TRANSPORT AND LOGISTICS PLATFORM FOR MULTIMODAL PASSENGER TRANSPORTATION

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ABSTRACT

The options for increasing the volume of passenger transportation by railway through development of a set of services with other modes of passenger transport based on multimodal transportation are considered as drivers of attraction of customers and of transport efficiency growth.

Transport and logistics platform offering various kinds of transport and logistics services based on railway facilities is suggested as a tool for organizing multimodal routes. The suggestion is based on the analysis of commuter bus and rail flows in Russia, of profiling of customers of transportation services, of notions of platform and transport and logistics platform for passenger transportation, comprising its core elements, of the effects and risks of implementation of the concept. Particular attention is paid to possible contribution of the large-scale use of digital and IT-technology, global distribution systems, a set of criteria of assessment of satisfaction of a passenger with transport services is developed.

Keywords: economics, logistics, multimodal passenger transportation, combined transport and logistics services, transport and logistics platform, railway infrastructure.

Background. *A rapid growth of demand, which is the main driver of economic development, is not expected in early 2000s. New reality is increasingly associated with a possible stagnation (and even «long-term braking»), the reason for which is an expected change in the technological mode, digital transformation of the economy, a high degree of technological uncertainty, which is considered as a key factor slowing the global economic growth rate [1]. Under those conditions the choice of a vector of development and the search for relevant strategic and operation decisions are of particular importance for each country. For Russian economy transition to a new model of sustainable economic growth remains a core task.*

Objective. *The objective of the authors is to study different aspects of passenger transportation focusing on transit capacity of railways, and to suggest an effective model of transport and logistics platform for multimofsl passenger transportation.*

Methods. *The authors use general scientific and economic methods, comparative transport market and statistics analysis, management analysis tools.*

Results.

Justification of the choice

For the Russian economy, the macroeconomic task of increasing the country's territorial coherence, «gathering up» production and consumption centers using transport infrastructure, facilitating population mobility remains of core importance [2]. Series of target guidelines up to 2024 include removal of infrastructural constraints for long-term economic growth, an increase in mobility of production factors, and an increase in availability of transport services for the population and businesses.

At the micro-level, for transport organizations, such recipes as cost reduction and development of cost optimization programs, mastering new products/services and new markets, improving the quality of services, and management decisions aimed at winning and retaining customers continue to be relevant. The one who finds and proposes a differentiating, that is, different from the competitors, alternative idea – new products, new markets, new preferences, new communications – to retain customers and expand the customer base, wins [3, p. 9].

One of these management decisions in the field of transport is organization of multimodal passenger transportation [4, p. 18]. Let's consider the possibilities in this area at the example of two passenger transportation markets: rail and bus in intercity and suburban traffic.

The structure of passenger transportation in intercity traffic in Russia is presented in Table 1.

Railway passenger long-distance transportation includes passengers in international traffic. In 2005, the share of railway transport in intercity traffic was 41,8 %, then decreased by 2010 to 35 % and, after a slight increase by 2015 (38,4 %), decreased again to 35 %.

In 2005, bus transportation accounted for more than half (51,2 %) of intercity traffic, and in the next five years its share grew even more – to 55,5 %. After 2010, the share of bus transportation fell sharply and in the past two years has been stable at 38,4 %.

The suburban transportation market of rail and bus transport shows a sharp decline in the number of passengers transported. In 2005, 3070,7 million passengers were transported, and in 2015, only 1868,5 million people, or almost 40 % less [5, p. 38]. At the same time, the number of passengers transported by bus transport fell by 20 %, and those transported by railway transport – by 31 %.

After 2015, the number of passengers in suburban traffic is gradually increasing, but in 2016–2017, if we look at one and the same direction of the routes, the number of passengers transported by buses is higher than number of those transported by railways.

The structure of passenger transportation in suburban traffic is presented in Table 2.

