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Choice of carriers on the market of public city passenger transport services

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ABSTRACT

The passenger transport system in cities is the backbone of sustainable urban mobility. The problem faced by the city authorities is the question of choosing the carrier with the best bid in the public call. Services in charge of public transport are often able to choose carriers for one or more lines, and often for the entire area. The basic dilemmas are related to the type of procedure that should be carried out, whether the transport services market is open to competition, what methodology to apply if the transport services market is not declared open to competition, whether the selection procedure should end with the signing of the contract between the city government and the operator, and other questions for which answers are sought. This paper presents an analysis of practices and proposed guidelines for the development and application of the bid operator ranking model in the public selection process.

1. Introduction

In many cities, due to the poor quality of public transportation services, a large number of residents have stopped using these services, which results in an increase in the use of private cars and the emergence of major traffic problems. The increase in the number of private cars has resulted in an increase in traffic jams and parking problems in all parts of the city, and the worst situation in this regard is in the city centers. The often insufficient legal regulation of this area and the impossibility of better organization of traffic is one of the important factors that cause traffic problems in cities.

In an effort to improve the service of public urban transport, many cities have tried to find answers and acceptable solutions through studies (Sustainable Urban Mobility Plan, Restructuring of public carriers, Inclusion of private carriers in transport, Drafting and harmonization of legal regulations, Defining models for pricing services [1], Selection of carriers, Regulation of rights and obligations between authorities and carriers through contracts and others).

As one of the very current issues, especially in the countries of the Western Balkans and other countries that have noticed the need to improve public urban transport, the choice of a carrier that will transport passengers on a specific line or on several lines is considered.

This paper presents the methodology for ranking carriers' bids on a public call for certain lines with reference to the need to define input data and the existing regulatory framework.

2. Objectives of the work

The main goal of this task is to look at aspects of the development of a new methodology for evaluating operator offers according to regulatory frameworks in the transport sector, with the aim of improving the organization and selection of operators on certain lines of public passenger transport, all in accordance with the good practice of the transport sector and EU recommendations. It should be borne in mind that the methodology for evaluating the operator's offer must take into account the recommendations and instructions of the city authorities, as well as all plans and strategies for the improvement of the transport sector adopted by the city authorities.

3. Carrier Selection Procedure

City authorities are often in a situation where they need to choose a carrier that will transport passengers on one or more lines or in a certain area in a certain period.

According to EC Regulation No. 1370/2007, if a public authority decides to entrust a service of general interest to a third party, it must select a public service operator in accordance with EC law on public contracts and concessions, and the principles of transparency and equal treatment. In particular, the provisions of this Regulation may not call into question the obligations applied to public authorities based on the directives on the conclusion of public contracts, if public service contracts are covered by them [2].

Public tender calls for carriers require competent authorities to define and describe complex systems, i.e. requirements and criteria, and when they enter into contracts in such cases, they should have the authority to negotiate details with some or all possible public service operators after the bids have been submitted.
According to the Directive, invitations to tender for the conclusion of public service contracts should not be mandatory if the contract concerns small amounts. Competent authorities should not be allowed to unbundle a contract or network to avoid a public tender. The fact that the transport services market in the area is open to competition is important for the procedure of choosing a carrier (defined by the Law on Competition, and the procedure is defined by the Law on Public Procurement of Goods and Services). This is a very important item because if the transport services market is open to competition in the public call for operator selection, the price of transport services is included in the operator selection criteria, otherwise the price is defined by the authority that announces the public call for operator selection.

The selection of the carrier according to the public call should end with the signing of the contract between the authorities and the selected operator. The content of the contract should, among other things, include: - Rights and obligations of the carrier (Vehicles, Safety, Service Quality, Tariffs, Ticket Sales, Information, Marketing Activities, Billing Control); - General provisions; - Obligations of authorities (Payments for transport services; Control of legal and contractual obligations; Traffic infrastructure and traffic control measures; Quality of service); - Contract execution.

In the legal regulations of some countries, there is no obligation to conclude a contract, which will certainly need to be changed.

If the competent authority plans to enter into a public service contract without subjecting it to a competitive tendering process, it must also follow detailed rules to ensure that the amount of compensation, in order to cover the costs incurred in fulfilling the public service obligation, is appropriate and reflects efforts directed towards efficiency and service quality

The competent authority that conducts the public procedure for the selection of carriers should be notified of the intention at least one year in advance so that interested operators can prepare for participation.

