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Methodology for Modeling the Efficiency of the Implementation of Objects to Improve the Transport Network of Tashkent City

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Abstract: The qualitative parameters of the provision of services are evaluated on the basis of subjective parameters that depend on the consumer properties of passengers, and objective parameters that depend on existing service standards, as well as quantitative values based on retrospective data.

Key words: income, tariff, analysis, quality, car, model, methodology

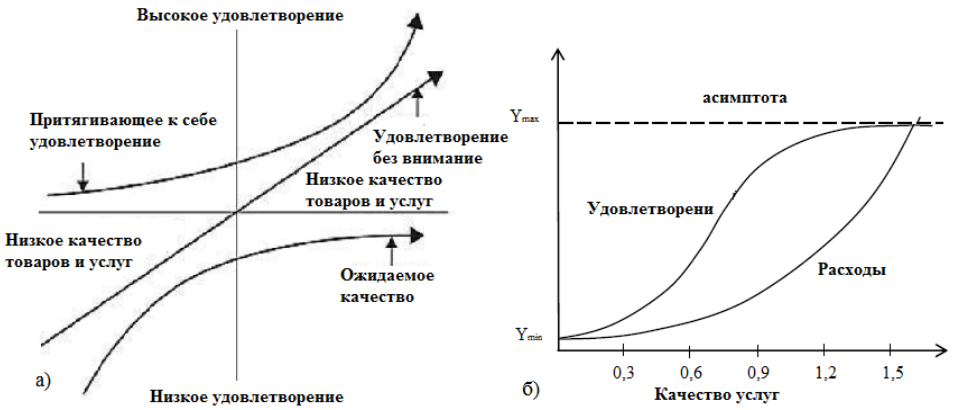
As the analysis shows, there are several points of view on the assessment of quality indicators, among which the main shortcomings inherent in all of them are highlighted: - ignoring by transport operators the wishes of existing and potential customers, traffic safety issues, environmental protection, social protection and communication, etc. d.

Evaluation of the quality of real services based on the opinions and feedback of passengers allows only a diagnostic analysis. The main disadvantage of such an assessment is that the opinions and feedback of potential passengers are not taken into account. In addition, firstly, if an error was made in choosing the number of respondents, i.e. the level of representativeness is incorrectly determined, this leads to the emergence of statistical errors, and secondly, if the opinions of respondents about the quality differ, then it is impossible to achieve the goal.

Taking this into account, it was considered expedient that the dissertation be based on data on qualitative indicators determined by the real and statistical (RS) way in the practical activities of a transport organization. Currently, the opinions of scientists regarding the assessment of the quality of services differ. According to the author, the RS method, based on a combination of subjective and objective assessment methods, makes it possible to obtain fairly accurate and reliable results.

The relationship between customer satisfaction and service quality was systematically implemented in Noriaki Hong's studies, in which a graphical model of this relationship was developed (Fig. 1-a)

But this approach generates a higher degree of subjectivity than the rationality of assessing the quality of services. This circumstance complicates its practical application, for example, by the department of urban transport and JSC "Toshshahartranskhizmat". Therefore, as factor signs and signs of the final satisfaction of existing and potential passengers, we can consider a graphical interpretation of the relationship between the quality of services provided (Fig. 1-b).



Rice. 1. Graphical model of the degree of passenger satisfaction with the quality of services

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Passenger satisfaction increases in the form of logistics links as a result of improving the quality of transportation and the provision of services, the highest growth rate occurs in the range of changes in the quality of services 0.6-0.9. With a quality index above 1.0, the increase in the level of satisfaction slows down, the subsequent increase in the level of customer satisfaction is limited.

In developed countries (in the USA and Great Britain), the level of customer satisfaction is determined by a special method. This customer satisfaction index is determined for one industry and compared with other industries. The customer satisfaction index is determined on a 100-point scale and is 26,000 responses per year based on the results of online surveys. The online questionnaire also reflects customer objections regarding the quality of services and measures taken.

