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## **NEED FOR ANALYTICAL SERVICES FOR RAILWAY LOGISTICS MARKETPLACES**

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### **Abstract**

The Russian rail market has always been conservative. Its change requires active introduction of innovative developments: new IT services that are not yet present in the container market. The paper is devoted to the introduction of cloud solutions in railway logistics based on “transport marketplaces” and the selection of analytical services that accompany their effective use. These services represent analytics tools and make it possible to predict, analyze the data of participants in the transport process, calculate current trends in optimizing freight transportation, and develop effective promotion strategies on the marketplace. The need to introduce such technologies is creating new challenges for research and development in the digital economy. Without the digitalization of railway logistics and its integrated assessment, it will be impossible to achieve increased cargo turnover. Therefore, the joint efforts to create a single integral information cloud may ensure efficiency both at the level of railway stations and at the level of the transport and logistics industry in Russia in general. The introduction of marketplaces with the necessary set of external analytics services will speed up the maintenance of the transport cycle of cargo delivery and will make it possible to plan a complex and multi-stage transportation process.

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## 1. Introduction

To increase the competitiveness of Russian rail container transport, it is necessary to develop a service-accelerated container trains (ACT) and use modern information technologies to optimize organizational measures related to transportation. In terms of the Russian market of container trains it can be noted that their use in 2020 increased by 8 % and has a high potential for further growth, since the level of goods containerization on the network is still low due to insufficient transshipment capacity (equipped container sites), lack of knowledge of the advantages of rail container transport by market participants (many fresh products are transported by road, despite the significant costs associated with the need to carry out transshipment operations) (Chernetsov, 2020).

The need for the dynamic development of the ACT entails the introduction of modern IT solutions in the country's railway logistics. At the end of 2020 in international ratings related to digitalization, Russia ranks 38th out of 115 countries in the Enabling Digitalization Index (EDI) (Shuisky, 2020).

One of the new trends in the railway logistics market is marketplaces.

Marketplace is a technological infrastructure that consists of a set of different IT systems integrated with each other, where all elements are converged and predisposed to productive work, which will make it possible to speed up the maintenance of the transport cycle of cargo delivery. The application and creation of marketplaces in railway logistics will create a number of advantages.

The introduction of marketplaces will make it possible to:

- Simplify internal business processes;
- Improve the efficiency of containerization;
- Manage the rolling stock movement;
- Reduce processing time of transport operations;
- Automate the work of every participant of the transportation process;
- Reduce costs due to transparent pricing.

The basic model of the marketplace of railway services consists of full transport cycle cells, and is estimated by the digitalization indicator from 10 to 0. An estimate close to 10 means a very high level, 5 means an acceptable level, 0 means a low level. This scale helps to break down the transport process into the smallest components and dynamically track the impact on container service by rail. First of all, it is necessary to integrate the routing system of requests (orders) from the supplier (sender) to the buyer (recipient): by region, index and other parameters of the location of the platform operator. There is a need to create a direct link.

Thus, it is possible to build an algorithm for processing an order and get an efficient, flexible structure with the automation of all transportation elements. Orders received through the cloud service are divided evenly between platform operators. The turnover of the railway infrastructure increases, the downtime of cars decreases, the speed of goods delivery increases. It becomes unnecessary to hold marathon talks on the topic of warehouse stocks. All of the above suggests that it is already possible to develop and launch platforms within 2 weeks thus allowing senders to deliver goods without thinking about the archaic sequence of the logistics route selection algorithm.

The entire complex and confusing transportation process previously had to be planned and calculated manually to the smallest details. The proposed marketplace model easily solves this problem. It is enough to enter the address for the follow-up delivery of goods, the address where the goods will be delivered, dimensions, weight parameters and other necessary conditions in the ready-made B2B (business for business) system. The system will automatically calculate and independently propose a list of options with a set of services that will satisfy the customer's demand as much as possible.

Such marketplace sites are a catalyst for fair competition among cargo delivery companies, which subsequently leads to the formation of the most attractive transportation prices. Besides, we shall not forget about more complex models where the SRM (Supplier Relationship Management) modules are actively involved, the supplier interaction management system where the application is formed and filled out, the operator and the railway service provider from the previously listed White List are selected, over time new proven performers are invited and other important stages are carried out. Each of these points affects the marketplace (Artamonova & Zemlyankin, 2020; Benson & Whitehead, 2000).

