Modern challenges of the digital ecosystem of transport and logistics

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Abstract. The modern stage in the development of the transport industry is characterized by changes in the traditional economic models of interaction between multiple participants in the provision of transport and logistics services. These changes are caused by digital technologies that form a new digital outline of the business models of the transport industry. The digital ecosystem of transport and logistics is the basis for the breakthrough development of the Russian economy and increasing its competitiveness. However, the digital update format does not offer ready-made solutions, its deployment is constrained by the lack of the necessary number of competent personnel, the high cost of implementing and maintaining digital tools, ensuring high reliability, data preservation and security. All this requires additional resources to overcome the emerging barriers with minimal losses. In this regard, the study of the stated topic is demanded and relevant. Therefore, the purpose of the current study is to systematize the main challenges that create imbalances in the pace and scale of modification of the digital circuit of the transport and logistics ecosystem of the Russian Federation. The need to systematize the challenges in creating the digital contour of the transport and logistics ecosystem is justified by the presence of multiple economic interests in this area, including socially significant ones. However, their multidirectional and contradictory nature hinders the rate of formation of a single trend of development of the transport complex and logistics activities of all participants providing services, as well as the creation of a single digital platform that accumulates the potential for effective interaction of transport complex operators. The study was conducted using general scientific methods of knowledge, such as: generalization and systematization of scientific and statistical data on the risks of the barrier environment in the digital transformation of the Russian transport industry, forming the main challenges of the digital ecosystem of transport and logistics, their comparative analysis, synthesis, application of systemic and functional approaches.

1 Introduction

The nature and scale of the problems studied, connects the study with the works of Russian
The research has shown that Russia is not a leader in digitalization in the transport industry. Modern IT systems of the transport complex work with a wide range of data formats, tending to increase their unstructured volumes, which need to be stored, processed, extract the necessary information, etc. As a consequence, labor-intensive data filtering and preprocessing procedures are applied. Processing large volumes of data generates errors that distort the results of the analysis. However, transport systems are forced to undergo transformation, as even a slight lag in the development of logistics market competitiveness will throw Russia into the environment of catching-up countries for many years, which means the loss of transport corridors, a drop in cargo turnover, lower quality of life of consumers due to the reduction in the output of the national product.

The challenges of digitalization are now a daily agenda for many economic agents in the transport industry, including those involved in logistics activities.

According to several authors, one of the challenges slowing the progress of rail transport is the lack of interoperability of data related to rail transport and limited access technologies used in programs [6]. From the point of view of S.I. Makarenko, interoperability can generally be defined as the ability of two or more systems as well as components to exchange information and use the information resulting from the exchange [7]. The importance of interoperability of transport systems information is recognized by most developers, because it is a prerequisite for large-scale innovations in the industry. Innovation is hindered by the level of competence of information flow control personnel in such areas of knowledge and skills as artificial intelligence and machine learning, virtual and augmented reality, blockchain technology in processing big data, etc., which form the basis of innovation drivers in the digital transformation of railway transport content [8].

Unfortunately, the minimal level of integration of digital solutions in the transport industry is not the only deterrent.

At the moment, the transport industry of the Russian Federation is solving a set of problems caused by internal and external challenges:

- High accident rate due to the human factor;
- Inefficiency of the transportation process by traditional modes of transport;
- Low mobility of the population;
- High share of "gray" transportation with cash fare payments;
- Low use of the transit potential of the Russian Federation;
- Low attractiveness of transport corridors of the Russian Federation due to high transaction burden (paper documents, control procedures, intermediaries);
- Lack of opportunity for operational management of the transport complex from a single center depending on the situation;
- Low awareness and coordination of actions of federal, regional and local authorities, subjects of transport activities on transport security (including transport security, cyber security);
- Lack of ability to monitor the condition of transport infrastructure facilities at all stages of the life cycle [9].

