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DIGITALIZATION OF THE TRANSPORT INDUSTRY IN RUSSIA: TRENDS, DRIVERS, POTENTIAL

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Abstract

The authors conducted a study of the main digitalization trends in Russian transport and logistics in the context of the fourth industrial revolution. It is indicated that the pace of the fourth industrial revolution determines a decrease in the cost of communications and an increase in labour productivity and the effectiveness of global logistics, on the other hand. The key driver for the implementation of new digital concepts in the transport business today is the integration of cyberphysical systems in the industry. The results of the study showed that the tools of intelligent traffic management, modelling and monitoring, as well as digital platforms in the near future can also become powerful drivers for the development of digital technologies in the transport business. In general, in Russia, as in the world, such global digitalization trends as the Internet of things, blockchain and artificial intelligence are being tracked with the mandatory implementation of transparency, security and customer focus on the global supply chain. The authors considered the means and methods of implementing the concept of the digital economy in the transport and logistics on the example of practical experience of the Russian Railways company. It is typical for Russian conditions that such large market players as Russian Railways create their own unique digital products.

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Keywords: Industrial revolution, industry 4.0, digitalization, digital logistics, transport industry.



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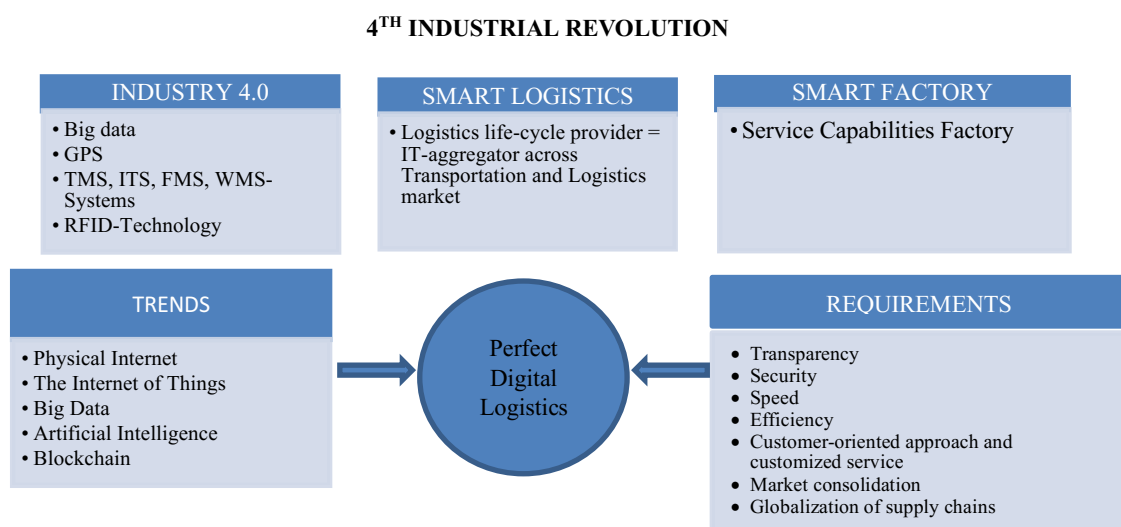
1. Introduction

The fourth industrial revolution is a completely new era in development that erases the boundaries between physical, digital and biological technologies. A breakthrough in technological development is necessary to implement the strategic tasks facing the transport system of both the whole world and the Russian Federation (Russian Railways, 2017).

The pace of the fourth industrial revolution determines the reduction in the cost of communications and the growth of labour productivity and the effectiveness of global logistics. Despite the fact that the third wave of the industrial revolution has not yet spread around the world, new concepts have ripened, such as Industry 4.0, Industrial Internet, Internet of Things, etc., the driver of which is the integration of cyberphysical systems (CPS) in industry (Viriyasitavat, Xu, Bi, & Pungpapong, 2019). The fourth industrial revolution will lead to a total unification of supply chains, machine tools, assembly lines and entire factories, as well as objects of labour and their consumers (Aptekman et al., 2017).