**Table 1.** Overview of popular solutions for external analytics services

Type of data analysis service	Opportunities and advantages
MoneyPlace	<p>The system gives access to extensive functionality, due to which it is possible to quickly analyze competitors and evaluate personal position on the marketplace. The obtained data will help to draw up a competent strategy and significantly increase profits. Advantages:</p> <ul style="list-style-type: none"> <li>- analysis of data on all supported marketplaces in one account;</li> <li>- automation of service management;</li> <li>- possibility to define and select categories with the maximum revenue;</li> <li>- reporting, which is useful for making competent, economically sound decisions;</li> <li>- structured presentation of information in graphical and tabular form.</li> </ul>
MPStats	<p>The system is used for preliminary market research, search for niches and ideas that are optimal for work, and further expansion of services. It shows the order quantities of specific goods and categories on marketplaces. Advantages:</p> <ul style="list-style-type: none"> <li>- data are shown as visual summary tables;</li> <li>- goods movements are tracked on a dynamic map that helps optimize deliveries to warehouses;</li> <li>- sales, balances, margins, gross profit, and other indicators are fully controlled by a special module;</li> <li>- with the help of the proposed tools it is possible to quickly evaluate the strategies of competitors and develop personal even more effective ones.</li> </ul> <p>Universal tool for multi-channel market monitoring. The system collects data from various online sites, marketplaces, price lists from open sources and compiles them in a convenient single report.</p>
MetaCommerce	<p>This is a unique service, due to which it is possible to quickly respond to market changes, maintain proactive price and assortment policies, and reduce the cost of researching large data sets. Advantages:</p> <ul style="list-style-type: none"> <li>- possibility to form the claimed assortment based on real current demand;</li> <li>- online data collection from a large number of sources, including marketplaces;</li> <li>- partner program for individuals and companies.</li> </ul> <p>An effective tool for sales analytics and supply optimization. Advantages:</p> <ul style="list-style-type: none"> <li>- system is optimized for mobile devices;</li> </ul>
Seller.Whisla	<ul style="list-style-type: none"> <li>- significant acceleration of routine processes through automation (e.g. transportation orders);</li> <li>- creation of necessary documents literally in several clicks (orders, analytics, etc.);</li> <li>- partner program, agency functionality for customer monitoring.</li> </ul>

Marketplaces contain detailed information about the customer and real demand for transportation. But in order for companies operating on such platforms to qualitatively manage the process, it is necessary to have full data on customers, competitors, cargo flows. External analytics systems allow performing detailed analysis for the business on marketplaces. These services represent analytics tools, and make it possible to predict, analyze the data of participants in the transport process, calculate current trends in optimizing freight transportation, and develop effective promotion strategies on the marketplace, which may be conditionally divided into 2 bulky groups. The first provides internal data on the carrier company, while the second analyzes the site as a whole. The use of analytics services on marketplaces is necessary, since they allow collecting information on site.

Tasks of analytics services on marketplaces:

- To forecast the demand, profit and focus on key business matters;
- To optimize the transportation process;
- To store the history on clients, processed orders, to draw various reports and follow them in planning;
- To create an efficient business development strategy based on analytics.

Today, the market of information analytical services has various modules that companies begin to use in marketplaces. The providers select the appropriate tools relying on the company's activities, its scale and types of services. Let us consider the analytics modules that may be adapted to a particular transport company (Table 01).

As the marketplaces develop and competition on platforms grows, the number of specialized analytical services will increase (Marchenko, 2019).

## **2. Problem Statement**

In the future, demand for a fixed train schedule for small shipments will become a very urgent problem, as many customers reduce warehouse stock and move to just-in-time inventory control. This can only be done through automated convenient systems – marketplaces. The need to accelerate the introduction of digital technologies poses new challenges for the participants in railway transport logistics. At present, the transition to digitization is continuously growing, as evidenced by the increased number of online projects (Filatova, 2020; Koroleva et al., 2020).

## **3. Research Questions**

The paper is devoted to the introduction of cloud solutions in railway logistics based on “transport marketplaces” and the selection of analytical services that accompany their effective use. These services represent analytics tools and make it possible to predict, analyze the data of participants in the transport process, calculate current trends in optimizing freight transportation, and develop effective promotion strategies on the marketplace.

#### 4. Purpose of the Study

The main purpose is the theoretical justification of the need to introduce marketplaces with the necessary set of external analytics services in railway logistics and the development of practical recommendations for their use on the example of a transport and logistics company, which will allow analysing and predicting transportation, tracking cargo, saving time and money on paperwork, thereby improving the overall train logistics.

