Perspectives for the development of safe-ecosystems based on 5-pl logistics in Russia

L.M. Chechenova[1*] and *V.V.* Toschev[1]

[1]Emperor Alexander I St. Petersburg State Transport University, 190031, 9 Moskovsky pr., Saint Petersburg, Russia

Abstract. The purpose of this research is to assess the prospects for the development of the Russian transport and logistics services market in the 5PL logistics segment as a basis for the development of safe ecosystems based on the active introduction of digital technologies into the supply chain. The research allows us to identify the key features of the introduction, application and development of the digital logistics segment of the People's Republic of China and to reveal the features of using the practical experience of the People's Republic of China in order to create and operate a digital logistics platform in Russia. Methods: comparative analysis of statistical data on the volume and speed of cargo transportation is used; analysis of the logistics sector to assess the level of regulation and government influence on the development of this industry and characteristics of the level of automation and application of modern IT solutions in the logistics sector of both countries according to their impact on efficiency and competitiveness. Results: the features of the formation of 5PL logistics in the People's Republic of China are established, taking into account both the unique conditions for the development of transportation logistics and the advantages of digital progress penetrating into all spheres of the Chinese economy; the conditions for the promising development of the 5PL system provider format in Russia are determined; the current parameters of the functioning of the 5PL system of the People's Republic of China with recommendations for their application in the territory are highlighted In order to increase the efficiency and competitiveness of the national transport and logistics system. Practical significance: the results obtained are of an applied nature, since they propose and justify a number of measures aimed at optimizing the logistics sector in Russia, based on the experience of the Chinese logistics services market with increasing momentum in the development and development of 5PL systems.

1 Introduction

Digitalization of the transport and logistics services market is becoming an increasingly relevant and demanding topic in the business environment [1], as each company strives to consolidate its own position in the market, while increasing its competitiveness and providing

* Corresponding author: aliana1981-149@mail.ru

conditions for adaptation to rapidly changing market conditions [2,3]. We research the experience of managing the transportation process in China with the possibility of its partial implementation in Russian conditions, including with external partners [4,5]. Currently, the digitalization of China's transport and logistics sector is one of the priorities for the development of the digital economy in order to increase the efficiency and transparency of logistics processes (Fig. 1.) [6-9].

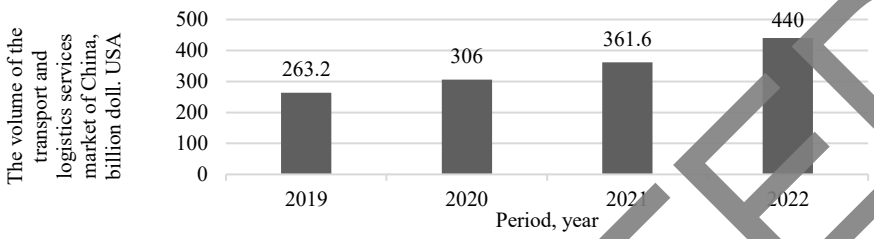

Fig. 1. The volume of the transport and logistics services market in China

Interesting is the Chinese approach to building transport and logistics chains for cargo delivery (from point A to point B) within the borders of the national territory no later than 4 days, which is facilitated by the creation of numerous pick-up points in each city of the People's Republic of China. This is the basis for ensuring technological independence in the field of transport and logistics, as well as creating a sustainable ecosystem for the development of digital logistics projects at the interstate level. China holds a leading position in the world in the field of digital technology implementation, and its experience in creating the largest digital platforms such as «Alibaba», «Tencent», «Baidu», «LOGINK» allows us to identify and transfer successful practices of legal and technological regulation of digital services to the activities of Russian organizations.

2 Materials and methods

This research analyzes the dynamics (Fig. 2.) and the growth trends of e-commerce, which determines the need for the development of 5PL systems, and considers the factors hindering the development of e-commerce in the Russian Federation [10].

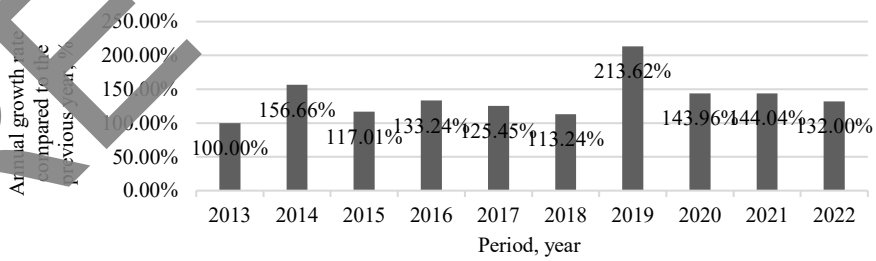

Fig. 2. The growth rate of the e-commerce segment in the Russian Federation for the period from 2013-2022 [10]

The contribution of the Internet economy to the economy of the Russian Federation in 2022 is estimated at 12,2 trillion rubles with annual positive dynamics in terms of e-commerce volumes [10]. At the same time, there is a decrease in the share of cross-border trade to 4% in the total volume of e-commerce in the Russian Federation (Fig. 3), caused by

the refusals of the largest foreign platforms from delivering orders to the territory of the Russian Federation, difficulties with logistics, as a result of the policy of sanctions and restrictions, and the inability to pay for orders with cards of Russian banks.

