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METHODOLOGY FOR IMPROVING THE QUALITY INDICATORS OF PASSENGER TRANSPORT SERVICES ON CITY BUS ROUTES

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Abstract

This article analyzes the quality of transport services for passengers on city bus routes and the criteria for its assessment. First of all, such factors as the level of efficiency of the existing bus route system, the traffic schedule, the infrastructure of bus stops, the professional training of drivers, and passenger safety will be studied. To improve quality indicators, proposals have been developed for optimizing the service process, monitoring passenger traffic in real time, regular monitoring of the technical condition of vehicles, and the introduction of modern information and communication technologies. The proposed method serves to improve the quality of service in the city's internal transport system, increase the level of passenger satisfaction, and improve the overall transport efficiency.

Keywords: *bus routes, passenger service quality, transport system, service criteria, optimization.*

Introduction. Transport services for passengers should be organized so that all consumer needs are met with minimal costs. However, the development of methods for a comprehensive quantitative assessment of the quality of transport services remains a complex task. This is due to the following reasons:

- the quality of passenger transport services cannot be assessed by a single criterion;
- an increase in the indicator of one criterion can lead to a decrease or increase in the indicator of another criterion (due to the presence of a correlation between the criteria);
- not all quality indicators have a quantitative dimension. One of the main requirements of consumers for the quality of transportation
- creating favorable conditions for them during transportation and delivering them to their destinations in a timely manner.

The comfort created for passengers inside a technically sound bus cabin is primarily assessed by its occupancy rate, i.e., the capacity utilization coefficient (the concentration of toxic gases, noise, and vibrations within the cabin of technically sound buses meet the established standards).

The bus capacity utilization coefficient is determined by the ratio of the number of passengers in the cabin to its total capacity.

$$\gamma=\frac{q_a}{q_n} \quad (1)$$

here: q_a-the number of available passengers in the bus; q_n-nominal capacity of the bus.

When determining the capacity utilization coefficient of buses on routes, it is impossible to achieve the expected result by linking it to two indicators. Connection with various indicators allows for a comprehensive approach.

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In order to determine the quantitative value of the quality of passenger transport services and conduct research work, it is recommended to express the bus capacity utilization coefficient in the form (1).

Theoretical analysis of the indicators influencing the bus capacity utilization coefficient is considered below.

The stopping time of the bus at intermediate stops consists of the waiting time for the bus to enter due to the bus's occupancy, the time for disembarking passengers from the bus, the waiting time for passengers to board and exit the bus (if the exit lane of the bus is occupied), and the travel time of the bus from entering the bus to exiting.

$$t_{ob}^{n}=t_{kir.kut}^{n}+t_{yo`l.tush}^{n}+t_{yo`l.chiq}^{n}+t_{chiq.tush}^{n}+t_{xar}^{n} \quad (2)$$

$n_{ox}^{o} \in \{\frac{1}{n_{ox}^{o}}\}$where: n belongs to sets consisting of first and last station numbers, i.e., n

$t_{kir.kut}^{n}-\ t_{yo`l.tush}^{n}-t_{yo`l.chiq}^{n}-\ t_{chiq.tush}^{n}-\ t_{xar}^{n}$waiting time for the bus to enter the station due to bus stops being occupied; the time for disembarking a passenger from the bus; the time for passengers to board the bus; hours; the time the bus waits to exit the station (if the exit lane from the station is occupied; hours).

Considering that the bus's travel time during the trip is the sum of the travel times between intermediate stops, it is expressed as the ratio of each l distance between stops to the average technical speed V_t achieved on this section of the road

$$t_{xar}=\frac{l_1}{V_T}+\frac{l_2}{V_{T_2}}+\ldots+\frac{l_n}{V_{T_n}} \quad (3)$$

$V_T,\ V_{T_2}, V_{T_n}$ –*avtobusning*Here: $l_1, l_2, \ldots l_n$, -distances between intermediate stations, km; technical speeds between intermediate stations, km/h.

The stopping time at the last stop of the bus route can be expressed as follows [11]:

$$t_{T}^{ox}=t_{yo`l.tush}^{ox}+t_{xuj}^{ox}+t_{yo`l.chiq}^{ox}+t_{dam.ovq}^{ox}+t_{xar}^{ox} \quad (4)$$

$t_{xuj}^{ox} t_{yo`l.tush}^{ox}\ t_{yo`l.chiq}^{ox} t_{xar}^{ox}$where: - time spent on recording the driver's completion of a certain trip in the duty mechanic's log and other documents, hours; - time spent on disembarking passengers in the bus cabin, hours; - waiting time until the cabin is filled to a certain extent with passengers, hours; - time spent on moving the bus in the station area, hours;

The time of bus delays on the route for other reasons is the time of unjustified delays at all intersections, sections of the section, etc.:

$$t_{bosh}=t_1+t_2+t_n\ldots.+ \quad (5)$$

t_1, t_2, t_n,where: - unjustified trip times at intersections, sections of crossings, etc., hours.

The formation of the number of buses, the time of their stay on the route, and the number of passengers transported per day is a complex process.

The number of buses operating on the route is formed under the influence of the maximum number of passengers transported on the route (the maximum number of passengers that need to be transported per hour), round-trip time, and bus capacity [25];

$$A_{ish}=\frac{Q_{max}*t_{ay}}{q_m} \quad (6)$$

$Q_{max} t_{ay} q_m$ Here: - maximum number of passengers, - time spent by the bus on one round trip, hours; - nominal capacity of the bus, passengers.

The number of passengers transported per day is the sum of passengers transported per unit time (hour, trip,...);

$$Q_{kun}=Q_1+Q_2+...+Q_n \quad (7)$$

Q_1, Q_2, Q_n Where: - number of passengers transported in units of time, passengers,
The bus's travel time can be expressed as follows

$$T_M=t_{xar}+t_{ob}+t_{ish}+t_{oxb}, \quad (8)$$

$t_{xar} t_{ob} t_{ish} t_{oxb}$ Here: - bus travel time on the route, hours; - bus stopping time at intermediate stops, hours; - bus delay time due to road conditions, hours; - bus stopping time at final stops, hours.

Leading scientists of the world have conducted research on the standard value of the capacity utilization coefficient on city bus routes. For example, for "peak hours," US scientists J. Harington noted in their research that "exemplary" should be equal to 0.89, "good" - 0.75-0.89, "satisfactory" - 0.59-0.74, "bad" - 0.59, European scientists N.B. Ostrovsky [6] 0.73-0.78, and I.B. Spirin 0.78. This, in turn, indicates the need to develop standard values for the capacity utilization coefficient on city bus routes. The Department of "Transport Logistics and Traffic Safety" (now "Transport Logistics") of the Tashkent Institute of Automobile and Roads (now the Tashkent Institute of Design, Construction and Operation of Automobile Roads) has developed "Polozhie i metodicheskie rekomendatsii po otsenke "Obrazsoviy marshrut," according to which the value of the capacity utilization coefficient on city bus routes is determined to be up to 0.8 during "peak hours" and higher than 0.3 during the day.

The lack of uniformity in the research of scientists regarding the normative values of the capacity utilization coefficient on city bus routes necessitates the development of a State Standard for quality indicators and their normative values in order to improve the quality of public transport services in our country.

By the coefficient of capacity utilization on bus routes
standard values proposed by scientists of the countries

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