Research Into Demand for Intercepting Parking in the City of Rostov-On-Don

D N Sorokina¹

¹DSTU, Rostov-on-Don, Gagarin square 1, 344001, Russia

E-mail: naukauni@mail.ru

Abstract Thousands of cars come daily to the city of Rostov-on-Don. During working hours, the city’s street-road network is congested, it’s hard to find a parking space. Quite frequently, out-of-town drivers leave private transport in parking lots of large shopping centers at the entrance to the city and then make a change to public transport. However, this creates parking difficulties for those who actually come to shopping centers. This article discusses one of the possible ways to solve this problem, namely intercepting parking. This is confirmed by the data obtained in an a priori ranking of factors on the basis of a survey covering out-of-town drivers.

1. Introduction
Every year the number of cars in the city of Rostov-on-Don rapidly grows. Most of the administrative bodies and socially significant facilities are located in the city center. Therefore, the city center is a place where a large number of vehicles gather every day, and this leads to traffic jams and road congestion [1-3]. This is especially relevant during working hours. Another factor contributing to traffic jams is the lack of bypass roads that would help divert a large traffic flow from the city center [4-6]. The efforts aimed at reducing traffic jams are constant. One of the ways to achieve success is for citizens to abandon private transport in favour of public transport [7].

2. Relevance
Every day, about 30 thousand cars come from the districts of the region to Rostov-on-Don. Out-of-town drivers do not know Rostov-on-Don well, they face difficulties building a route, they feel insecure due to intensive urban traffic. They get caught in traffic jams and cannot park their car. Quite frequently, out-of-town drivers leave private transport in parking lots of large shopping centers at the entrance to the city and then make a change to public transport or take a taxi. In turn, this creates parking difficulties for those who actually come to shopping centers [8, 9].

3. Problem statement
One of the options for solving the problem of parking for out-of-town drivers can be intercepting parking lots [10, 11].

Intercepting parking is a parking lot located near a public transport stop and intended for drivers who wish to leave their vehicle and continue to their destination by public transport [12].
4. Theory
A plot near the southern entrance to the city of Rostov-on-Don was considered. In the first phase of the study, data were obtained on the characteristics of traffic flows on the incoming highways. To fulfill this task, the method of natural observations was chosen [13]. The result is information on the intensity and composition of traffic entering the city. This information is important in order to determine the potential demand for intercepting parking lots. Assuming that intercepting parking lots will be used by drivers of passenger cars, the intensity of all cars entering the city was calculated.

The calculation of the intensity of the traffic was carried out at various hours during the working day (8 a.m. – 9 a.m., 13 p.m. – 14 p.m., 17 p.m. – 18 p.m.). On the basis of the received data, the percentage composition of the traffic flow was established, which showed that the traffic flow consists mostly of passenger cars [14]. Then a graph of the traffic intensity distribution by the hour of the day is constructed (Figure 1).

The results of a study of the traffic intensity conclude that the area in question is sufficiently busy. The traffic is especially intensive in the morning and evening, since in the morning people go to work, and in the evening, they come from work. The composition of the traffic also demonstrates this.

The second phase of the study examined the transport demand for intercepting parking. The study was conducted on the basis of an a priori information through an a priori ranking of factors [15]. This method is well studied and is highly effective [16-19]. The survey was carried out in the parking lot of the MEGAMAG hypermarket, which is located at the southern entrance to Rostov-on-Don. The survey covered drivers from the suburbs who regularly come to Rostov-on-Don.

| Number | Question name |
|--------|---------------|
| 1      | Are you satisfied with the time spent going around the city in a private car? |
| 2      | Are you satisfied with the cost of going around the city in a private car? |
| 3      | Are you confident in your driving skills in the streets of Rostov-on-Don? Do you know the route to your destination in Rostov-on-Don? |
| 4      | Is it hard to find a parking space in the city center? |
| 5      | Do you use a shopping center parking as an intercepting parking lot? |
| 6      | Do you use public transport in Rostov-on-Don? |

Figure 1. Schedule of traffic intensity distribution by hour of day.

The survey questions were designed to gather information about the satisfaction of drivers with various aspects of their driving experience in Rostov-on-Don.
The purpose of the research is to establish what the reason is behind the need for intercepting parking at the entrance to Rostov-on-Don? Questions were selected for the questionnaire, which are presented in Table 1. A total of 175 drivers were interviewed. The survey took place in October–November 2020, on weekdays from 10.00 to 12.00 hours during peak traffic hours. It should be noted that the issue of intercepting parking is interesting to drivers and they were eager to take part in the study.

5. Practical significance, proposals and results of the implementation, results of experimental research
According to the results of the survey, a ranking matrix was compiled. The information received from the participants was processed. The degree of consistency of their opinions was assessed using the concordance factor W, which was 0.79 indicating a high degree of consistency of opinions [20]. At W≥0.5, the hypothesis of non-randomness of consent using the Pearson's chi-squared test is tested [21]. It is established that the opinions of experts are not coincidental. Convinced of the consistency of the opinions of specialists, a chart of ranks was constructed according to which it was concluded that the main factors influencing the need to design an intercepting parking lot in the city of Rostov-on-Don are: difficulties with parking in the city center, parking lots in shopping centers used as an intercepting parking lot; out-of-town drivers using urban public transport.

6. Conclusion
According to the results of the research, conclusions were made about the prospects of intercepting parking lots. Based on objective data, it is established that there is a need for intercepting parking at the southern entrance to Rostov-on-Don. Out-of-town drivers would willingly leave their car in an intercepting parking lot and then continue their way to the city on public transport. Thus, number of traffic jams in city streets will be reduced, there is no need to look for parking in the city.

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