According to the author, there are some shortcomings in determining the satisfaction index based on foreign methods, which do not recognize the existence of a logistical relationship between passenger satisfaction and their service.

The quality of transport services is characterized by a system of quality indicators of transportation.

The main ones are:

filling the rolling stock; the regularity of the movement of vehicles; time spent by passengers for movement (possibility of direct movement without transfers); traffic safety; providing information to passengers and others.

The basis for measuring the quality of the provision of transport services is the established system of standards for the quality of transportation.

In order to determine the degree of relationship between quality and safety parameters in road transport, the author conducted surveys among passengers.

Many large cities of the modern world are faced with the problem of overloading road networks (SRN), which results in a decrease in the speed of vehicles moving along SRN segments, i.e. reducing the efficiency of their use. The difference between the time of movement in free conditions and during peak hours can be 6-8 times or more. At the same time, the level of motorization continues to grow. So, for example, in the city of Tashkent, at present, the level of saturation of the population with cars is 50 cars per 100 families. Based on the materials of the Master Plan for the Development of the City of Tashkent by 2035 year, the level of motorization is predicted in the amount of 500 cars per 1000 inhabitants. In such conditions, it is necessary to take measures to optimize the functioning of the city's transport network. One of the ways to solve the identified problem is the development of a system of the main street and road network, which provides high throughput and the implementation of high-speed ground transport links. Recently, the introduction of objects to improve the transport network, for example, “transport corridors” - objects with the help of which users can move at the maximum allowable speed, avoiding traffic congestion [1,2] has become increasingly widespread .

With public-private partnerships, there are no universal rules; in each specific case, certain agreements are used on the distribution of profits, government guarantees, and various mathematical models are applied. In this study, we considered the analysis of the issue of buying out objects for improving the transport network by the public sector [2].

Income from the operation of the transport network improvement facility fluctuates. In order to calculate the average income, you need to find its average for a certain period of time. To do this, we use the Monte Carlo method - a simulation model of the sum of discrete values of annual income for each section of the path, divided by the time of its passage. After determining the average income, it is necessary to compare the expected income from the project with the simulated sections of the path for which income forecasting is carried out. Note that the operation of paid facilities for improving the transport network has a stochastic character. Consider this process under the condition of average indicators of various risks through the following equation:

$$dS(t) = rS(t)\,dt + \sigma S(t)\,dW_t \qquad (1)$$

Where:

r – tariff in the absence of risks;

σ is an indicator of tariff volatility.

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Let us assume that in the period of time T the indicators r and σ are unchanged. Now consider the integral of the stochastic process in the observed period of time:

$$A(T)=\int_{t_0}^{T} S(y)dy \qquad (2)$$

Determination of the expected profit in a given period of time:

$P_p[S(T)]= S_{t0} *\exp[(r-0.5*\sigma^2) t+\sigma W_t]$ (3)

So way :