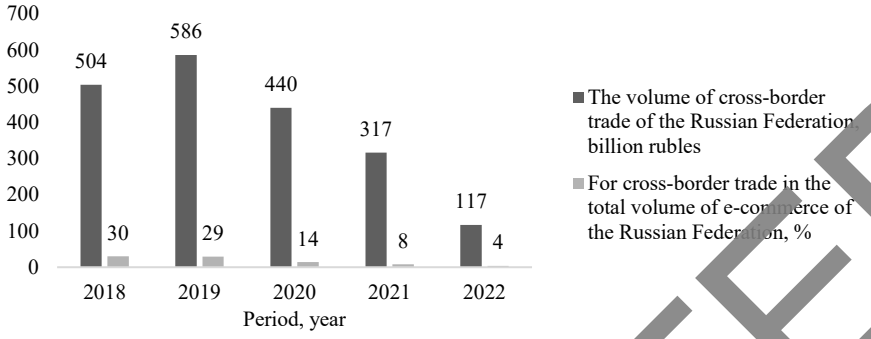

Fig. 3. Cross-border online trade of the Russian Federation for the period from 2018-2022 [10]

Against the background of the global events of 2022/23, there is a restructuring of the national transport and logistics industry caused by the departure of global container operators and logistics companies from the Russian market, changes in logistics chains with a shift in the vector to the South and East, an increase in tariffs as a result of increased demand for domestic transportation and rental and storage costs due to a shortage of warehouse capacity, digitalization, availability of value-added services with a high level of competition [11,12]. In addition, trade volumes with EU countries decreased by more than 60%, and with China showed an increase of more than 20% compared to 2022 [13]. As a result, the key focus of this study is to assess the level of development of the 5PL system in China, provided by the active spread of Internet technologies, diversification of e-commerce sales channels in interaction with the components of the transport system. According to the National Bureau of Statistics of the People's Republic of China, more than a third of the economy is directly dependent on the use of digital technologies: the volume of the digital economy in 2022 - 45.5 trillion. yuan is 39.8% of GDP [13]. The vast majority of large Chinese companies, such as «Alibaba», «JD.com» (Russian analogues of «AliExpress» and «Yandex Market»), «Huawei», «Suning Commerce Group» and «SF Express» are actively engaged in the implementation of the 5PL concept by developing new innovative logistics solutions and combining various logistics resources and platforms through digital technologies. This approach allows you to significantly reduce costs, establish and optimize logistics processes, and increase the level of service. For example, the «Alibaba» and «JD.com» from their range of 5PL services, they provide the following: automated inventory management, cargo routing and tracking, optimization of delivery methods, as well as the use of consolidation warehouses. In addition, the development of 5PL logistics in China is associated with increased requirements for efficiency and quality of service from consumers. The active growth of e-commerce (Fig. 4) encourages logistics companies to plan the introduction of technically innovative techniques such as the use of robots and drones (UAVs) in order to ensure mobility and delivery efficiency. This approach is based on the popular Chinese company «Meituan» in terms of food delivery in urban areas with dense buildings. For the successful implementation of its idea, «Meituan» has installed pick-up kiosks within walking distance of residential and office buildings, which allows the UAV to fly along a predetermined route in order to facilitate navigation within the boundaries of a given territory. In addition, the Government of the People's Republic of China provides permits for special economic zones (such as Shenzhen with its dense residential development) and shows great flexibility in managing and regulating activities related to the use of commercial UAVs for

the transportation of small-sized goods. However, this approach currently manifests itself exclusively in urban areas. A pilot project for the delivery of UAV cargo in rural areas has been implemented by companies "JD.com " and SF Express, the results of which showed a negative economic effect due to a significant difference (almost twice) in the total number of deliveries in rural areas and cities.

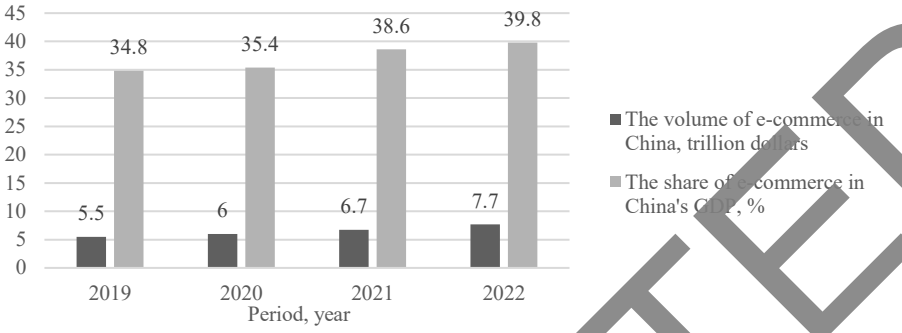

Fig. 4. Dynamics of the volume of the e-commerce segment in China [6-10]