1.1. Modern trends in digital logistics

A wide range of directions for implementing the concept of “smart logistics” is well known (Sicari, Rizzardi, & Coen-Porisini, 2019). Most often they are combined under the name of "Transportation Management System" (TMS). However, a single terminology has not been finalized. In some cases, terms such as “Intelligent Transportation Systems” (ITS), “Fleet Management Systems” (FMS) are used to create “Smart Enterprises” - service capabilities factories - with advanced digital support and sophisticated transport and logistics. In the passenger transportation industry, a striking example of such revolutionary changes was the use of mobile applications for taxi calls (Uber services). In transport and warehouse logistics - radio frequency tags (RFID), which transmit the necessary information about orders to the assembly robot, electric vehicle, and on-board equipment of warehouse equipment. In addition, a tendency can be called an increased appreciation for the security of electronic contracts and maximum transparency in the formation of supply chains. Russian experts admit a full transit of the vehicles on an unmanned autonomous driving in the next decade. Figure 01 shows that the trends in creating perfect digital logistics are the tools of the Internet of things, blockchain and artificial intelligence.



Source: authors.

Figure 01. Global digitalization challenges and logistics

A separate, quite powerful area of digital logistics is becoming the so-called “green” logistics, in which digital solutions are also actively used. The modern development of the logistics infrastructure of railways has led to the formation of a global technosphere. It required logistics to implement energy and resource-saving technologies in built-in delivery systems - “green” chains. In these chains, the needs for goods, work and services are calculated according to their impact on the environment.

1.2. Current state of Russian logistics

The trends in creating perfect digital logistics are the tools of the Internet of things, blockchain and artificial intelligence. These trends are global, and the Russian Federation is no exception. The listed technologies are actively used in Russia in the digitalization of transport and logistics activities in compliance with the fundamental requirements of transparency, security and customer focus in global supply chains (Pokrovskaya, Fedorenko, & Khramtsova, 2018a).

Figure 02 shows, that according to the World Bank, Russia ranked 75th in logistic efficiency index (LPI) 2018, having improved its performance compared to 2016 by about 7 percent.

RUSSIAN LOGISTICS EFFICIENCY

Subindicator (World Bank) Definition	2016	2018	Growth, %	
Efficiency of Customs Process	2,01	2,42	20,4	75 TH PLACE IN LPI LIST
Quality of Infrastructure	2,43	2,78	14,4	
Ease of International Shipments	2,45	2,64	7,8	GOODS TRANSPORTED 2,56 t-km/dollar.
Competence of Logistics Services	2,76	2,75	- 0,4	85 % OF LOGISTICS PROCESSES ARE AUTOMATED
Ability to Track and Trace Consignments	2,62	2,65	1,1	19 TH PLACE IN THE LIST OF COUNTRIES LEADING IN ARTIFICIAL INTELLIGENCE DEVELOPMENT
Timeliness of Shipments in Reaching the Destination	3,15	3,31	5,1	
Logistics Performance Index	2,57	2,76	7,4	

Source: authors based on Worldbank (2019)

Figure 02. The current state of Russian logistics

Modern Russian logistics is primarily the “physical Internet”, a network of services that supports the physical movement of goods. The appearance of the Internet of things on the Russian market has led to the consolidation of logistics systems. A serious problem of the Russian logistics system is uneven development of digitalization in the constituent entities of the Russian Federation (Razumova & Levine, 2019).

2. Problem Statement

It can be stated that the Russian digital transport and logistics market is still in a stage of turbulence and there is no single solution yet, which is logical, given the huge data arrays and the growth of international trade. The task of transport is to connect to a new ecosystem in which the boundaries between production, transportation and consumption are blurred. Data streams - impulses of modern logistics - replace rigid system processes. Intelligently connected, they form the basis for the digital logistics

ecosystem. Cargo turnover by all types of transport in Russia in May 2019 amounted to almost 477.2 billion t-km. The cargo intensity of the Russian economy is quite high and amounts to 2.56 t-km / dollar. For comparison, the load capacity of the United States is 0.30, Germany - 0.12 t-km / dollar.

The gradual transition to modern transport technologies in Russia is still limited by the technical lag of the transport infrastructure. In terms of its quality, Russia ranks 64th out of 144 countries participating in the rating of the World Economic Forum.

