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## A NOTE TO NON-TRADITIONAL SYSTEMS OF PUBLIC TRANSPORT

The paper deals with the following non-traditional (from the Czech point of view) solutions of public transport: • free competition of several providers, • use of heterogeneous rolling stock, • Dial-a-Ride systems and • integration with other systems.

### 1. Introduction

First, we have to say that in the case of the Czech Republic the public transport system is said to be *traditional* if the following conditions hold:

T1: In the given area, the whole bulk of services is run by a unique provider. This is usually completely valid in the case of rail or trolley-bus systems. In the case of bus transport it is valid with the exception of buses coming from outside.

T2: In the bus (or trolley-bus) service, the prevalent size of buses is the standard one for about 80 passengers (sitting and standing together). If needed, some few articulated buses for about 120 passengers are added.

T3: These vehicles do not perform any other transport service (post delivery, transport of goods to shops etc.) during their trips with passengers.

T4: The service has a fixed schedule i.e. the vehicles move on compulsory routes through compulsory stops arriving/departing to/from them at precisely determined times.

The service is called *non-traditional*, if any of T1-T4 conditions does not hold.

Czech (as well as foreign) transport specialists argue in favor of the use of non-traditional systems mainly in case of a weak demand. We speak about a *weak passenger demand*, if the traditional transport system service, applied to satisfy the demand, might be extremely inefficient (i.e. the difference between cost and fare revenue is extremely high).

Further, we are going to present several types of non-traditional services and we shall discuss their suitability for the Czech scene. We shall deal with road transport mainly, because its role is highly prevalent in the Czech Republic.

The topics we are going to deal with are not new neither in the CR as one can see in [1] - [5], [7], nor abroad - [6]. Now we intend to present some facts which are not important only from

the theoretical point of view, but we hope they may be interesting for the readers among employees of public authorities and transport providers.

### 2. Free Competition of Service Providers

The case of several service providers is in opposition to condition T1. One cannot expect to meet an absolute free competition of providers. It is more probable to have an oligopoly formed by two or more providers. It is well known from the economic theory that in the oligopolistic case one can expect smaller declared costs than in the monopolistic one.

We can distinguish the following alternatives:

#### 2.1 One Major and One Minor Provider

Some time ago there were two very similar Czech districts, let us call them X and Y. They had very similar rural bus routes using similar vehicles and connecting villages of similar size having similar distances. However, there were two big differences to be noticed:

- in the X district, there was only one monopolistic provider and in the Y one there existed a minor provider (providing about 15 % of the service) beside the major one,
- in the Y district, the declared cost of one vehicle kilometer was 24 CZK and in the X it was 30 CZK!

This example clearly shows that even a minor provider can have a non-negligible influence on the declared costs and consequently on the required subsidy.

#### 2.2 Oligopoly of Two or More Providers

In another Czech district there were two (almost balanced) providers. Their services covered the district overlapping in some areas. The district authorities decided to optimize the vehicle and

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crew scheduling of both companies keeping the timetable and the rolling stock unchanged. Two approaches were used:

- a) each provider's scheduling was optimized independently,
- b) a common optimization was elaborated neglecting the assignment of bus journeys to providers.

The results were surprising. The optimization a) led to the saving of 8 % and b) led to 15 %! Almost twice as much.

This promotes the following conclusion: If the regional authority wants to get profit from the oligopolistic situation, it is necessary to optimize the total service first and only then to assign vehicle daily duties to the individual providers. Of course, the better way of that assignment is an open competition.

### 3. Heterogeneous Rolling Stock

Regarding their size, the buses can be divided into the following classes:

- *articulated buses* for approx. 120 passengers,
- *standard buses* for approx. 80 passengers
- *midibuses* for approx. 40 passengers,
- *minibuses* for approx. 20 passengers,
- *microbuses* for approx. 10 passengers.

As one can find in the book [4], the rural bus service in the Czech Republic is based on standard buses (more than 80 %). The average capacity of all used buses is about 75 passengers, but the average number of passengers on board is only 19. It is obvious that the corresponding mean capacity of vehicles need not exceed the double of this figure, i.e. 38, only a half of the present value. This is an evident disproportion!

The transportation theory is able to give a tool optimizing the fleet (see [4], part 14.2.3). One can expect savings of about 10–15 % of costs after having been applied.

Many Czech providers use pure fleet consisting of standard buses only, although the demand does not correspond to it. This sticking to the "traditional" alternative causes significant economical damages and the use of „non-traditional“ heterogeneous fleet is an obvious necessity.

### 4. Flexible Systems of Public Transport

As we have already said, a "traditional" public transport system has a fixed schedule i.e. the vehicles move on compulsory routes through compulsory stops arriving/departing at/from them at precisely determined times. It does not reflect the topical passenger demand at all.