So:

1. There have been significant changes in the structure of intercity transportation market:

Table 1

Intercity transportation in % to the total number of passengers transported by all modes of transport

	2005	2010	2015	2017
Railway transport	41,8	35,0	37,2	35,0
Bus transport	51,2	55,5	38,4	38,4

Calculated according to: Transport in Russia. 2018: Stat. collection. – M.: Rosstat, 2018. – p. 38 [5]. *Figures refer to public transport, excluding taxis and private road cars. – ed. note.*

Table 2

Suburban transportation in % to the total number of passengers transported by all modes of transport

	2005	2010	2015	2017
Railway transport	39,2	35,6	49,6	49,2
Bus transport	60,4	64,0	50,2	50,6

Calculated according to: Transport in Russia. 2018: Stat. collection. – M.: Rosstat, 2018. – p. 38 [5].

• the total share of bus and railway transportation fell from 93 % in 2005 to 72,2 % in 2017;

• market shares of bus and railway transport in intercity transportation market have become closer and are respectively 37,2 % and 35,0 %.

2. Changes are also observed in the structure of suburban transportation market:

• bus and railway transportation still occupy a dominant position, their total share is 99,8 % in 2017 (99,6 % in 2005);

• the share of passengers transported by bus transport in suburban traffic decreased from 60,4 % to 50,6 %; the share of passengers transported by rail increased from 39,2 % to 49,2 %;

3. The equalization of market shares belonging to two types of transport in suburban transportation market has its consequences:

• increased competition between modes of transport, as evidenced by introduction of a new product line for railway transportation – rapid suburban transport, urban electric trains, etc. This explains the sharp decline and then stabilization of the share of passengers transported by bus transport, starting from 2010;

• emergence of signs in the market indicating transition to cooperation and positive cooperation as to profitable forms of interaction between two modes of transport. The railway passenger transportation market has been consolidated within the framework of JSC Russian Railways (e.g. through its subsidiary JSC Federal Passenger Company – FPC) and its regional divisions. In contrast, the bus transportation market is highly fragmented and organizationally represented by a large number of companies, mainly small and medium-sized businesses, operating according to different standards, with different pricing policies and quality of services, primarily regarding safety. Consequently, negotiating power is rather with JSC Russian Railways and its affiliate structures, to propose initiatives on how to consolidate markets, integrate business processes, cooperation models – everything that provides synergistic effect, efficiency and profitability of business.

It is not by chance that in recent years, European railway carriers have been actively entering the bus transportation market. For example, the German Railways (DB) launched its bus transportation service IC BUS, and the French Railways (SNCF) launched Ouibus. It is obvious that the Russian Railways holding company could also launch its own bus transportation service and receive economic benefits from multimodal passenger lines[1].

Consumer, demand, feedback

For a passenger – a consumer of a transport service – speed, price, convenience are the main preferences that shape demand. Multimodal transportation using different types of transport, accompanied by relevant services, become a reliable tool to meet demand with proper organization of the process.

Our research allows us to describe the «profile» of a consumer of a «passenger transportation» service as follows:

a) a consumer is more likely to choose the direct route; the choice of a route with transfers, as a rule, is due to the lack of direct communication in the required direction or to savings in price, significant for a consumer;

b) a consumer tries to book and to purchase travel documents on dates as close as possible to the date of the trip. Data on the results of the pre-sale of tickets in railway transport confirm this position. With an increase in the sales depth of travel documents, the timelines for their acquisition have not changed significantly: no more than 10 % of travel documents are issued 60 days before the planned departure, mostly for resort destinations;

c) deep reservation of travel documents is typical for such types of travel as: 1) targeted, tourist; 2) on heavily loaded destinations where there is a risk that there will be no free seats at the time of the trip; 3) regular (planned) trips of employees to the place of work; 4) focused on transportation of shift workers;

[1] E.g.: The Station to be Reached by a Contracted Bus. *World of Transport and Transportation*, Vol. 14, Iss. 1, pp. 61 (2016). – *ed. note*.

