

# THEORETICAL AND PRAGMATIC ASPECTS OF FUNCTIONING OF FLEXIBLE TRANSPORT SYSTEMS

TOMASZ KWARCIŃSKI

University of Szczecin, Faculty of Management and Economics of Services, POLAND  
e-mail: tomasz.kwarcinski@wzieu.pl

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**ABSTRACT** The article presents selected aspects connected with the functioning of flexible transport systems. Their important feature is irregularity in providing transport with regard to space and time. In the case of such transport services, the passenger fulfils a significant role. In the pragmatic aspect, solutions are presented that are present in the countries of Western Europe. They are related to types of flexible transport systems, i.e. linear, aerial and with making these means of transport available to residents. Bummelbus, which apart from its transport provision role, is a valuable example, as it fulfils an important function connected with the activation of persons who are unemployed. Unemployed persons, with appropriate qualifications, are employed for a specified period as drivers. The scientific goal of the article was to present a review of theoretical and practical considerations related to the functioning of flexible transport. Such goal is reflected in the methodical side of the article. The theoretical approach presents the essence of flexible transport systems, using for this purpose the available, first of all foreign literature on the subject. In practical terms using, among others, the author's research related to the participation in the LAST MILE international project, foreign and domestic solutions applied in this field have been presented. Obtained results of research may be useful for further research related to the development of flexible transport systems, both in theoretical and pragmatic terms.

## Introduction

As far as the market is concerned, the transport needs of the citizens may be satisfied by regular and irregular transportation. The characteristic feature of regular transportation is a timetable, which does not exist in case of irregular transportation. Such way of satisfying the transport needs of the citizens is defined in the literature as

flexible transport. Other terms may be encountered, e.g. on request or transport services provided on the basis of a reported need.

Flexible transport has two main objectives. The first is derived from the need to provide citizens with availability of public transport. Whereas the latter is related with rational transport use, and minimizing the costs of such transport services.

The purpose of the article is to present theoretical and practical considerations connected with the functioning of flexible transport in domestic and foreign experience. Such goal is reflected in the methodical side of the article. The theoretical approach presents the essence of flexible transport systems, using for this purpose the available, first of all foreign literature on the subject. In practical terms using, among others, the author's research related to the participation in the LAST MILE international project, foreign and domestic solutions applied in this field have been presented. Obtained results of research may be useful for further research related to the development of flexible transport systems, both in theoretical and pragmatic terms.

### **Theoretical aspects of flexible transport systems**

Flexible transport systems are characterised by irregularity regarding time and space for provision of transport services. These systems are connected with a greater influence of potential passengers on the organisation of transport services. An important role in the system is fulfilled by the passenger, who shapes the timetable according to time and, for some types of flexible transport system (e.g. aerial), the direction of transport services (Kwarciański, 2016, pp. 189–190). The above features constitute a factor for determining such type of services as need-oriented transport services.

Flexible public transport systems constitute a valuable element of public transport system. (Mężyk, 2013; Wright, 2013) This is primarily because of their positive influence on the level of availability of public transport for residents. Moreover, similarly to public transport of a regular nature, these constitute a significant alternative to individual motorization (Velaga, Nelson, Wright, Farrington, 2011, p. 111).

The flexible transport services enable better adjustment of time compliance to an occurrence of need of citizen transport and the provision of transport service (the means of transport reaching the citizen) This also means that a timetable, being an external condition for a passenger, is in the case of a flexible system, determined by passengers. Time required for the means of transport to arrive is individually set by transport operators.

An important characteristic that differentiates flexible transport systems is the use of ICT solutions (primarily, telephone and internet) and mobile applications. They connect clients and transport operators, simultaneously fulfilling numerous functions e.g. ad information, ordering means of transport, payment services, etc. Maintaining traditional telephone connections is especially important for elderly persons, the vast majority of whom do not have access to the Internet or do not use mobile applications, available on smart phones.

With regard to space, the significance of flexible transport systems may be determined through features of the places that they service and the manner of movement process organisation. Flexible public transport systems are applied in areas characterised by low population density and wide extent. These features lead to the fact that the need for transport services in areas of such types (e.g. agricultural, peripheral) is low. This makes provision of transport to satisfy needs in these areas, in a regular manner, not very profitable (high number of scheduled services with no passengers, low level of vehicle load). Moreover, in this aspect, the direction of movement is important. In some flexible systems there is a possibility to use means of transport with direct indication of the

target location, and at the same time, the direction of movement, e.g. shopping centre, medical service facility or a hospital.