#### 5. Research Methods

Theoretical research and practical recommendations were carried out using the verifiable publications of 2019 and 2020, which are part of the Scopus and RSCI databases in terms of publications on information technologies and intelligent systems in the field of transport and digital economy. The methods of prediction, analysis, mathematical modeling were used during the study. In the framework of theoretical and methodological research and the practical validity, the following concepts were of particular importance: marketplace, analytical services, cloud technologies.

The need to introduce modern information technologies is creating new challenges for research and development in the field of digital economy. Without the digitalization of railway logistics and its integrated assessment, it will be impossible to achieve increased cargo turnover. Therefore, the joint efforts to create a single integral information cloud may ensure efficiency both at the level of railway stations and at the level of the transport and logistics industry in Russia in general.

#### 6. Findings

The mathematical analysis of the marketplace requires the calculation of the number of customers of the service (railway transportation), comparison of this number with new customers and with indicators of those that remain active after 30 calendar days. The ultimate goal will be to gain a single base of railway operators every day. The single base of contractors will not make sense until the number of orders placed in the marketplace leads to an increase in the concluded transactions for freight transportation services by rail. It is important to mathematically calculate the buyer-to-seller ratio. This indicator will reflect the predominance of “supply” or “demand” in real time (BTS, Buyer-to-Seller).

$$BTS = B_a / S_a, \quad (1)$$

where  $B_a$  – number of active buyers;  $S_a$  – number of active sellers of the service.

For the marketplace of the railway operator, which is just getting into operation, this indicator is considered normal within the ratio of 1:3 and 1:6.

In order to calculate the success of processed orders by carriers (provided that they constitute the minority) let us introduce a positive performance factor  $R$ .

$$R = T_b / T_s, \quad (2)$$

where  $T_b$  – number of completed customer requests;  $T_s$  – number of accepted service orders by service providers.

If  $R$  tends to 100 %, then the railway operator can close several customer orders at once with a positive result. Conversely, if  $R$  tends to 0 %, it means that the railway operator cannot handle more than one customer order positively. Now it is possible to calculate the lifetime of the project (client) to the estimated date (LTD, Lifetime to Date). This will reflect the profit of the railway operator from one marketplace per calculated unit of time.

$$LTD = ((M_{ch} \cdot n) - P) \cdot t, \quad (3)$$

where  $M_{ch}$  – average cost of the rolling stock;  $n$  – number of all orders in a set period of time;  $P$  – information system maintenance costs (other costs);  $t$  – running time of the marketplace.

The result will show the efficiency and margin of any order for the necessary time period that will pass through the information base – marketplace (Artamonova & Zemlyankin, 2020).

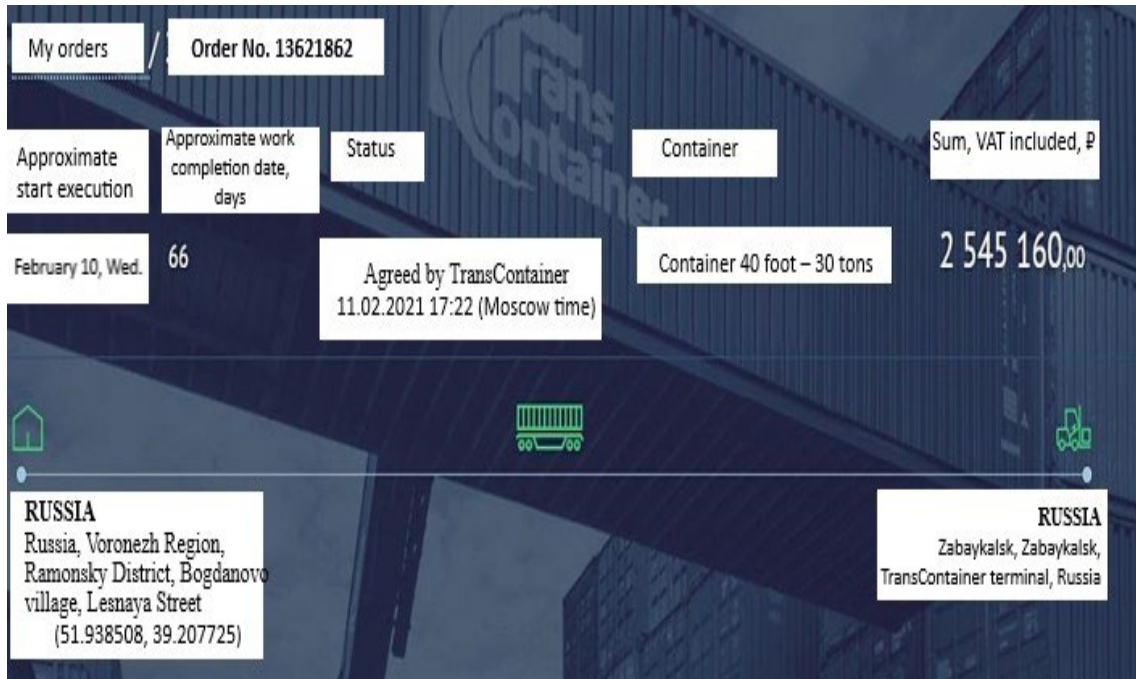
In practice, the owner of the IT cloud will easily be able to predict the pricing of each transportation, the final buyer will see an integrated cost for the entire range of services of the railway operator. Each participant will be able to choose the most suitable conditions.