Table 3

Indicators of satisfaction of population with transport services

	Indicators	Meters
1.	Availability of information on conjugation of schedules of regular modes of transport at transport interchange nodes: railway and bus stations, airports	Yes, no
2.	Number of routes having conjunction	In units
3.	Average waiting time for transfer from one mode of transport to another	Hours, minutes
4.	Distance between the transfer infrastructure of regular modes of transport	Kilometers
5.	Informing about critical situations in the operation of regular modes of transport	Yes, no
6.	Number of passengers traveling in a combined traffic	People
7.	Availability of information on conjugation of schedules of regular modes of transport at the regional level	Yes, no
8.	Number of carriers that provide access to information retrieval and reservations online	In units
9.	Degree of automation of distribution systems of carriers providing services in the region	% to the total number

d) demand for combined transport is initiated by:

• passengers planning to visit several places with stops at destinations and exact dates of arrival/departure;

• the population that does not have direct access to the place of departure – railway station or airport, and to overcome the «last mile» those travellers prefer one of the regular modes of transport, most often commuter railways or buses;

• transit passengers who use large hub airports in order to optimize time and resources for transportation.

Accordingly, in order to offer a service or a package of services that meet the consumer profile, his preferences, one should help the client to make a choice that implies a value above the search and purchase costs of the «right» service.

To assess the effectiveness of services for organization of combined passenger transportation, we offer a system of indicators characterizing the satisfaction of the population with transport services, with the work of transport interchange nodes (Table 3).

The basis of the qualitative and quantitative assessment is formed by expert opinions, consumer feedback through feedback form, designed as quality criteria. Modern IT-technologies are capable of collecting and systematizing such information [6, p. 31].

Platform integrator

The organization of multimodal transportation involves development of a transport and logistics platform. The term «platform» is widely used in relation to the transport system, especially when a particular importance belongs, on the one hand, to interconnection and complementarity of modes of transport, infrastructural and organizational possibilities of their sharing, and, on the other, to the ability of agents participating in a chain of combined services to create customer value for clients through coordination or even deeper interaction [7]. It is indeed the network interaction that provides the optimal balance of costs, quality, competencies, flexibility and competitiveness. At the same time, there is an objective need for coordinating business processes in order to simultaneously solve two tasks – improving service quality and reducing costs.

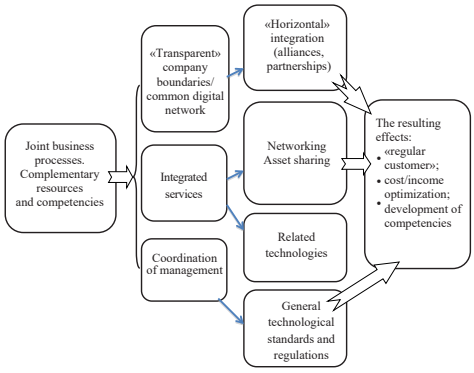
In fact, it is legitimate to talk about the transport and logistics platform – an integrated system of specialized service packages (based on IT technology), including a route network, multimodal transportation, a «single window» system for interfacing different modes of transport and organizing multimodal passenger transportation.

The platform becomes an integrator tool for development of a common (joint) business process that operates on the basis of complementary resources and competences that are combined into network cooperation, which allows for interconnectedness and complementarity of businesses and associated types of production to achieve common results. The use of common technological standards and regulations, and therefore development of a common operating platform that helps to consolidate assets for combined transport, ensures the all-inclusiveness of transportation services and the quality of services at competitive costs.

The model of the transport and logistics platform for development of a common business process that functions on the basis of complementary resources and competencies in order to provide an integrated service of combined passenger transportation is shown in Pic. 1.

The transport and logistics platform for combined passenger transportation has as its foundation:

• developed transport infrastructure, which provides interface of all modes of transport and organization of multimodal transportation;



Pic. 1. Model of transport and logistics platform for combined passenger transportation.

• IT infrastructure, digitalization of a joint business space for integration of business processes, their interconnected functioning and real-time control [8, p. 12];

• organizational infrastructure in the form of network contracts, contracts for long-term service, electronic document management, electronic trading platforms, allowing to implement the «single window», «single ticket», «single tariff» technologies.

The framework of the transport and logistics platform built in this way creates the basis for network interaction.

