Theoretical Approaches in the Organization of Transport Services by Taxi

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Abstract. Public passenger transport of the Russian Federation provides about 85% of the labor and domestic trips of the population in urban and suburban traffic. Taxi transport is currently the third largest in terms of the volume of services provided, which is primarily associated with the convenience of delivery, the level of prices, the stereotype of consumer behavior, the emergence of new services - services for on-line taxi booking (aggregators), lack of government regulation of the market, lack of passenger insurance. In recent years, in the concepts of development of the transport sector, transport strategies, much attention has been paid to improving the quality of transport services. In order to improve and expand the passenger transportation market, it is necessary to create favorable market conditions for taxi companies. Today, private transport and passenger taxis can make significant competition to municipal transport. Due to the complexity of the concept of "transport service", many activities aimed at improving its quality do not produce tangible results due to insufficiently developed methodological foundations. Improving the quality of public services by taxi cars should be based on an objective comprehensive assessment of the state of transport and determining the prospects for their development, based on the forecasting of the main technical and operational indicators.

1. Introduction

The public passenger transport of the Russian Federation provides about 85% of the labor and domestic trips of the population in urban and suburban traffic and is an important component of urban infrastructure. The main share in the provision of services is occupied by two types of transport - rail and bus. This situation is primarily associated with the largest volume of services provided, ease of delivery, price level as well as a stereotype of consumer behavior.

The modern problems of business in the field of passenger transport in the Russian Federation include: the low level of socio-economic development of the country's regions as a whole; low living standards; lack of competitiveness of services; adverse investment climate in the regions of the country; obsolescence of fixed assets; budget deficit and complete financial dependence on revenues from the federal center.

There are a number of factors that affect the regional market of passenger transport services, to include them:
1. State regulation of the industry.
2. The level of socio-economic development of the region.
3. The geographical position of the region.
4. Economic regulation through: the ratio of supply and demand; the ratio of state and regional prices, interest rates on financial resources, foreign exchange rates; correlation of the level of service provision, determination of quality characteristics; development programs, forecasting the pace and dynamics of indicators.
5. The organizational regulation through quotas and licenses, how to export, so and on the import of goods and services; licensing, certification, state control.

There is significant interspecific competition on the market, which in turn has an impact on consumer choices and preferences. In recent years, in the concepts of the development of the transport sector, transport strategies, much attention has been paid to improving the quality of transport services. In order to improve and expand the passenger transportation market, it is necessary to create favorable market conditions for taxi companies.

2. Relevance
Taxi transport is currently the third largest in terms of the volume of services provided (Table 1) [1].

Table 1. The provision of means of transport as a percentage of the total volume, the dynamics of 1992-2019 years, %

| Transport       | 1992 | 2000 | 2006 | 2011 | 2013 | 2014 | 2017 | 2018 | 2019 |
|-----------------|------|------|------|------|------|------|------|------|------|
| railway         | 48,38| 42,28| 50,06| 47,17| 49,58| 50,12| 48,27| 46,65| 47,92|
| bus             | 40,56| 43,95| 41,37| 47,75| 45,70| 45,59| 47,19| 48,85| 47,81|
| passenger taxi  | 0,73 | 0,05 | 0,03 | 0,10 | 0,10 | 0,11 | 0,11 | 0,12 | 0,15 |
| car sharing     | 4,97 | 6,35 | 3,92 | 2,28 | 2,16 | 1,92 | 1,86 | 1,86 | 1,77 |
| trolleybus      | 5,01 | 7,11 | 4,36 | 2,41 | 2,26 | 2,06 | 2,38 | 2,32 | 2,12 |
| tram            | 0,36 | 0,25 | 0,26 | 0,27 | 0,21 | 0,22 | 0,19 | 0,19 | 0,23 |