A.S. Sinitsyna specifies that in order to ensure highly efficient supply and transportation processes in transportation systems, the methodology of systems engineering and logistics engineering, based on the criteria of acceptable risk, should be developed in parallel with digital technologies [10].

From the position of A.M. Tyagunov, "digital communication sharpen the problem of information security in management. For an effective information security policy it is necessary to apply software shells" [11].

The considered approaches do not allow to justify in full the complexity of realization of
2 Materials and Methods

The creation and implementation of a digital ecosystem for transport and logistics in the Russian economy requires time and resources. Unfortunately, business does not have both in the necessary quantity. Nevertheless, the introduction of digital technologies has given rise to a powerful impetus for the emergence of various economic interests accompanying the development of the transport complex and logistics activities. According to research by Strategy Partners, the transportation and logistics industry is undergoing rapid digital transformation: 55% of companies have already embarked on digital transformation strategies; 80% of companies are partially or fully transitioning to new business models based on digital technology. Digital platforms have been created and are in operation in the industry: sales of passenger tickets (e.g. aviasales.ru), freight transportation (e.g. RZD Electronic Cargo Marketplace, cab aggregators (e.g. Yandex.Taxi), etc. Along with the positive results, Strategy Partners Digital Transformation Center identified the following most significant barriers to the digitalization of the industry:

- Digital workforce and competencies (62% of companies cite workforce and competencies as a barrier to digitalization: the share of ICT specialists among those employed in Russia is 2.2%, in the US - 4.1%; the share of university graduates in information professions is 7%, in the US 22%, in Canada 29%);
- The financing of digital transformation (100% of companies use their own funds, and 25% use bank loans);
- The maturity of the ecosystem of digital solution providers (most companies in the industry prefer to buy IT solutions from external contractors (rather than develop their own); there is very little startup activity in Russia in the area of transportation and logistics - one startup per 1 million people);
- Ineffective standards and regulation (a barrier to digitalization for 43% of companies);
- Implementation of the requirements of law 223-FZ (regulation of procurement by companies with state participation) makes it much more difficult to attract external partners for the implementation of digital transformation initiatives [12].

The list of barriers to digitalization proposed by the Center for Digital Transformation Strategy Partners is not exhaustive and requires clarification. The challenges, as well as the barrier environment, are shaped by numerous factors. One of them is the territorial and spatial extent of Russia. Large territories always mean high risks, the multiplicity of economic agents, different levels of digital competencies of management teams, limited volumes of the resource base, uneven pace of regional development, increased effect of external and internal challenges, etc. The effect of the risks of large territories is supposed to be reduced through the creation of a unified digital platform for participants in the freight market. The key players are defined by the Russian Government Decree No. 3744-r of 21.12.2021 "On approval of the strategic direction in the digital transformation of the transport industry of the Russian Federation until 2030". It would seem that everything is very simple: there is a strategy, financing has been determined and executors responsible for the implementation of the strategy have been appointed. But it is the specific list of players that is another factor in the formation of a barrier environment. The official executors of the strategy for the digital transformation of the transport industry have been identified as twelve macroeconomic agents: Ministry of Transport of the Russian Federation; Ministry of Digital Development, Communications and Mass Media of the Russian Federation; Ministry of Economic
Development of the Russian Federation; Ministry of Finance of the Russian Federation; Ministry of Internal Affairs of the Russian Federation; Ministry of Construction, Housing and Utilities of the Russian Federation; Federal Air Transport Agency; Federal Road Agency; Federal Maritime and River Transport Agency; Federal Rail Transport Agency. The large number of major carriers forms another zone of increased risk in the creation of a single digital platform for participants in the freight market. The slow pace of implementation of the state program of digital transformation of the Russian transport industry triggers the process of independent Uberization (Uber) of the logistics market for its own needs, forming digital platform services to eliminate intermediaries in direct transactions in the chain "service - consumer". Uber technology creates what is called the "on-demand economy" or the "instant gratification economy. Waiting for service and services is a characteristic feature of the traditional economy, the quality standard and indicator of the new economic time is the urgency of service provision. Therefore, ahead of the pace of state participation in the development of logistics activities, private companies are a kind of "joker", explaining their leadership in this market by the lack of necessary breakthrough technologies in state companies and still insufficiently high quality of domestic software.