3. Research Questions

In modern conditions, digitalization is a key trend in the development of the transport and logistics industry worldwide. In the course of writing the work, the authors analyzed the digitalization processes of the transport industry and identified the main Russian features. The main trends in Russia are three independent vectors of the development of digitalization. The authors paid serious attention to the study of the influence of the 4th industrial revolution on the development processes of the transport and logistics industry.

4. Purpose of the Study

The work is devoted to the study of the main digitalization trends in Russian transport and logistics in the context of the fourth industrial revolution. The main objective of the study is to analyze the means and methods of implementing the concept of the digital economy in the transport and logistics business. The authors chose the Russian holding Russian Railways as the key object for exploring the possibilities of digitalization.

5. Research Methods

During the preparation of the study, methods of logistics, synergetics, transport geography, cluster and system analysis, classification were used. In developing the theoretical and practical foundations digitalization of the transport industry, the authors were based on the results of research in the field of transport logistics (Dybskaya & Vinogradov, 2018), transport geography (Rodrigue, 2017), and digital economy (Sturgeon, 2019). The study complies with the priorities of the Transport Strategy of the Russian Federation, as well as the Concept implementation of the comprehensive scientific and technical project "Digital Railway".

6. Findings

As part of international cooperation in the digital field, Russia invited the EAEU and BRICS participants to begin work on four priority integration projects: the creation of Eurasian Internet resources in the field of education, science, culture and tourism. The main goal was to create a digital platform for small and medium-sized businesses (Tolstykh, Shkarupeta, Purgaeva, & Fedorenko, 2019). According to the World Economic Forum, Russia has planned about \$ 30 billion to implement the proposals. An expert assessment of Russia's readiness for the digital economy provides balanced indicators. This is because Russia is developing an integrated approach to digitalization, stimulating national economic growth with the help of digital tools in the legal sphere, educational innovations, positive cross-cultural communications.

6.1. Digital Transport and Logistics in Russia

Digitalization of transport and logistics takes place in the Russian Federation in accordance with the priorities indicated in the national program “Digital Economy of the Russian Federation until 2024”.

One of the areas of this program is “Digital Transport and Logistics”. In the framework of this area, in 2018 the eponymous association was formed as a logistics aggregator of integrated transport and logistics solutions in digital format.

The Association brought together key market players with state support: Russian Railways, Aeroflot, Avtodor, Glosav and others. In fact, this is the state segment of a single secure trusted space in transport, providing access to government services on a “one-stop-shop” basis, in the format of an open service ecosystem.

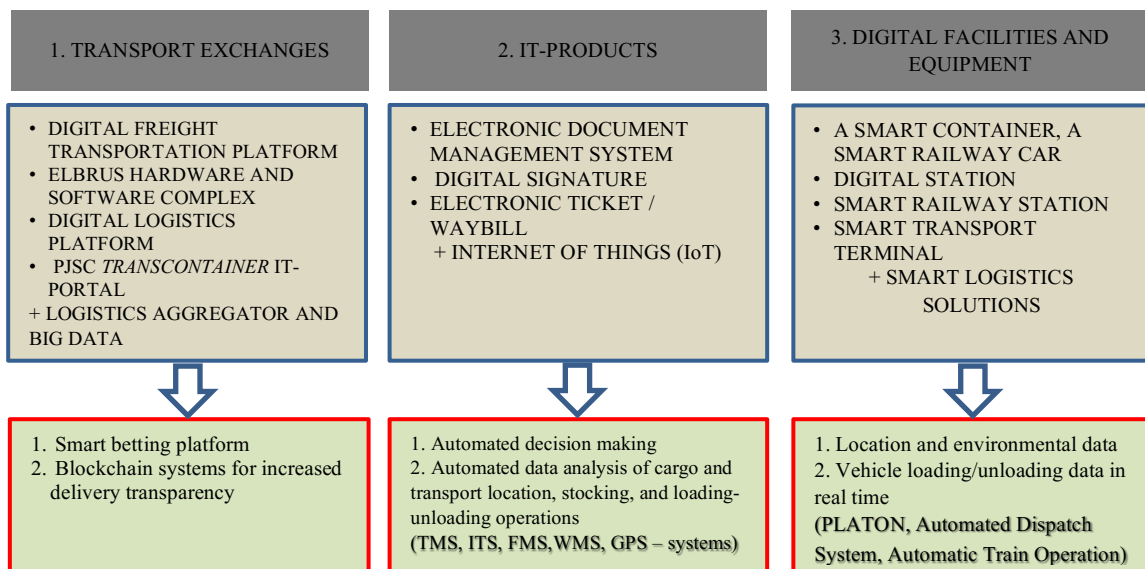
As a technical and infrastructural basis for implementing digital changes in Russia, the Unified Digital Platform of the Transport Complex has been created. It is obvious that it is impossible to create a working platform on the basis of one mode of transport, especially since the borders between the modes of transport are blurring today. It becomes even more obvious for end-to-end integrated transportation services. A comprehensive transport and logistics service as a “seamless through” service is formed on the basis of mutual provision of digital services by partner organizations (Pokrovskaya, Fedorenko, & Khramtsova, 2018b).