The factors for development of flexible public transport systems derive from: providing citizens with mobility, possibility to satisfy social and professional objectives, improvement of public transport availability, which is particularly important for persons, who due to various reasons, are unable to use individual motorisation (the elderly, school age youth, persons without an appropriate licence) (Mulley, Nelson, 2009, pp. 39–45). Due to flexible systems, there is a growth in participation of persons and urban areas in which public transport is available. Also, in connection with the issue of rationalisation, and satisfaction of needs, the cost of service costs of public transport provision is important. Within such scope, one may discuss consideration of the rationality principle that considers transport needs and costs of satisfaction of the same.

Development of various flexible transport systems requires support from public authorities. This may be provided in a financial or organisational form. Financial support derives from lack of profitability while performing transport services within flexible transport systems. Moreover, it is connected with financing the purchase of means of transport and the costs of its maintenance by public authorities. So an important, and costly issue is a remedial element of the system (so called, record organisation), that with the use of proper software, transport means management, establishment of the route, collects information regarding needs for routes to be served, etc. Moreover, another type of cost that to some limited extent occurs also in the case of regular transport is a so called readiness of means of transport to provide service, which includes payment for drivers and maintenance of backup transportation.

As far as organisation is concerned, the inclusion of flexible system solutions is important in a general public transport system through technical, time and tariff integration. This provides a sense of stability of the public transport by creating greater added value for the passengers.

Flexible passenger transport services may be related with changing needs and preferences of the customers. They are the answer to the growing expectations of passengers, especially in the areas characterised by low need for transport services. Due to its flexibility, from the point of view of time and space, they are as comfortable as private transport, and due to price of service, they are more available than taxis.

Evaluation of the functioning of a flexible transport system may consider economic and non-economic aspects. As far as economy is concerned, low need for transport services does not guarantee recovery of costs borne in relation to satisfying transport needs of the citizens. It should be noted however that the cost of transport service provided in a flexible manner is lower than if these services were provided in a regular manner.

There would be no costs of functioning of a flexible system if the provider withdrew from serving transport needs of citizens with public transportation. Thus, while evaluating the factors for provision of transport services in an irregular manner, it is important to also consider their positive social and environmental role. This corresponds with the principle of public service duty. First, an important issue is the problem of social inclusion. By providing access to public transport for people who due to age, predispositions, or financial status cannot use other means of transport (e.g. individual motorisation), we provide them a means of satisfaction of obligatory and facultative needs (work, school, shopping, health, culture, social activity). As far as the environment is concerned, an important issue consideration of environmental pollution.

To summarise, flexible systems fulfil an important role in supplementing regular public transport. Moreover, they improve the access to transport services, which is important for areas characterised by low need for such

services. As far as social issues are concerned, they fulfil an important role in preventing occurrence and deepening of social exclusion. They also positively influence reducing the negative influence of transport on the environment.

### **Pragmatic aspects of functioning of flexible transport systems**

In Western European countries, flexible transport systems are commonly used for serving the transport needs of the citizens. This applies especially to areas characterised by a low need for transport services. Furthermore, a few good practices are presented, which are connected with the functioning of flexible transport systems in the international dimension.

Night Rider is a transport service that has been provided since 2005. For the first four years, it was co-financed with national funds of the Ministry of Transport of Luxemburg (Kwarciański, 2018, pp. 97–107). Currently, it is of a commercial nature. This service is used by 40,000 passengers a year in order to reach locations connected with entertainment (such as discos). This destination is related with a higher purpose of the project being the reduction of the risk of traffic accidents at night among young people.

The possibility to use Night Rider is limited to weekends between 18:00 and 5:00 in the morning. The time of the service certainly relates to the name. Minimum time for reservation is 60 minutes, and reservation 2 months ahead is also possible. Reservation and payment for movement is possible in many ways, including online. In this service, any starting point occurs. The confirmation of receipt is made via SMS. The booking party receives the SMS 10 minutes before the transport arrives.

Bummelbus is another solution that may be related with flexible transport systems. However, it is a system that differs from the previously described solutions. It is connected with the function of professional activation of citizens of Luxemburg. The drivers are recruited from among the unemployed.

The system operates from Monday till Saturday from 6.30 till 21.15 (17.15 on Saturdays). Reservations are made via a call centre, and are possible from Monday till Friday from 8 till 18. Reservations must however be made on the day before the day of the planned trip.

