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 transport services, transport and logistics platform, railway infrastructure.

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 multimodal 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:

<p>| Intercity transportation in % to the total number of passengers transported by all modes of transport |</p>
<table>
<thead>
<tr>
<th>Railway transport</th>
<th>Bus transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>2010</td>
</tr>
<tr>
<td>Railway transport</td>
<td>41,8</td>
</tr>
<tr>
<td>Bus transport</td>
<td>51,2</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Indicators</th>
<th>2005</th>
<th>2010</th>
<th>2015</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Availability of information on conjugation of schedules of regular modes of transport at transport interchange nodes: railway and bus stations, airports</td>
<td>Yes, no</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Number of routes having conjunction</td>
<td>In units</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Average waiting time for transfer from one mode of transport to another</td>
<td>Hours, minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Distance between the transfer infrastructure of regular modes of transport</td>
<td>Kilometers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Informing about critical situations in the operation of regular modes of transport</td>
<td>Yes, no</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Number of passengers traveling in a combined traffic</td>
<td>People</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Availability of information on conjugation of schedules of regular modes of transport at the regional level</td>
<td>Yes, no</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Number of carriers that provide access to information retrieval and reservations online</td>
<td>In units</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Degree of automation of distribution systems of carriers providing services in the region</td>
<td>% to the total number</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

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.

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;


Table 3

Indicators of satisfaction of population with transport services

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Meters</th>
</tr>
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<tbody>
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Transportation

Dunaev, Oleg N., Guts, Alexey V. Transport and Logistics Platform for Multimodal Passenger Transportation

passenger transportation has as its foundation: competencies in order to provide an integrated service functions on the basis of complementary resources and the quality of services at competitive costs. ensures the all-inclusiveness of transportation services that helps to consolidate assets for combined transport, therefore development of a common operating platform common technological standards and regulations, and production to achieve common results. The use of complementarity of businesses and associated types of competences that are combined into network operates on the basis of complementary resources and development of a common (joint) business process that transport and organizing multimodal passenger «window» system for interfacing different modes of route network, multimodal transportation, a «single service packages (based on IT technology), including a logistics platform – an integrated system of specialized and reducing costs.

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 impact is required. It can be both develop 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 «network» 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 transport; 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 effects;
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...
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 different 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 of tickets set by them to the maximum possible depth. The main point here is given fact 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/refund of travel documents 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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