The principles of the platform - availability, quality, reliability and security (Pokrovskaya & Fedorenko, 2018). It consists of the largest carriers, transport and logistics companies, forming their own intelligent systems, which are then integrated from separate “smart” solutions into the ecosystems of “smart city”, “digital railway”, etc.

The expansion of intelligent transport systems in the Smart city format is also developing. They include “smart roads” with digital solutions for collecting and processing data on vehicles and road infrastructure: these are “smart traffic lights”, means of automatically recording violations of traffic rules, parking meters, information boards, etc.

6.2. Trends and prospects of digital logistics in Russia

Let's consider three key digitalization trends in Russia (Figure 03).



Source: authors.

Figure 03. Trends and prospects of digital logistics in Russia

There are 3 main vectors of business digitalization in Russian transport and logistics market under the influence of Industry 4.0:

- The first vector is the creation of transport exchanges in the format of a Logistics aggregator. It includes a single digital platform of Russian transport complex, the electronic trading platform "Freight", the automated software complex "Elbrus" and the IT portal of PJSC Transcontainer. All of them are digital platforms for communication between customers and contractors. The logical continuation of this vector may be decisions to create blockchain delivery systems and analysis platforms. In particular, the electronic bill of lading is already in use as the basis for smart contracts at the multimodal freight exchange;
- The second trend is the development of personal IT products. Today, the client does not need a lot of programs that are difficult to connect with each other. He can use a single vertical solution that allows to solve all the necessary tasks in one program. A characteristic feature of Russian rail transport is the introduction of low-populated and uninhabited technologies at the core stations of the network. The development of this vector is the adoption of automatic management decisions;
- The third trend is the digitalization of machinery and equipment for working with goods at all stages of the supply chain ("smart wagon", "smart container", "smart terminal", "digital station"). The development of this vector is the automatic online data analysis, for example, the system "auto-dispatcher-motorist" (Pokrovskaya, 2018).

The listed trends are typical in the implementation of the logistic approach to "building" flexible client-oriented systems of interaction of participants in the transportation process in a changing external environment.

6.3. Development of digital technologies by Russian Railways Holding

It is typical for Russian conditions that large players create their own, unique digital products. For example, Russian Railways has been developing unique technologies since 2013, including controlling the movement of trains and a locomotive without a driver. Company equips smart containers and wagons with sensors that measure the parameters of the external environment and cargo. It implements a blockchain in the management of the life cycle of rolling stock with many participants. Russian Railways creates own platform solutions for interacting with clients and managing big data databases.

Until 2025, Russian Railways will invest 150 billion roubles in the development of digital technologies with the goal of reducing to 5% the share of the costs of information management in two areas: external - when providing customers with "near-transport" service; and internal - while optimizing the logistics chains controlled by Russian Railways Holding. Russian Railways Holding has already done a lot in digitalization. Today, the company operates 280 thousand computers, 4 thousand information systems, 300 corporate servers.

Regarding targets, a 10 percent increase in the number of online freight transport orders using new digital interaction formats is envisaged. These formats include tools for intelligent motion control, modelling and monitoring, as well as digital platforms. Last year, Sberbank and Russian Railways signed a contract to integrate banking services with the electronic exchange of freight cars and ratings for shippers and carriers. Two companies decided to launch the Smart Station project using the Sberbank platform.