Since countries that are not members of the EU have different practices for selecting operators or assigning transport rights on certain lines, the procedure for selecting carriers will need to be changed in the coming period. Accordingly, it will be necessary to improve the methodology for evaluating the offers of operators who apply to the public call.

4. Operator Evaluation Methodology

The operator evaluation methodology regulates the conditions, method and procedure of operator evaluation in the selection process.

4.1. Multi-criteria Evaluation Method

Evaluation and ranking of bids and selection of operators on the lines in question will be carried out using a multi-criteria evaluation method.

All criteria in the public call for evaluation will be evaluated using the SAW (Simple Additive Weighting) model [3], which contains the following steps:

1. Defining the criteria matrix for evaluation, the number of offers and values according to all criteria;

2. Determination of weighting coefficients of criteria (w_j) ;
   It can be done by the Delphi method, the rating method, the Satie method, etc.;

3. Normalization of the input matrix of values (x_{ij}) of *the i* -th offer according to *the j* -th criterion is performed by calculating the value (r_{ij}) in the following way for criteria:

   that are maximized: $r_{ij} = \frac{x_{ij}}{x_{\max}}$;

   to be minimized: $r_{ij} = \frac{x_{\min}}{x_{ij}}$

   where: x_{ij} - value of the ith offer according to *the jth* criterion; x_{maxj} – the highest value of offers according to *the jth* criterion, x_{minj} – the lowest bid value according to *the jth* criterion;

4. Calculation of the total number of points for each offer (*i*)
   The values of one offer for all criteria are multiplied by the corresponding weight coefficients of the given criteria and these products are added:
   $V_i = \sum r_{ij} \cdot w_j$, that is

$$V_i = \sum \frac{x_{ij}}{x_{\max}} \cdot w_j$$ for *x* tends to the maximum value (if it is favorable that the criterion tends to the maximum)

$$V_i = \sum \frac{x_{\min}}{x_{ij}} \cdot w_j$$ for *x* tends to the minimum value (if it is favorable that the criterion tends to the minimum)

The weighting coefficients (w_j) should be determined in such a way that their sum is 100.

The methodology makes it possible to evaluate the offer according to criteria that do not have the same unit of measure. It is also important to emphasize that the result is not only which carrier is the best, but also the number of points won in relation to the maximum number of points 100, i.e. how much the best offer is less than the best possible offer which is 100 points.

4.2. Evaluation Criteria

The elements that are evaluated in the operator's offers are:

- The number and quality of the operator's fleet,
- Operator infrastructure and
- Operator references.

The criteria for evaluating the number and quality of the fleet are: the number of available vehicles, the age of the vehicle, the capacity of the vehicle, the type of fuel, the convenience of exhaust gas emissions (according to the EURO characteristics of the engine), the height of the floor in the vehicle, the degree of accessibility of the vehicle to people with mobility difficulties, external and internal appearance of the vehicle, having air conditioning in the vehicle, and the number and area of doors on the vehicle.

In order to carry out regular passenger transport, the operator needs to have the appropriate infrastructure that affects the quality of passenger transport services, so the infrastructure will be evaluated for each operator. Operator infrastructure: Technical and personnel equipment; Vehicle maintenance capacities; Parking area and car wash area; Towing vehicle and service vehicle.

Operator references are: Past experience and success in performing public line passenger transportation; Business creditworthiness of the operator; Professional and qualified staff for the organization of public transport of passengers, maintenance and repair of vehicles; Favorability of the offer for the implementation of measures for the preservation and protection of the environment; Adaptability to the existing passenger information system on and in the vehicle; Transportation management system (radio connection, satellite monitoring of work); Other circumstances that may affect the quality of public passenger transport.
The evaluation of the offer according to several criteria is described below.

The evaluation of the number of vehicles will be done by determining the number of points for each operator according to the route:

$$B_{V\,op} = \frac{V_{op}}{V_{\max}} \cdot w_V$$

where is:

- B_{Vop} - the number of operator points for the number of available vehicles
- V_r - the number of vehicles provided for in the timetable
- V_{op} - the number of available vehicles of the operator that will be engaged in the execution of the timetable (Note: this number of vehicles cannot be less than the number of vehicles provided for in the timetable specified in the public invitation, and it cannot be greater than the maximum number of vehicles specified in the public coll. The offered vehicles must have the minimum number of seats required in the public invitation).
- V_{maxV} - the largest number of vehicle that can be offered by the operator is the number of vehicles provided by the timetable increased by the number of vehicles in reserve, which will be determined in the public invitation.
- w_V - weight coefficient for the criterion number of available vehicles.