Today, RUSKON, which is the largest multimodal integrator of transport and logistics services of the Delo Group of Companies, developed its information service – the ISALES marketplace platform, which summarizes all data on rail container transportation and the transportation process participants. This platform fits perfectly into the work of the company, allows giving the customer of transportation the optimal transport solution in a short time and offers the following:

- scaling: ability to process up to 1000 orders per day;
- full integration with 1C;
- catalogue of ready-made solutions with the possibility of their further adjustment;
- no restrictions on the volume of hosting and traffic – fast download speed at any attendance;
- integration with professional tools: delivery, payment receipts, 1C, CRM – system, telephony;
- fast, reliable and unlimited hosting with protection against hacker attacks;
- open API for additional services.

The developed ISALES marketplace platform includes the Seller.Whisla data analytics module adapted to the specifics of the company.

Let us consider the main order for the transportation of confectionery products to China using the example of one container train. The order is placed on 50-ton 40-foot containers. The main customers are three factories within the KDV GROUP – Yashkino, Voronezh Confectionery Factory, KDV Nizhny Tagil. There are three main customers and one contractor represented by RUSKON. Demand prevails over supply (Figure 01).



**Figure 1.** Sample order on the marketplace using the example of RUSKON transport company

In order to calculate how successfully RUSKON processes orders (provided there is one provider) let us enter the positive performance factor  $R$  (Formula 2). Figure 02 shows the archive of all orders received from KDV GROUP. Based on the data, it can be noted that there are 16 processed orders and 10 new orders. RUSKON processes all incoming orders (BTS indicator=100 %). The incoming order flow is fully processed. Therefore, the dynamics is positive.



**Figure 2.** Number of incoming orders on the marketplace for 2020

Now it is possible to calculate the lifetime of the project (client) to the estimated date (LTD, Lifetime to Date). This will reflect the profit of the railway operator from one marketplace per calculated unit of time (Formula 3). Each participant will be able to choose the most suitable conditions (Table 02).

**Table 2.** Main transportation services generated by RUSKON for the customer

Transportation mode*	Export
Departure station (point)*	PRIDACHA
Cargo shipper at the first hauling distance*	RUSKON LLC
Destination station (point)*	ZABAYKALSK (CRIMEA RAILWAY)
Outgoing railway station	ZABAYKALSK (CRIMEA RAILWAY)
Cargo shipper at the last hauling distance*	KDV SHANGHAI TRADING LTD
Description of cargo/class of transport rates	CONFECTIONERY SUGAR PRODUCTS NOT INDEXED BY NAME IN THE ALPHABET/(51403)
Description of cargo/NHM code***	CONFECTIONERY PRODUCTS FROM SUGAR AND ITS SUBSTITUTES, CONTAINING COCOA/(18069050)
Owner of cars	Private TransContainer
Number of containers*	50
Gross cargo weight (t)	360
Size of containers*	Container 40 foot – 30 tons
Owner of containers*	Private not TransContainer
Dispatch type	Container. AST
Note****	Russia, Voronezh Region, Ramonsky District, Bogdanovo village, Lesnaya Street – Pridacha station, TransContainer terminal
	CARGO SHIPPER: LLC RUSKON – NOVOROSSIISK
	CARGO RECEIVER: KDV GROUP – TOMSK
	Container train is arranged by the Client

After the optimal transport solution is issued, the program generates a consolidated list of specific transportation, which takes into account all the client requirements and the capabilities of the organizing company, while all parties to the transportation are involved in the process, which significantly reduces the time for decision making. The current work is being organized according to the warehouse-warehouse scheme on the routes Pridacha – Zabaykalsk, Yekaterinburg – Tovarny – Zabaykalsk and Kleshchikha – Zabaykalsk through the Zabaykalsk – Manchuria border crossing to the recipient’s warehouse in China. RUSKON acts as a tariff payer pursuing the interests of the railway transport development in these regions (Table 03).



