



Low-Cost Long-Distance Passenger Train Model



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ABSTRACT

The introduction of low-cost long-distance passenger trains will improve transport availability, expand the geography of routes, increase train departure frequency, resulting thus in growth of passenger turnover and carriers' incomes.

From the standpoint of national economy, the emergence of trains of that kind will contribute to better transport mobility of population, labour market balance, tourist attractiveness of the country and its regions, to increase in GDP thanks to multiplicative effect.

As a result of active implementation of state support measures for development of regional aviation, construction of high-speed highways, introduction of car sharing services, in recent years there has been a significant increase in competition in the long-distance passenger transportation market.

Each segment of this market requires meeting the needs and expectations of a certain type of customer, reflecting the age, education, type of activity, income, physical condition of a passenger.

The competitiveness of a particular type of transportation in the modern world, is based, first, on the widespread growth in the value of time as of a significant resource of human life, and consequently in speed of movement along all the route (from door to door) since life expectancy, in addition to extensive factors (high-tech healthcare, healthy nutrition, etc.) evolves at the expense of intensive factors also which certainly include the saving of time for movement.

The objective of this article is to describe the business model of a low-cost long-distance railway passenger carrier, to analyse technical, technological, organizational factors that form the model using the methods of economic analysis, observation, and comparison. It is concluded that key conditions for functioning of the model of a low-cost long-distance passenger carrier comprise among others operation of modern energy-efficient rolling stock, flexibility and promptness in development of the route network, identification of the travel frequency and the composition of low-cost trains.

Keywords: passenger transportation, low-cost transportation, low-cost carriers, railway passenger complex.

For citation: Troitsky, P. S. Low-Cost Long-Distance Passenger Train Model. *World of Transport and Transportation*, 2021, Vol. 19, Iss. 5 (96), pp. 173–177. DOI: <https://doi.org/10.30932/1992-3252-2021-19-5-5>.

The text of the article originally written in Russian is published in the first part of the issue.
Текст статьи на русском языке публикуется в первой части данного выпуска.

INTRODUCTION

Expansion of the product line, provision of multimodality and a significant increase in the route speed of transportation should serve as a strategic guideline for railway passenger carriers. To the greatest extent, these characteristics are now inherent in road transport due to its autonomy, flexibility, and geographic spatial distribution [1].

Nevertheless, long-distance trains have some undoubted advantages in comparison with road and air transport:

- Transportation safety.
- Respect of the timetable exceeding 98 %¹.
- More comfortable conditions for accommodating passengers in the coach.
- Combination of travel with rest at night (train-hotel).
- Almost complete independence of transportation from weather conditions [2].
- Developed route network.
- Free transportation of children under the age of five.
- High allowable rates of carry-on baggage.
- Location of embarkation and disembarkation stations in city centres.
- Environmental friendliness of railway transport [3].

In addition, railway passenger traffic is of high social and strategic importance for the state, including in regions with extreme natural and climatic conditions lacking road and aviation infrastructure [4].

Currently, business models of Russian railway carriers in long-distance passenger travel are focused mainly on providing a standard, established complex of transportation services in the railway industry. Thus, the structure of the car fleet of JSC FPC, the main railway long-distance passenger carrier of the Russian Federation, is made up mainly of coaches with berths, which have a significantly higher cost per passenger seat, and the operation of which at distances from 200 to 600 km is unprofitable, which leads to the loss of the corresponding short-distance passenger market in favour of road (bus) transport. According to 2020 annual report of JSC FPC, its car fleet composed of 16596 coaches, of which only 637 were interregional ones¹. It is worth noting that competition

between modes of transport does not result by itself in increase in efficiency of activity of each mode of transport since when competition is growing it often implies the problem of public subsidies to even the conditions of transportation (e.g., to align difference in infrastructure fees) [5].

It is then relevant to search for new product models that might raise the competitiveness of rail transport in the segments of transportation market that meet high demand of customers. Low-cost transportation in long-distance trains can be among those product models. Civil aviation widely uses such practices, and we can witness now practical steps in some countries to implement such projects in rail sector.

The first ever low-cost flight of Pacific Southwest Airlines took place on May 6, 1947. Over the past ten years, more than 100 new airlines have emerged globally that have started flights using low-cost technology. Many classic airlines started focusing on this segment, and the share of air passengers traveling with low-cost airlines has grown from 13 % to 29 % in the global passenger traffic².