The multilateral participation of business in the process of creating services accessible to all market participants is, on the one hand, a good thing: there are processes of approbation of services, alternative digital platforms are offered, information and resource flows are formed, and systems for modeling traffic flows are introduced. On the other hand, certain centers of "gravity" of profit are being formed, that is, the point realization of economic interests of a narrow circle of non-state operators occupying free market niches. The leaders of the market will be logistics companies, which will combine their economic interests with the economic interests of digital companies. Narrowly focused aggregators - Uber-companies will not succeed due to the impossibility, at the current stage of social development, of simplifying all logistical activities to orders via applications and the choice of vehicles for them. In practice, the importance of risk increases as state operators enter the transportation ecosystem, many services of non-state operators will be much more interesting to carriers and will create barriers to the seamless entry of state operators. New competitors may appear suddenly, driven by their own economic interests, introduce a fundamentally different business model, understandable in its triviality to partners and consumers, not subject to regulatory restrictions, and squeeze out traditional market participants.

Therefore the state must now reserve "niches" in the transportation services market and fill them with various services. Then we can talk about preserving the parity of state and non-state economic interests realized in the Unified Digital Platform, created in the form of a wide range of services (from storage services to recycling services) for participants in the freight market.

The next area of counter economic interests, which increases the risks when creating the Unified Digital Platform for participants of the freight market, is the uneven development of transport infrastructure, which undoubtedly correlates with the differential differences in the cost of implementing infrastructure projects in different regions. The situation is also complicated by different approaches to financial and legal regulation of transport at the level of the subjects of the Russian Federation and individual municipalities within the boundaries of the subjects of the Russian Federation. As a consequence, different starting conditions in determining the cost of implementing projects of digital transformation of transport infrastructure in the regions.

Digital inequality in the regions creates prerequisites for the diffusion of economic interests, pushing agents with low demand for digital services of transport infrastructure against agents with high demand for advanced digital services.

Despite the presence of the above-mentioned risk zones, there is currently an active collaboration of conflicting economic interests in the logistics services market. In particular,
it is possible to identify several schemes for the promotion of logistics services in the digital format:

1. The priority of implementing the economic interests of IT-giants, which have taken the leading position in the logistics market. Large IT-companies are able to independently create digital ecosystems, in which transportation products, services, and services are added.

2. The balance of economic interests of IT-giants and traditional logistics companies on the basis of mutually beneficial partnership. The effect of economic interests through numbers can be achieved when IT players work in collaboration with companies providing real transportation services.

3. Lobbying of the economic interests of traditional logistics companies, transforming into universal ecosystems to solve the issues of responsibility and security of cargo transportation, expansion of infrastructure services.

4. The monopoly of the realization of public economic interests. The single digital base will be a public platform, which will host the registers of carriers for commercial purposes and for their own needs.

The list of schemes for the promotion of logistics services in a digital format is not final, but it gives the idea that any scheme accumulates and models in itself zones of conflict of economic interests, the boundaries of which are difficult to narrow due to the low level of integration of digital solutions.

3 Results and Discussion

The study proves the need to classify modern challenges of the digital ecosystem of transport and logistics. According to E.A. Mamaev and N.V. Guzenko, "the space of problems of transition to digital technologies in transport leads to the need to scale them in three planes: regulatory and legal support of the relationship between entities and standardization, infrastructure and rolling stock (freight units), information and telecommunication space". [14].

The scaling proposed by the authors does not take into account the challenges associated with the staffing of the transport complex with qualified specialists who have the necessary level of digital literacy to work with digital solutions in transport. Challenges related to cybersecurity are left out.