The opposite is the so called "Demand Responsive Transport" (briefly DRT). The extreme case of the DRT is the traditional taxi-

cab service serving individually to any demanding passenger (or small groups of 2–4 passengers travelling together).

Between these two extremes – the traditional public transport system and the taxi-cab system – there are several forms of public transport DRT's.

#### 4.1 Fixed Schedule with Demand Responsive Journeys

Such a system uses a fixed time table where several journeys have a footnote "The journey is worked out only in case of  $x$  passengers ( $x$  tickets sold)." These systems are quite common at mountain cable ways. Beside that one can find them in the Czech Republic at the following places:

- Near Rychnov nad Kněžnou, several scheduled rural bus journeys run only in case of a sufficient passenger demand.
- Passengers can order an evening train connection between Bezdrůžice and Konstantinovy Lázně in West Bohemia if they buy about 60 tickets.

The authors were informed by their Italian colleagues that similar type of journeys can be found in Italy as well. However, the home and foreign experts do not consider this type of DRT suitable for the areas with a weak passenger demand.

#### 4.2 Hail-a-Ride Systems

This type of system is suitable for (strongly demanded) routes with fixed time tables passing through weak demand areas. There could be request stops used only occasionally by hailing passengers. It is possible to admit hailing on the other place as well, but there must be a possibility of safe stopping of a vehicle and boarding of passengers.

#### 4.3 Systems with Fixed Routes and Optional Stops outside them

The system consists of fixed routes with compulsory or request stops and moreover there is a set of optional stops outside the routes. The time tables do not precise the departures (e.g. 6:26) but they contain „time windows“ (e.g. 6:26–6:34) for each compulsory or request stop on the routes where a passenger can come, wait and board. If the passenger wants to board at an optional stop he/she has to ring up the provider's dispatcher who may accept the demand (and promise the arrival of the vehicle) or refuse it or suggest another stop for the boarding of the passenger.

Transportation experts consider this system very promising. The authors recommend it to regional and municipal authorities. However, the transportation theory has not yet solved all problems connected with the preparation and operation of it. Therefore the providers and public authorities will have to improvise if they want to prove this solution of a weak demand problem in practice.

#### 4.4 Fully Flexible Dial-a-Ride Systems

This type of service is close to the taxi-cab one. We can mention only two differences:

- the cabs are usually for 3 or 4 passengers, but these Dial-a-Ride systems operate usually micro-buses for 8-10 passengers,
- a cab transports a passenger or a small group individually from the origin to the destination but a dial-a-Ride bus has passengers with different origins and destinations on board in the same time simultaneously.

#### 5. Non-Traditional Integration with Other Systems

In this part we should like to mention several other alternatives of a non traditional solution of public transport services in areas with a small passenger demand. However, in the Czech Republic there is no or hardly any experience with them and we recommend to think about these possibilities.

#### 5.1 Combined Passenger-Freight Transport

There is only small experience with this type of integration in the Czech scene:

- on several Czech private railways one can see trains consisting of both passenger wagons and freight ones,
- during short periods of extreme frosts, foodstuffs were transported to rural shops by buses as „heated vehicles“.

However, the idea, not yet put into practice, is the following: The bus takes milk and bread to rural shops during its first morning trip from the town to the surrounding villages, then it transports workers to the town, afterwards it turns to the villages with other goods and brings pupils to schools in the town. In the afternoon the inverse operations can be performed bringing back empty shipping boxes.

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#### 5.2 Combined Passenger-Post Transport

This solution is very well known in Austria and the authors cannot understand why it has not been put into practice yet in the Czech Republic.

#### 5.3 Car Sharing

For a foreign observer, it could be surprising that Czech public authorities do not promote any form of car and ride sharing, even in areas with a small passenger demand. It is due to the opinion of many lawyers that any car owner financially subsidized for sharing his/her car ought to meet all complex conditions of a public transport provider.

The authors agree with that. But there is another solution – not to subsidize the car owners, but to subsidize individual passengers (mainly the pupils) for “solving their transport problems themselves without any demand for public transport”. One can expect that passengers (or their parents) will organize some private car sharing in that situation. Of course, the financial expenses for such a subsidy would be much smaller than the necessary subsidies for the traditional bus service.

#### 6. Conclusion

The paper has presented several non-traditional alternatives for the transportation services mainly in areas with a weak passenger demand. The authors hope that it could be interesting mainly for regional and municipal authorities. The highest importance can be expected in the solutions described in parts 2, 3, 4.3 and, maybe, 5.3 as well.

#### Acknowledgements

The paper was partially supported by the grants of IGA VŠE No. 32/04 and of the Czech Grant Agency No. 103/05/2043