In the railway industry, the low-cost business model has remained not very popular until recently. The most striking examples of low-cost railway carriers are the Czech Regio Jet³, Leo Express⁴, the Spanish high-speed trains Avlo of the national operator Renfe, and the project of Ouigo, a subsidiary of the French SNCF⁵. The later case has been studied by researchers [6]. We can also cite the example of the low-cost transportation project is called Izy⁶ implemented by high-speed rail company Thalys (it is easy to note that it sounds in English like the word «easy»). Arthur D. Little company has

² What is a low-cost airline? [Electronic resource]: <https://tripmydream.com/media/layfhak/loukost-perelety-vse-minusy-i-plyusy>. Last accessed 15.10.2021.

³ See, e.g., the website of Regiojet company. [Electronic resource]: <https://www.regiojet.com/services/services-onboard-of-trains/low-cost.html>. Last accessed 15.09.2021.

⁴ Railway transportation – the largest companies. [Electronic resource]: <https://www.oborudunion.ru/largest/jeleznodoroga-uslugi>. Last accessed 15.10.2021.

⁵ Renfe has launched low-cost Avlo trains between Madrid and Barcelona. [Electronic resource]: <https://zdmira.com/news/renfe-zapustil-byudzhetnye-poezda-avlo-mezhdu-madridom-i-barcelonoj>. Last accessed 15.10.2021.

⁶ Please see, e.g., information on the website of international unit of Belgian national rail company (SNCB International). [Electronic resource]: <https://www.b-europe.com/EN/Trains/IZY>. Last accessed 15.09.2021.

¹ Annual report of JSC FPC. 2020. [Electronic resource]: <https://fpc.ru/api/media/resources/1735779?action=download>. Last accessed 15.10.2021.

recently made a study on existing practices and development prospects for long-haul low-cost trains focusing on high-speed rail⁷.

The peculiarity of all the listed trains is that they have seating coaches, which allows to use most of the car interior space to accommodate seats, while the carry-on luggage allowance included in the price allows carrying no more than 1 unit of luggage per person.

Considering the promising character of the issue, the main *objective* of the research is to study the possibility and to analyse parameters of introduction of a new product offer which is low-cost long-distance passenger trains on the network Russian Railways. The study applied methods of comparative and economic analysis, content analysis of technical information.

RESULTS

Michael Porter, a leading expert in the study of economic competition, identifies three strategies for developing a company's competitive advantage, depending on the degree of market breadth:

- Low cost (cost leadership) strategy.
- Differentiated strategy (creation of a product with unique characteristics).
- Focus strategy (obtaining a competitive advantage in a narrow market segment) [7].

In our opinion, the offer of low-cost passenger trains should combine the advantages of all three strategies. The distinguishing features of a low-cost train comprise low cost of transportation, a fixed and clearly recognisable set of consumer characteristics, focus on a defined segment of passengers, namely on passengers with a minimum amount of baggage, without requesting additional services, the main goal of whom is to move between points of departure and destination with minimal financial costs and considering allowable time constraints.

The formation of competitive advantages of the transportation service in the transport market occurs as a result of interaction of the elements of the chain: the carrier – the owner of the infrastructure. The quality of the transportation process is within the area of responsibility of the owner of the infrastructure (JSC Russian Railways in Russia), the quality of transport

services is within the area of responsibility of the carrier company [8].

Let's form a group of factors that make up the business model of a low-cost-carrier:

1. *Group of technical factors (TECH)*: technical characteristics of traction and non-traction rolling stock, coach interior, specific energy consumption per passenger seat.

2. *Group of technological factors (TECHN)*: time of departure and arrival, route speed of the train, location of stations of departure and arrival.

3. *Group of organizational factors (ORG)*: tariff setting (pricing), labour productivity of the train crew, additional service on board the train.

Thus, the target function of the low-cost carrier is:

$TECH + TECHN + ORG = \text{Cost of 1 passenger seat} \rightarrow \min.$

TECHNICAL FACTORS

The group of technical factors includes the following activities:

1. The use of coaches with increased passenger capacity, primarily double-deck seating coaches, as well as capsule coaches [9].

2. Unification of the car fleet of low-cost-trains that means the use of coaches of the same model range with a single colour-graphic design, internal equipment, and design for the most efficient interchangeability of rolling stock during periods of maintenance, repair, emergency situations. The age of the low-cost train car fleet should not exceed 10 years to minimise repair costs.

3. Implementation of traction by dual-system and hybrid locomotives with increased service runs to reduce the cost of initial and final operations and unproductive downtime at intermediate stations [10; 11]. It is also possible to operate electric trains, including double-decker coaches [12].

4. The use of energy-saving equipment in traction and non-traction rolling stock: LED lighting, automatic individual climate control systems in a compartment, energy recovery and storage (electrodynamic braking with energy storage unit in each coach, piezoelectric inter-coach walkway and floors) [13].