In addition, it is established which barrier environment factors in the digital transformation of the transport industry require the actualization of mechanisms for the realization of economic interests to reduce their conflict, due to which changes will accelerate the uberization of services of the transport industry.

4 Conclusion

Economic interests are changing the profiles of players in the transport and logistics ecosystem. The digital outline of national logistics can already be seen today. For example, in order to reduce the number of hours to pass control measures at the border, operators have implemented conditions for the development of electronic freight ordering platforms, logistics services and eCommerce (FaaS). Artificial intelligence technologies used repeatedly increase the speed of decision-making, distributing transport flows with maximum efficiency, reducing the share of "gray" traffic.

At the same time, reducing the costs of control and oversight activities in the transport industry does not automatically solve the problem of cybersecurity. The economy of trust that underpins the transport and logistics ecosystem makes it necessary to revise contractual relations, protect the digital security space, identify users of restricted information, etc. At
the intersection of economic interests, the state needs to solve the next task of building a
dialogue with business partners without squeezing them out of the market, but also without
allowing illegal interference of aggregators in the areas of national cybersecurity. Such
mechanisms have already begun to be applied in the transportation industry. For example,
predictive optimization of maintenance and repairs of transport infrastructure facilities allows
reducing maintenance costs by engaging the services of narrowly focused operators while
not increasing the risks of cybersecurity breaches. Consequently, the systematization of the
economic interests of players in the digital ecosystem of transport and logistics will largely
reduce the pressure of external and internal challenges, which will enable the successful
implementation of the state strategy in the field of digital transformation of the transport
industry, providing it with cybersecurity.

Based on the external and internal factors considered in the study to influence the pace of
digital transformation of the transport and logistics ecosystem, the system of constraining
challenges can be structured as follows:
1. The level of digital literacy;
2. Mobility of the population;
3. Organization of work with information flows, labor intensity;
4. The presence of a domestic ecosystem for the development of digital models and tools;
5. The cost of implementation and maintenance of digital innovations;
6. Reliability and security of data and systems;
7. The attractiveness of transport corridors in Russia;
8. Centers of "gravity" of profit and "niches" for state participation;
9. The effectiveness of standards and regulation;
10. The cleanup of the logistics market;
11. Digital regional disparities;
12. Advanced digital services;
13. Alternative financial instruments, their accessibility;
14. Monitoring the results of the application of digital technologies.

Digitalization of the transportation industry is not a one-time campaign. Without
government support to reduce key barriers and challenges, businesses will not be able to
accelerate the digital transformation of the industry. Active government involvement in
training specialized personnel, providing an accessible market of financial resources, and
eliminating inefficient standards in industry regulation will increase demand for digital
products and services, as players will be able to determine the economic effect of "point-to-
point" reorientation to customer needs [15].

Theoretical significance of the results of this study, its main provisions contribute to the
development of the theory of digitalization of transport systems and processes related to the
creation of the ecosystem of transport and logistics, and the results of the study complement
the methodology of digital transformation of the transport industry in Russia. The practical
significance of the results of the study consists in the use of the system of constraining
challenges for corrective management actions to address them.

The rapid development of digital technologies erases familiar boundaries, making
business more and more cross-border. This is most evident in the sphere of transport and
logistics.

In accordance with the results of the expert survey and the estimates of the Institute for
Strategic Studies of the Higher School of Economics, the demand of the transport and
logistics industry for advanced digital technologies in 2020 was estimated at 89.4 billion
rubles, with the prospect of a sevenfold growth by 2030 to 626.6 billion rubles. Thus, the
digital transformation will provide an additional increase in labor productivity in transport
and logistics by 20.04% until 2030 (cumulative total) [16].

These indicators will be achieved with the application of solutions that eliminate the
impact of constraining challenges, accompanied by external and internal factors of influence on the pace of digital transformation of the transport and logistics ecosystem.

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