Taxi market contribution in Russia estimated by various sources to 0.7% GDP [2]. Moreover, from the moment Law No. 69 came into force, which stipulated that in the regional territories all taxi companies, both legal entities and individuals, should operate on the basis of a license that is issued for each vehicle, according to official data, the number of licenses issued has a tendency to a constant decrease [3, 4]. At the same time, the market sector itself is growing, but it is moving “into the shadows”. There are a number of regions in which there are more individual taxi drivers than permits issued to them. For example, in Moscow such an excess reaches 15%, and the maximum value of 165% is observed in Kalmykia region. According to the data for 2018, the illegal market share calculated as the difference between the total number of trips and the number of trips physically licensed cars could physically make at their maximum work intensity is 16% across the country. The volume of the illegal market in 2019 is estimated at 101 billion rubles. The average annual number of taxi drivers for 2019 is estimated at 600 thousand people. At the same time, up to 2017, there was an increase in the number of taxi drivers, but recently, market growth has been carried out by increasing the number of operated and taxi cars (used in two shifts) [5, 6].

The proportion of the population who regularly use taxis (those over 15 years) is the dynamics of growth and for the period of 2014-2018 years increased from 12 to 15.4%, while the percentage of the rural population is higher, at 17% compared to 14.9% of the urban. The percentage of the urban population using taxis on an ongoing basis is highly dependent on the size of the city. So in cities with a million-plus population, the share of the population using a taxi in 2018 is only 9.5%, and in cities with a population of less than 50 thousand sheep, this is already 22.7%. Just in the last 2 years of age of a la the frequency of use of a taxi to the 33%, 18% of the population began to use them less often, while 50% remained with the same frequency. In small towns, taxis increasingly perform the functions of
public transport, the worse the development of public transport, the greater the proportion of the population using taxis [7, 8].

The transport market provides passengers with various types of transport services, which, as a rule, are unequal not only in cost, but also in speed and comfort. The choice of a type of transport by a passenger is influenced not only by economic, but also by qualitative characteristics. Today, personal transport and passenger taxis can make significant competition to municipal transport [9, 10].

Due to the complexity of the concept of “transport service”, many activities aimed at improving its quality do not produce tangible results due to insufficiently developed methodological foundations. The analysis of specialized literature showed that in many cases the concept of transport services is often compared with the concept of transport services, which seems insufficiently substantiated theoretically and methodologically [11]. Transport service is a more complex concept, because the client perceives it in terms of the services provided, the level of organization of the transport process and interaction with users of transport services.

GOST R 51006-96 gives the definition of “transport service” as the result of the activities of a transport service provider to meet the needs of a passenger, consignor and consignee in transportation in accordance with established norms and requirements [12]. Mirotin L. defines transport services as "... activities related to the process of moving goods and passengers in space and time and the provision of appropriate transport services" [13].

Transport services can be equated to the concept of transport activities related to the process of moving goods and passengers in space and time, and the provision of transport services related to this activity. Other definitions focus on the process and define transport services as "... the process of providing transport services in accordance with established standards and requirements" [14, 15].

The development of the theoretical foundations is necessary to identify a set of advanced technologies and methods for actuating the existing reserves of the system as a key marketing function. Such an approach is accompanied by an increase in the importance of qualitative indicators, an increase in social orientation, and allows a flexible response to changes in economic conditions and the situation on the market due to the iterative nature of decisions made. The same theoretical justification is necessary for the formation of legislative acts on the regulation of the market for taxi services, the boundaries of the distribution of various forms of ownership, the stimulation or restriction of certain types of activities, ensuring compliance between the goals of a market economy and the interests of society, and the social protection of its citizens.

3. Development of taxi transport models and methods for their characterization

Speaking about the complexity of such a concept as transport service and considering it from the point of view of the client, who will subsequently evaluate it, it is necessary to take into account the structure of transport service (see Fig. 1).

