street network, they often choose their own vehicle because of greater driving comfort. As many as 42% of respondents answered this question. Nearly half of the respondents know all subsystems operating within the Intelligent Transport Systems, but only 10% say they follow the messages displayed on the arrays. More than half of the respondents do not see the benefits of the system, but among the respondents who see positive aspects of the system's functioning include the reduction of traffic congestion in the city streets, as well as faster movement and greater throughput. The operation of the entire system by more than half the drivers was rated at 3 on a five-scale scale. This means that not all things have been tested correctly, so there are also disadvantages and changes that they think should be introduced to make the system work better. The most common problem faced by the respondents was the poor articulation of the tables and often the lack of possibility to read the information contained therein. During the ride, there is no opportunity to assimilate and analyze all the data that is there. Drivers, like public transport passengers, would like the system to operate on a larger area of the city, not only in its center.

CONCLUSIONS

Urban transport services are determined by transport demands. Transport requirements are requirements for travel conditions. [19] The most frequently mentioned postulates include: punctuality, travel time, availability, frequency of courses and other. [14] The demands are based on communication needs of passengers. Communication need occurs when a traveler needs to move from one place to another at a time. [17] The determinants of communication needs include: place of residence, sex, age, education. [13]

In Bydgoszcz public transport is becoming more and more effective thanks to the conducted analyzes of the communication market. The city has a wide offer of transportation. This is important for all who use Bydgoszcz's road network. For several years Intelligent Transportation Systems have been introduced in the city, which allows them to reduce travel time, improve road capacity, improve the quality of the environment, and improve the comfort of travel and communication in the city.

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