Prices for a trip depend on distance. If the distance does not exceed 10 km, the fee for children is EUR 1.5, and adults pay EUR 2. A trip for a distance between 10 and 20 km costs EUR 2 per child and EUR 2.5 per adult. Longer trips: 20 km – 25 km cost EUR 3.0 per child and EUR 3.5 per adult, whereas 25 km – 35 km costs EUR 6.0, and EUR 7.0 respectively.

The main users of the system are children who constitute approx. 60% of the passengers. The remaining group is parents (approx. 30%) and child cares (approx. 10%). The main objectives of the trips are those connected with sports (20%), school (10%), shopping (9%), medical services (6%), musical school (6%), hairdresser, dancing, restaurants (1–2%), and other trips (30%) are also significant.

Another example of a flexible transport system is the so-called civil bus. It is based on provision of the means of transport to the citizens. It is most common in Germany, Switzerland, Great Britain, and Holland. In this system, transports are initiated by the citizens. Costs of purchase of a means of transport are borne by units of territorial authorities (operation costs). Also, co-financing by private persons (sponsors) is possible, as well as by advertisers and units of territorial authorities. A bus driver is not employed (he works voluntarily). In some areas, the citizens must pay annual membership fees, which enable them to use this form of transport.

The beginnings of such way of satisfying transport needs in areas of low need were noted in the 80's (Kwarciański, 2016, pp. 79–87). Self-organisation of supplementary transport lines of public transport (vehicles and

rail transport). A vehicle used in this system is relatively small (max. 8 seats) and driving it does not require any licence connected with being a professional driver.

The means of transport provided to the citizens serves to satisfy their transport need connected with travelling to work, for youth to go the disco and also to satisfy the needs of senior citizens. It is characterised by high flexibility according to time and space of provision of transport services, although in principle, it may not constitute competition for regular passenger transport services. Compared to other flexible systems, there are no limitations, caused by availability of a person (driver) that provides transport service. This form of transport serves to maintain current mobility of the citizens, but it also give (long-term) a possibility to convert the civil bus system into regular and irregular lines.

Another way to satisfy transport needs is to include passenger and load transport, which is used in rural areas, where due to certain functions (e.g. agricultural) it is possible to combine small passenger transport with loads. In Germany, such system is called *KombiBus* and it fulfils an important function in moving agricultural products on agricultural areas.

In Poland, the experience in need-related public transport organisation may be considered minor. Until 2016, this applied only to one city (Kraków–Telebus) (Obuchowicz, 2008) Since April, 2016, Szczecin is the second city in Poland to implement a bus on request.

In Szczecin, the need-oriented public transport services (transport on request) are provided for the benefit of citizens of one of the districts (Podjuchy). The choice of this area for handling transport needs of citizens in a flexible manner derives from its features. It is influenced by topography (hillside area), narrow streets and relatively low population density (mostly single-family houses).

Road and City Transport Authorities are responsible for organisation of transport on request in Szczecin. It enables the passengers to use the same ticket in Szczecin. Passengers, who use one tariff, are able to move around the city with the use of regular or irregular (flexible) transport. This increases the attractiveness of public transport in the city, both for the areas covered by regular and irregular transport services. In the area where the transport on request was implemented, 11 communication stops were located. Later, this number was increased to 13. Means of transport (3, including a backup), are at the disposal of the citizens, on working days, for ten hours a day (Kwarciński, Leszczyński, 2017, pp. 39–47).

## Conclusions

Flexible forms of transport constitute a guarantee of the possibility to satisfy the transport needs of citizens of the areas characterised by low need for transport services. It is especially preferable for persons without a passenger car and it also provides a sense of social inclusion. Access to public transport improves the attractiveness of a city. In the general social dimension, the environmental aspects are also important, such as lower energy consumption. The disadvantage of flexible systems is the time required for performance of a transport service that includes waiting for transport, which requires good planning of own needs regarding mobility.

In the countries of Western Europe, there is a common understanding of the need to finance transport services to improve the availability of public transport. However, there is a trend of improving the economic rationality in the process of organisation of such services. It is reflected, above all, by searching for new solutions, which are to limit the costs of functioning of the system of handling the transport needs by ensuring minimum availability level that guarantees a possibility of social activity (i.e. education, health care, shopping, and culture).

Flexible transport systems may also fulfil an important economic-social role by ensuring a possibility of professional activation among people looking for work. With proper qualifications, it is possible to work as a driver in a flexible system.

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