**Table 3.** Commercial conditions of railway transportation formed for the customer

n/n	Service description and its parameters	Amount	Measure	Rate (₽)	VAT amount (₽)
	1.01.01. Complex freight forwarding services on container/cargo transport route Route: PRIDACHA-ZABAYKALSK				
1.	(CRIMEA RAILWAY) Cargo shipper: RUSKON LLC Cargo receiver: KDV SHANGHAI TRADING LTD	50	containers	153000.00	7650000.00
	TOTAL: VAT included				7650000.00 0.00

In order to develop the cargo traffic, the all-inclusive rate through the platform was agreed – ISALES marketplace for RUSKON according to the warehouse-station operation scheme on Pridacha-Zabaykalsk route, the rate amounted to 153 thousand rubles.

## 7. Conclusion

In conclusion, it is necessary to compare the delivery patterns of the above cargo by road and container train through the marketplace.

The carrying capacity is almost not limited – it is possible to ship any amount at a time, and on average the same weight as in two trucks fits in one car. Railway accidents are more an exception than a rule. Therefore, the property is safe. Another parameter is the cargo safety. The train almost does not stop, it rarely stops at the station, so the probability that the cargo will be stolen or damaged is negligible. The train may leave behind schedule, if only it is impossible to move along the rails if they are covered with snow. At the same time, neither fog, nor heavy rain, nor other factors stop the container train. It is impossible to say the same about road transportation. Another important difference is border crossing on the Russia-China railroad haul. When goods are delivered by rail, customs inspections are carried out in a simplified manner, so much less documents and time are required compared to motor transport.

Summing up it may be said that we considered 2 options: the first – by the ISALES platform (marketplace for railway transportation) and the second – by the motor carrier, which is part of the KDV GROUP Holding (Table 04).

**Table 4.** Efficiency of marketplaces in rail transport

Route	Distance between warehouses – kilometerage, belt, km	Final cost, ₽	Transit time, days	Efficiency, %
Voronezh-Shanghai (road)	6834	15854880.00	32	48.25
Voronezh-Shanghai (railway)	6834	7650000.00	18	207.25

After rendering services, the company may view a report for a specific period in the history of operations in the marketplace, which is automatically generated using the analytics module. In the future, these analytical reports will help to adjust the work of the transport company. The analytical service issues the following comments, which the company needs to pay attention to in the future:

- “availability of the right type of cars in sufficient quantity” and “completeness of demand for transportation” immediately went down by 5 points;
- “speed of clearance of requests (including carload/group shipment, non-recurrent shipment)” – decreased immediately by 7 points;
- “car spotting according as scheduled” and “compliance with delivery dates, including in comparison with the regulatory time limit”, also decreased;
- “cost of services of operator companies”, “level of information technologies and speed of accounting documents transfer” and “level of transport infrastructure development” went down by 2 points;
- “cargo safety” was reduced the least of all indicators (1 point);
- “technical condition of cars” managed to maintain its value at the level of the previous quarter;
- “cost of services of the Russian Railways” showed positive dynamics thus having increased by 2 points (Figure 03).

Cloud technologies have a number of advantages for railway customers (in particular, for KDV GROUP): low price, large cargo classification, comments and ratings of supplier users, THC reduction for processing the entire cycle of the transport process.

As for railway operators and car owners, the disadvantages of outdated methods of orders processing, including the maintenance of a huge staff, result in enormous annual costs. Needless to say, transport contractors attribute these costs to customers (clients). Therefore, the transition from calls to Internet sales will be beneficial for both freight owners and freight carriers – this will reduce prices, increase the railway tariff transparency, speed of orders processing and effectiveness of logistics services in general. In the near future, a single information space will be created that will allow each transportation participant to monitor the location of containers, make orders for platform operators, and conduct mutual settlements.

Marketplace makes it possible to predict delivery times and offers the best transportation option based on customer preferences. This is especially interesting for exporters of products to China. Building common competencies, exchanging data and developing a modern trend in the digitalization between Russia and China are the future of railway transport.