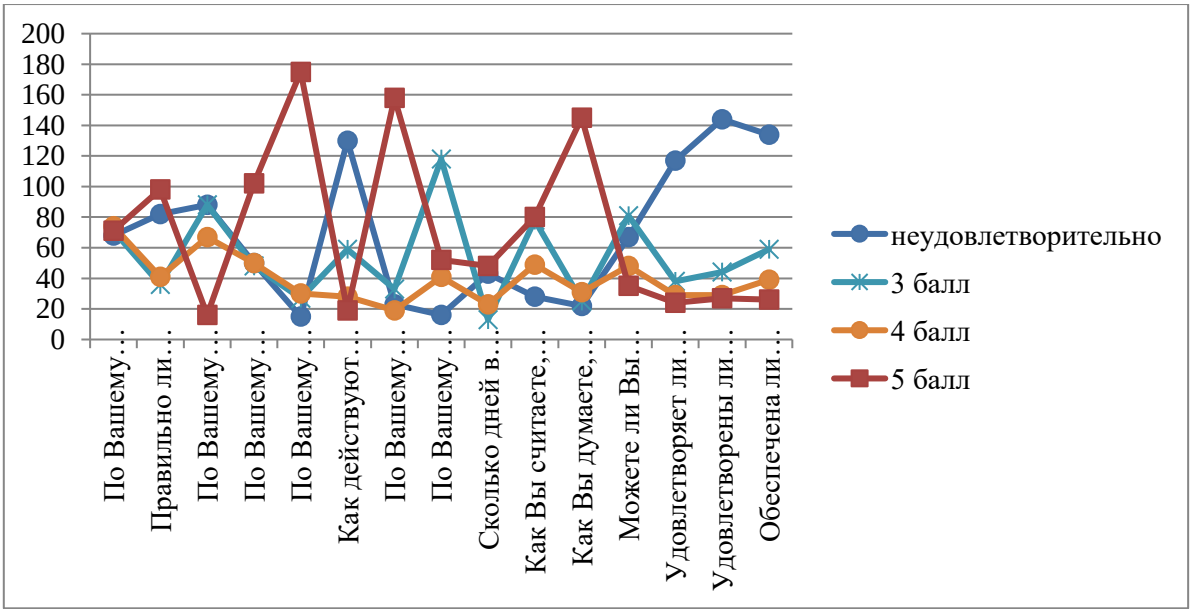
$P_p[A(T)]= P_p[S_{t0} \int_{t_0}^{T-t_0} \exp[(r-0.5*\sigma^2) y+\sigma W_y] dy]$ (4)

Now let's define the interval [0, t], which contains the average income indicator. Note that it can only be determined after the end of a given time interval (i.e., at t0). The redemption of this object by the public sector is expedient if the actual income exceeds the planned one:

D_f \u003d [max (P_p [PV (t)] -K_c , 0) [D_{cf} (t_0)> D_{pl} (5)

Where:
Dav - average income;
D_{pl} - the planned indicator of income;
Kc is the selling price of the object (it can be considered as the cost of the initial investment) .

In total, there are 140 interconnections in the question under consideration, of which 70 are continuously interconnected. That is, we can see that 50 percent of quality and safety (QS) are related to each other.



Rice. 2 . The relationship between the parameters of the quality of services and traffic safety in road transport

One of the quality indicators is considered to be the quality factor K_k, which is determined by the ratio of the amount of time spent on movement in theoretical absolute comfortable conditions $t_{кўчиш}^{сарф}$ to the real time spent on movement in real conditions $t_{кўчиш}^{амалдаги}$ [3,4] :

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$$K_k = t_{кўчиш}^{сарф} / t_{кўчиш}^{амалдаги} \quad (6)$$

The average daily estimated time spent on trips in theoretically comfortable conditions with the parameters ρ $_{tr}$ \u003d 2 km / km ^{2} , ν $_s$ \u003d 20 km / h, t $_{norm}$ \u003d 5 min, is determined by the following formula:

$$t_{кўчиш}^{сарф} = 12{,}25\frac{3}{1{,}2}0{,}17\sqrt{F} \quad (7)$$

where: *F* - residential (built-up) area of the city.

The estimated time for trips during peak hours is calculated in the same manner, however, it is determined taking into account the correction $t_{n\text{-norm}}$ = 3 min, and the first component of formula (6) is replaced by the value 11.75 [5] .

It can be proposed to study the processes of ensuring the quality of passenger transportation and determine their relationship with the parameters of urban passenger road transport (GPAT) using the IDEF0 functional modeling methodology. Technological modeling of the process using modern software BP-Win allows you to visually study the process of improving the quality of transportation.

Analytical studies on the technical issues of introducing paid objects have shown that such objects are highly profitable, and with proper work with various indicators (type of vehicle, cost and travel time), it is possible to maximize profits.

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