The problem solution of introducing a taxi to improve the quality of public services can be provided on the basis of the methodology of a systematic approach to the interconnected tasks of taxi transportation in the system "demand – technology – equipment – management". Through optimization saturation city cars, taxi, the formation of a rational network of sites, scientific studies on the issue of the taxi line, and indicators of their use, work and rest of drivers, as well as improving the supervisory control of transportation process. To significantly improve the quality of public services and transportation efficiency, it is necessary to develop and implement methods for comprehensive optimization of the network and capacity of taxi ranks, the production of taxi cars on the line, taking into account rational working conditions for drivers and the formation of differentiated indicators of taxi use in accordance with operating conditions.
A comprehensive analysis of the transportation process leads to the conclusion that an effective solution to the problems of dispatch control of this type of transportation requires the development of a progressive technology for their implementation from the perspective of an integrated approach, a feasibility study of the means of communication and automation used. In this case, there is a need to develop methods for an objective assessment of the quality of public services, taking into account the stochastic nature of demand and the functioning of taxi transport (see Fig. 2).

**Figure 1.** The service level structure of taxi transport.

4. **Summary**

Improving the quality of public services by taxi cars should be based on an objective comprehensive assessment of the state of transport and determining the prospects for their development, based on the forecasting of the main technical and operational indicators.

The following main problems can be identified that affect the stability and security of the taxi market in the Russian Federation:

1. Lack of statutory liability, legal status and requirements for online taxi services (aggregators).
2. Implementation of tariff regulation by “aggregators” of taxi order. Currently, taxi aggregators, in fact in violation of applicable law, carry out tariff regulation of transportation.
3. Difficult implementation by the executive authorities of the regions of the existing powers to organize transport services for the population with passenger taxis on their territory.
4. Lack of a life and health insurance system for taxi passengers by analogy with passenger insurance for bus transportation.
5. Lack of access standards for the taxi driver profession.
6. A large share of the gray business.

For 2019, about 60% of trips at a cost are carried out using aggregators. The largest aggregator in Russia today: “Yandex.Taxi”, “Lucky”, “Maxim”, depending on the size of the city of their position are substantially different, but collectively occupy 48% of the legal market segment.

The sharp jump in the taxi market in recent years due to the emergence of aggregators, a decrease in the cost of travel and an increase in the number of passengers is coming to an end and the market is expected to stabilize, growth is expected to decrease from 8.6% in 2018 and 5.6 5 in 2019 to 3-7% in 2020, fixation is expected at a level exceeding the economy by 2 percentage points. The forecast plan for the market volume for 2020 will be about 735 billion rubles for the legal market [16, 17].
Recently, merger transactions have been carried out in the taxi market on such a scale that these transactions are controlled by the Federal Antimonopoly Service (FAS RF) [18], so strengthening “Yandex” is planned. Taxi up to 40% of the total market volume through the purchase of assets of the “Lucky” group of companies. Planned exit of new players of taxi business: it is the Estonian “Bolt”, Russia “InDriver” and Chinese “DiDiChuxing”.

The market itself is interested in continuous technical development, and it is in the taxi transportation sector that this becomes possible using modern developments. So “Yandex.Taxi” finances the development of a monitoring system for driver fatigue based on characteristic features, implements a comprehensive security solution: remote medical pre-trip examination of drivers, monitoring the condition of the car by analyzing its photo through neural networks; under tons of its approved identity of the driver through the smart phone's voice and facial shot; speed control and driving style monitoring via smartphone; “Panic button” for the passenger. It is expected the introduction of electronic waybills for taxi drivers until 2022, the development of a digital profile of a taxi driver [19, 20]. Current legislation does not meet modern requirements and requires updating [4, 21]. For the effective operation of these technologies, a single database of all drivers is required, and accordingly, the cooperation of all aggregators and legislative support of the state, which is not yet available. Economic stimulation is also taking place: the tax status of self-employed in several regions of the country is expected to take part of the business out of the shadows.

Thus, to date, the Russian market of transport services there is an urgent need to reform the organization of transportations of passengers and luggage taxi cars, which is caused by the socio-political importance and the need to provide quality services to the population during transport and the lack of meters of effective state regulation mechanism, organizational and economic mechanisms regulation and control guaranteeing this quality.
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