The evaluation of the technical and personnel equipment of the operator will be carried out by determining the number of points for each operator according to the relationship:

$$B_{TKop} = \left(0{,}5 \cdot k_{dnj} + 0{,}5 \cdot k_{pos}\right) \cdot w_{TK}$$

where is:

- B_{TKop} - number of points of the operator's offer according to the criterion " Technical and personnel equipment of the operator "
- V_{op} - number of available vehicles offered by the operator
- k_{dnj} - daily care coefficient (k_{dnj} =1 if the operator owns an organizational unit for daily vehicle care, k_{dnj} =0 if the operator does not own an organizational unit for daily vehicle care)
- k_{pos} - transport planning and organization coefficient (k_{pos} =1 if the operator has an organizational unit for planning and organizing transport, k_{posj} =0 if the operator does not have an organizational unit for planning and organizing transport)
- w_k - weight coefficient for the criterion "Technical and personnel equipment of the operator" .

The evaluation of the suitability of the offer for the implementation of measures for the preservation and protection of the environment will be carried out by determining the number of points for each operator according to the relationship:

$$B_{ZOop} = \frac{0{,}5 \cdot n_P + 0{,}75 \cdot n_h + n_e}{V_{op}} \cdot w_{ZO}$$

where is:

B_{ZOop} - number of points of the operator's offer according to the criterion " Advantage of the offer for the implementation of measures for the preservation and protection of the environment "

V_{op} - number of available vehicles offered by the operator

w_{ZO} - the weight coefficient of the offer's favorability for the implementation of measures for the preservation and protection of the environment

n_P - number of gas-powered vehicles

n_h - number of vehicles with hybrid drive (vehicle with two or more energy sources, necessarily with an electric motor)

n_e - number of vehicles with an electric motor.

4.3. Example of the Application of the Bid Evaluation Model

On the example of the offers of three operators, the application of the described model is presented. The data from the operator's offers were entered into the model (Excel form) and based on the model described, ratings were determined for each criterion, Table 1.

Table 1 Results of evaluation of operator bid

Weight	Favorable min/max	The name of the criteria	Rating of the operator's bid		
			1	2	3
70	**Criteria for evaluating the number and quality of the rolling stock**				
15	max	Number of available vehicles	9,00	7,50	9,00
20	min	The criterion is the age of the vehicle	20,00	13,33	10,00
5	max	Vehicle capacity	3,57	4,29	4,17
5	max	Types of fuel	1,92	1,20	1,08
5	max	Suitability of exhaust gas emissions (according to EURO characteristics)	1,25	3,25	5,00
5	max	Vehicle floor height	0,00	1,25	5,00
3	max	Degree of vehicle accessibility for people with mobility difficulties	2,00	3,00	1,00
2	max	Exterior and interior appearance of the vehicle	1,17	0,60	2,00
5	max	Air conditioning	5	2	0
5	max	Number and area (width) of doors	5,00	2,50	3,75
10	**Operator infrastructure**				
4	max	Technical and personnel equipment of the operator	4	2	0
2	max	Vehicle maintenance capacities	2	0	2
2	max	Parking area and car wash area	2	1	0
2	max	Towing vehicles and service vehicles	0	2	1
20	**Operator references**				
3	max	Previous experience and success in performing public passenger transportation	3	0	3
4	max	Business creditworthiness of the operator	0	4	0
4	max	Expertise and qualification of staff for the organization of public transport of passengers, maintenance and repair of vehicles	4	4	0
3	max	Advantages of the offer for the implementation of measures for the preservation and protection of the environment	2,5	3	3
2	max	Adaptability to the existing passenger information system on and in the vehicle	2,00	2,00	0,00
2	max	Passenger transportation management system	0	0	2
2	max	Other circumstances that may affect the quality of public passenger transport	2	0,6	0
100			**70,40**	**57,52**	**52,00**

The most favorable offer is the offer of operator 1 with 70.40 points.

5. Conclusion

The process of selecting an operator for the transport of passengers on public city transport lines can improve the transport service if it is aligned with the guidelines of the European Union. The choice of a carrier requires a multi-criteria evaluation where all relevant criteria that contribute to the selection of the most favorable offer of the operator should be included. The criteria should be adequately covered by the contract between the selected operator and the city government.

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