The efficient use of marketplaces required to equip the platform with a set of various analytical services that allow predicting, analyzing the data of the transportation process participants, calculating current trends in optimizing freight transportation, and developing effective promotion strategies on the marketplace.

Based on the above it may be concluded that the implementation of these proposals will help to track cargo, speed up logistics and become a new driver for business, thereby saving time, money on paperwork and warehousing and clear through customs with cargo faster.

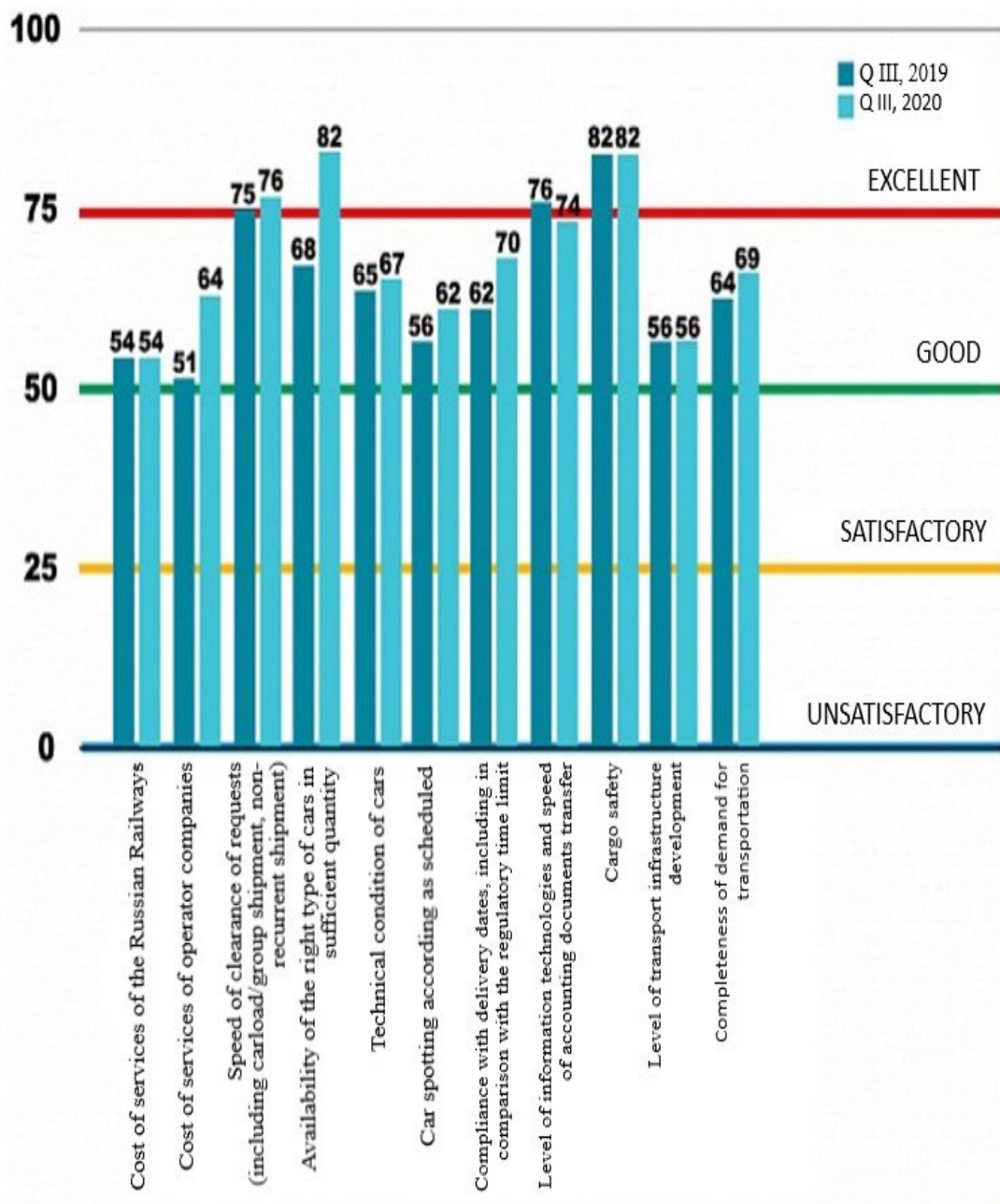


Figure 3. Analysis of quality structure of performed service taking into account the Seller.Whisla module

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