Networking

We note at once that in-depth interaction of all participants in the transportation process allows:

a) to optimize costs thanks to elimination of ineffective competition and duplication of functions, as well as to reduction of transaction costs, expansion of the client base, directions (geography) of the transportation process;

b) to ensure customer focus, expanding the customer base thanks to the focus on value growth for the end user; as the offer of services for an individual client implies a shift from the principle of commercial benefits for an individual participant to network interaction and partnerships in various forms for the sake of cumulative effect;

c) to obtain a powerful synergistic effect thanks to management coordination, which is equivalent to consolidating disparate assets into a single structure operating according to common standards, as well as thanks to selection of effective practices of logistic interactions, developing and mastering complex/ combined professional competencies.

Technical capabilities of networking and resource sharing are determined by IT-technologies, modern digital solutions. Management of network interaction during organization of combined passenger transportation involves access to a common information environment, databases of participants in the passenger transportation market, information about their functional capacity (competencies) and technological operations, ensuring transparency and effective coordination of managing network cooperation in order to simultaneously solve two tasks – improve the quality of service and reduce costs [9, p. 17].

An example of integration of passenger transportation services and provision of related services is a project organized by JSC Russian Railways with participation of LLC Innovative Mobility. The company acts as the operator of the IT platform

«Innovative mobility», which is a global distribution system (GDS). It is intended for distribution and sale of electronic tickets of all modes of transport, as well as for clearing and mutual financial settlements between carriers and agents.

It is clear that it is not necessary to absolutize such an undertaking. The organization of combined passenger transportation on the principle of «single window», «single ticket» is still associated with a number of difficulties.

Firstly, when planning combined travels, the client is forced to turn to reference and information systems and search engines for information on possible modes of transport and their timetable. The consumer, as a rule, uses search engines that aggregate information on schedules from distribution systems. Due to the fact that in Russia there is no compulsory publication by carriers of timetables in the established format, a significant number of carriers (railway commuter, bus) are not aggregated objects and do not fall into the route design systems. Another way is to access carriers' information resources in order to consolidate the schedules of the modes of transport participating in the combined traffic.

Secondly, the consumer must take into account the features of the reservation system and distribution of tickets for each mode of transport and an individual carrier. Carrier companies set their own terms of ticket sales, which can vary greatly. Thus, JSC FPK, from 01.01.2018, sells travel documents with a depth of 90 days, while tickets for commuter trains are sold not earlier than 10 days before a trip. Air carriers independently establish the sales depth of airline travel documents. For example, the S7 airline company opens the issuance of tickets for charter flights 180 days, and for regular flights 330 days before the scheduled flight. Regular bus carriers, as a rule, prefer the sale depth from 3 to 7 days. The main priority here is given to carriages on the basis of freight contracts that are different in terms of the risk-free organization of the transportation process. (Data based on the analysis of carrier distribution systems are calculated by the authors).

Thirdly, combined transportation under the classical «rigid» system, when cancellation or changing/reissue of a travel ticket at one of the route's sections leads to cancellation or reissue of the same documents at all sections of the route, implies need for additional time and financial resources that would compensate the costs of the trip on one or several segments in case of route change. There are certain risks, subject to prior reservation and purchase of a single travel ticket, which the consumer of the final service must be able to assess and, if possible, to neutralize.

Fourthly, in the passenger transportation sector, an increase in the number of carriers participating in network interaction will reduce flexibility and adaptability of the system, and, even in the case of minor changes in the external environment, will become a powerful barrier to organizing combined (mixed) passenger transportation.

Conclusions. *Removing restrictions/barriers to development of multimodal passenger transportation is technologically and organizationally feasible through development of a transport and logistics platform.*

Organizational support for business cooperation and network interaction, coordination of efforts to create and operate territorial transport and logistics platforms for implementation of multimodal transportation are required.

It is advisable to create a coordination structure (center/project office; e.g. in Russia – within passenger transportation businesses management department of JSC Russian Railways) to organize efficient mixed, combined passenger transportation within all modes of transport, taking into account their interaction based on digital technologies.

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