5. Decrease in the tare ratio of coaches and thus of the mass of the train due to the use of composite materials in coach bodies, elimination of heavy coach equipment, in particular, of water heating systems, generators.

⁷ Hensler, A., Zintel, M., Baron, R. The low-cost puzzle for long-haul trains. Arthur D. Little Luxembourg S. A. 2019. [Electronic resource]: https://www.adlittle.ru/sites/default/files/viewpoints/adl_low_cost_trains-min_0.pdf. Last accessed 15.09.2021.



6. The use of modern shock-absorbing devices, backlash-free automatic couplings, disc brake systems to reduce oscillatory processes and energy dissipation during the movement of the train [14].

TECHNOLOGICAL FACTORS

The group of technological factors comprise:

1. Increasing the productivity of coaches by minimising downtime at the train initial departure and round-trip start points. Namely it concerns organisation of high-frequency routes with the use of transformer coaches, operated at night as sleeping cars and, in the daytime, as sitting coaches.

2. Optimisation of the route network with focus on short and medium route distances to serve the most densely populated regions of the country. Since transportation tariffs for most types of transport are based on the principle of reducing the unit cost of 1 passenger-km with an increase in the travel distance, this makes the operation of low-cost trains on long-distance routes unprofitable due to the initially minimal base tariff. Therefore, the operating range of low-cost trains should count up to 2000 km through the territory of the most densely populated Russian Central, South, North Caucasian, Volga Federal Districts and St. Petersburg agglomeration.

3. Saving station and infrastructure costs: initial and final operations should be conducted at lightly loaded passenger stations (for example, in Moscow agglomeration departure and arrival can be organised at Khimki, Zelenograd stations, Vostochny TIH, Domodedovo, etc.). Meanwhile it should be provided that the train stops at all the major stations of large agglomerations to maximise passenger traffic. The departure time of low-cost-trains should be beyond the main train flow to get the cheapest schedule line [15, p. 129].

ORGANISATIONAL FACTORS

The group of organisational factors comprise activity that follows:

1. Traditional types of services on board should be denied. First, there will be no dining cars, showers, various kinds of equipment (reusable dishes, sanitary and hygienic sets, bed linen, etc.) in the low-cost trains, which will speed up and reduce the cost of equipment and cleaning of such trains before the journey.

2. Maximum differentiation of tariffs⁸. In particular, a set of decreasing coefficients can be applied as compared to the base tariff for places at the top, additionally for the upper places of the second floor of a double-decker car, for the outermost compartments, and a multiplying coefficient can be used for the compartments located in the middle of the sleeping car. For sitting coaches there can be a paid option to choose a seat in the coach. To maintain flexibility in planning the route network, ticket sales should start no earlier than 90 days before departure. There should be large-scale use of dynamic pricing and almost 100 % sale of seats at non-refundable rates, sale of multiple journey tickets, both for certain routes and distances (for example, up to 300, up to 600 km).

Additional paid options on low-cost trains may include:

- Paper ticket issuance.
- Transportation of baggage exceeding the minimum allowance.
- Changes in ticket details and its return.

3. Increased labour productivity of the train crew due to the increase in the number of coaches serviced by one conductor or guide with a minimum set of services on the train.

4. Receiving additional income from sale of advertising space on trains, including on the sides of cars.

It is worth noting that several activities of one group of factors can produce the ability to implement activities of another and vice versa. For example, with a reduction in the number of unproductive train stops, an increase in route speed due to the use of dual-system locomotives, it is possible to reduce the number of members of the crew accompanying the train. Station employees can check tickets of passengers boarding the train.

CONCLUSION

Contrary to the opinion that low-cost railway passenger transportation should use old cars and coaches preparing for write-off, following additional schedule lines with a low route speed, the real key parameters of success of functioning of a low-cost model include flexibility and promptness in appointment and assembly of those trains, operation of trains consisting of

⁸ Please see, e.g., Matyushin, L. N. Tariff policy in the railway transport of Russia: Study guide. Moscow, FSBE APE «Training and methodological center for education in railway transport», 2021, 208 p. ISBN 978-5-907206-80-9.

modern, energy-efficient, low-weighted cars, requiring low equipment and maintenance costs.

Considering the seasonality factor of transportation, low-cost-trains should be assigned only to highly loaded routes with a potentially constant demand for transportation. It is worth emphasising that the key service regarding a low-cost train is transportation of passengers with a minimum set of additional services, therefore, the main competitive advantage relative to other modes of transport is the comparable speed of passenger travelling.

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Article received 27.05.2021, approved after reviewing 15.09.2021, updated 22.10.2021, accepted 25.10.2021.

