

MODELLING OF ENTRANCE FEE TO THE BUS TERMINAL

МОДЕЛИРОВАНИЕ ВЪЕЗДНОГО ТАРИФА НА ТЕРРИТОРИЮ АВТОВОКЗАЛА

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Abstract: *This Paper deals with the definition of the general mathematical model for determination of the entrance fee to the bus terminal (BT) for any bus terminal operator in conditions of Czech Republic. Presently does not exist model for determination of the entrance fee for any bus terminal in Czech Republic, which should be universal and suitable for determining the entrance fee per any bus terminal.*

KEYWORDS: *ENTRANCE FEE, BUS TERMINAL, BUS TERMINAL OPERATER, BUS TERMINAL OWNER, MODELLING*

1. Introduction

This Paper deals with the definition of the general mathematical model for determination of the entrance fee for any bus terminal operator in conditions of Czech Republic. On the present doesn't exist model for determination of the entrance fee for any bus terminal in Czech Republic, which should be universal and suitable for determining the entrance fee per any bus terminal. There are three basic types of the bus terminal operators in the Czech Republic - bus carrier, private subject, which is not bus carrier and community or city.

One of conditions of the economical stability of bus terminals there are well set prices of entrance fees to the bus terminal that are on the one hand acceptable for bus transporters and on the other hand cover costs for the operating of the bus terminal at least partially.

2. Prerequisites and means for solving the problem

2.1. Creation of a mathematic model for determination of the entrance fee to the bus terminal

This model should be universal and suitable for determining the entrance fee per any BT under the pre-determined conditions that are as follows: economic information of the BT, operational information of the BT and information of the interest of carriers in using the services of the BT (present as well as prospective customers – bus carriers).

The following procedure was chosen for creation of the mathematic model: the first step was creation of a demand function for entrance to the BT, the second step was creation of a cost function of BT operator, the third step was creation of a profit function of the BT operator and the fourth step was creation of the mathematic tool for determining the entrance fee to the BT, both for the price for which the operator's profit is maximum, and the price when the capacity of the bus terminal will be maximally used.

2.2. Creation of the demand function – demanding the entrance to the BT

The demand function of the entrance to the BT is created on the base of data as acquired from the records of connections using the BT so-called database of bus connections. The analysis includes connections operated during the analysis as well as prospective new connections. A prospective connection means a connection of a bus carrier who was to use services of the BT during the analysis but who did not perform the business relation by any reason.

Generally is the demand function of specific goods dependent on the price of a given goods, prices of other goods (substitute or complementary), amount of customer earnings, promotion of a given goods, taste and preference of customer, etc. Simplified demand function is function dependent just on the price of given good. In

the case of the BT is demand dependent just on the price of the entrance fee.

A database of connections presenting a weekly demonstration of traffic on the BT was generated from all above-mentioned connections. This database of connections was further supplemented by the following information: from the list of concrete days when the connection was dispatched one may determine the number of days when the connection was operating, the connections are divided into three categories, i.e. international, long-distance and suburban (this classification is further used for correction of certain features of the connection), capacity of the connection according to the category (initial condition), occupancy coefficient according to category (initial condition), lowest required profit of the bus carrier for the given connection according to the category (initial condition), length of the route, average costs per one kilometre (initial condition), price of a basic bus ticket from the point of departure to the point of destination, the actual entrance fee to the analyzed BT.

Costs and profits may be calculated from such completed database as well as the profit per every connection may be calculated from their difference. This profit is first decisive criterion (economical influence), which determine if the bus carrier is interested in the entrance of the connection to the bus terminal (the profit is positive) or is not interested in the entrance of the connection to the bus terminal (the profit is zero or negative). On the bus connections, which fulfil the profit condition, is applied the second decisive criterion so-called willingness of paying coefficient (uneconomical influence). This coefficient means psychological aspect of willingness of paying of the entrance fee.

Based on these two decisive criterions we may state the number of connections and subsequently the number of buses that are interested in the entrance to the BT for the given entrance fee. By means of a regressive analysis and from the collected data we may get the demand function describing the demand of bus carriers for the entrance to the BT. For determining the amount of the entrance fee with maximally used capacity of the BT it is necessary to determine first the price from the function at which the BT is maximally used. Subsequently we may determine the costs, receipts and profit for the maximally used bus terminal.

2.3. Creation of the cost function – costs of the BT operator

Costs associated with the existence and operation of a company are its basic economic indicator and their cut-down is the main tool for profit creation at present. Therefore it is not difficult for the BT operator to create the demand function from his own inter-company economic information.

This function consists of two components: fixed component – costs independent on production (depreciation, rental, cleaning, lightening, control signals) and must be thus covered even though the company does not produce, in case of the BT this is the status when no bus enters the BT and variable component – costs dependent on the volume of production (for instance material costs)

mostly related to a production unit, in case of the BT there are the costs related to a single entrance of a single bus to the BT. The decision of what costs belong to what group is not currently arranged by any regulation and it is purely the subject of economic arrangement of every company. In the case of the bus terminal is costs sharing on fixed and variable depend on, if the bus terminal operator is or is not owner of the bus terminal.

2.4. Creation of the profit function – profit of the BT operator

For creation of the profit function of the BT operator it is necessary to define the function describing the dependency of receipts on the number of entrances of buses to the BT. The amount of the entrance fee at which the profit is maximum, may be calculated from the first derivation of the profit function. This shall be laid equal to the zero and then we can calculate the corresponding fee for maximal profit. This value may be added to the demand function, cost function, receipts function and profit function and thus we can determine the demand, costs and receipts at maximum profit of the BT operator.

For determining the amount of the entrance fee with maximally used capacity of the BT it is necessary to determine first the price from the demand function at which the BT is maximally used. Subsequently we may determine the costs, receipts and profit for the maximally used BT.

3. Results and discussion

There are three basic types of the bus terminal operators in the Czech Republic - bus carrier, private subject, which is not bus carrier and community or city. Entrance fee collection by the first and the third type of bus terminal operator doesn't follow any economical principles, just the second type of the bus terminal operator – private subject, on which follow all economical

principles (demand and supply, costs, receipts, profit and loss). Created model of entrance fee (for the price for which the operator's profit is maximum and the price when the capacity of the bus terminal will be maximally used) is not model totally general, which is given for any bus terminal operator, but is suitable just for private bus terminal operator, which is not bus carrier and whereupon follow all economical principles (demand and supply, costs, receipts, profit and loss). The model could be general in case, if of the unification of bus terminal ownership.

4. Conclusion

The model of the entrance fee is the model of a hypothesis, which is a simplified image of the complicated reality. The model is created on basis available information and qualified rating a given reality. Created model is suitable just for private bus terminal operator, which is not bus carrier and whereupon follow all economical principles. The model could be general in case, if of the unification of bus terminal ownership. Created model helps as a ground for the objectification of the economical operating of the bus terminal.

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6. References

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