The Russian Strategy for the Digital Transformation of the Transport Industry contains 55 projects, among them the comprehensive scientific and technical project Digital Railway. The project started in 2017 and aims to create a railway in which at least half of the added value is created using digital technology. Today the project is being implemented at 16 pilot training sites. The project “Digital Railway” has already created an intelligent railway management system. It allows automatically collecting all information about the transportation process. The project has two features: 1) rolling stock is considered as an object in the transportation process control system; 2) the digital railway operates with the principles of full coherence, online business and end-to-end service management. This is entirely justified, because today the consumer needs complex, seamless services that he can get anywhere and anytime.

To support the work of the Freight forwarders electronic trading platform, in 2018 Russian Railways created its own digital sales channel for integrated logistics services - Digital Logistics. The task is to simplify the process of organizing rail transportation for customers. For Digital Logistics, INTELLEX developed a cloud service in which the user, the rolling stock operator, needs to register on the site (etpgp.rzd.ru) and gain access to the service control centre.

Modern, intelligent transportation, as an innovative digital logistics product, allows to create comprehensive transportation services considering the dynamic wishes of the client. Today, Supply Chain 2.0, using the “Internet of Things”, is replacing Supply Chain Management.

It can be assumed that today the criterion of “minimum cost” is losing relevance in the transport and logistics market, and the “maximum of economic effect and value” comes to the fore. The target of digital logistics today is a new approach, with the wording: “Managed supply chain 2.0 is a direct path to profit”.

In these conditions, Russian Railways has already taken certain steps. Here are some examples:

- The technology of informing customers using the virtual interlocutor, a prototype of the site of the Sales Centre of services. There is also a chatbot "RZD Cargo" in the instant messaging system Telegram;
- Since 2019, the Federal Customs Service and Russian Railways have completely switched to digital format. Electronic transit declaration has already reduced customs clearance to 4 hours;
- In 2017, Russian Railways gradually launched the work of the electronic freight platform Freight, where registration and submission of an order in the “transportation + wagon” format is available. This is a unique service that allows you to order transportation in rolling stock of various owners from any point where there is Internet access, and pay for it.

In other words, Russian Railways created a trusted digital environment, which allows us to talk about the full-fledged conduct of business “with the speed of a click”.

7. Conclusion

Our study allowed us, within the framework of the identified topic, to formulate the following conclusions about the trends, drivers and digitalization potential of the transport industry of the Russian Federation:

- Trends: Development of a logistic aggregator format, development of personal IT products and digitalization of machinery and equipment;

- Active use of the Internet of things, blockchain and artificial intelligence tools on Russian transport to realize the transparency, security and customer focus of global supply chains built by Russian logistics;
- The seamless formation of digital platforms and intelligent transport systems in a “seamless through” format for interaction of all types of transport and participants in the logistics delivery chains;
- Promising areas for the development of digital technologies in Russian transport. The introduction of “uninhabited” technologies in the organization of movement and management of cargo and commercial work, the development of smart contracts, the initiation of the creation of a multimodal transport exchange to analyse the best rates for transport and logistics services, and the improvement of the adoption of automatic management of decisions.

Growth points of breakthrough digital solutions:

1) Activation of tools for intelligent traffic control in the transport business. Digital modelling and monitoring “near-transport” services adapted to each client’s requirements in the format of digital platforms and smart interaction;

2) Promotion of innovative digital logistics products - Supply Chain 2.0, using the “Internet of things” - to increase added value in digital management of business, orders and the transportation process as a whole;

3) Total union of supply chains built by the Russian transport business, their integration with cyberphysical systems and production logistics chains using blockchain tools, big data and smart package solutions (electronic bill of lading, multimodal aggregator, digital trading platform, etc.). Unconditional implementation of logistics “Eight rules”, as well as principles of customer focus, process and system approach;

4) Further improvement of the legal support for working with smart contracts and the formation of a unified terminology in the field of digital logistics and communication. Adaptation of the Russian digitalization experience to the global formats of the digital transport business.

Summing up, we can say that in Russia, as in the world, the conditions for a global digital environment for running a business with a click speed have already been formed.

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