The problem of the relevance of the introduction of services for the delivery of small-sized UAV cargo in Russia is quite acute. On the one hand, the large territory of the country and the unevenly developed infrastructure will ensure a positive effect from the large-scale use of UAVs, on the other, for the implementation of such an initiative it is necessary: • construction of appropriate infrastructure - logistics hubs and landing sites; • solving the problem of protection/safety of UAVs, since theft of UAVs, theft of cargo, danger of cyberattack, windy and snowy weather (risk of loss of UAV or cargo) are possible. Despite this, projects on unmanned cargo delivery are at the initial stage of development with projected implementation dates from 3 to 10 years and the total amount of investments to support this segment from 50 to 60 billion rubles [14].

3 Results

The priority tasks of digitalization of the transport and logistics industry of the Russian Federation are formulated and set out in a number of regulatory and methodological documents and form the basis for the formation of national economic policy and national development strategies. The provision of effectively functioning digital logistics services, the integration of various modes of transport and their interaction at the international level is an important area for strengthening national transport sovereignty [15].

Result 1. The features of the formation of 5PL logistics in China have been established, taking into consideration:

- unique conditions for the development of transportation logistics:
    - 2nd place in terms of population in the world, which creates a great demand for transport and logistics services and requires effective organization of goods delivery;
    - the PRC area creates the task of overcoming significant distances for the delivery of goods throughout the territory;
    - active development of transport and logistics infrastructure, including the construction of new highways, railways, ports and airports, including their constant updating and modernization;

- complex customs clearance procedures, especially for the import and export of goods.

- the benefits of digital progress penetrating all areas of the Chinese economy:
  - active implementation of digital technologies in transportation logistics - automated inventory management, cargo routing and tracking, delivery optimization, etc.;
  - creating platforms that combine various logistics resources for effective integration and optimization of the delivery process, vehicle selection and use of warehouse infrastructure – together this will ensure cost reduction and create much more efficient and flexible cargo supply chains. This feature is related to the growing requirements for transparency and visibility of cargo movement through intermodal transport networks;
  - the presence of a central coordination mechanism for logistics operations is the development of a semiconductor system that ensures the interaction of end-user devices along the central corridor of the digital communications infrastructure;
  - the use of UAVs and autonomous vehicles to address issues of traffic control and management, mobility of goods delivery to remote urban areas and provinces;
  - development of transport and logistics infrastructure: construction of new warehouse complexes, expansion of transport networks. An example is the creation of a Yusen Logistics center with an area of 16 thousand m2, located in close proximity to the seaport and airport, as well as combining two Yusen Logistics warehouses into one with optimization of total maintenance costs, reducing order processing time;
  - the existence of strict requirements in the legislation of the People's Republic of China for the quality and speed of service, especially taking into account the growing need for e-commerce.

In general, the level of development of 5PL logistics in China is an impressive and inspiring example of the introduction of innovative technologies and coordination of the work of leading logistics companies to optimize supply chains and improve service levels, which is confirmed by the annual reports of leading logistics companies. In particular, according to the results of 2022, the introduction of innovative technologies into the activities of the «Full Truck Alliance» in 2022. It provided an increase in the capacity of online freight platforms by 50%, as a result, a reduction in transaction costs by 7%, and an increase in the monthly income of drivers in the range of up to 40% compared to 2021 [5]. In total, according to the report on the development of digital cargo transportation in China, over 94 million waybills were loaded by the end of 2022. At the same time, the time of registration / receipt of sheets was reduced from several days to 1.5-2 hours. The total volume of the road transportation market amounted to about 800 billion US dollars, of which the total mass of the digital transportation market is 97.7 billion US dollars (12.2%) [6].

Result 2. The conditions for the long-term development of the 5 PL-systems provider formats in Russia have been determined:

• territorial potential and geographical features have a positive impact on the growth of trade and economic activity and create prerequisites for the application and dissemination of the 5PL format;

• the presence of a network of railways, sea, river, and automobile routes, as well as a variety of aviation routes, contributes to the development of multi-level logistics;

• stable growth in the volume of the national e-commerce market («Business Lines», «Pony Express», «Ozon», «Wildberries», etc.) has a positive effect on the diversification of internal logistics services in terms of order processing and delivery [7];

• the nationalization of industrial enterprises, the expansion of production capacities with a tendency to increase the volume of international trade in the direction of the South and East

determine the vector of development of multimodal transportation, customs logistics and risk management systems.

Result 3. The current parameters of the functioning of the 5PL system of the People's Republic of China are highlighted with recommendations for their application in Russia in order to increase the efficiency and competitiveness of the national transport and logistics system:

• centralized coordination of the complex of logistics operations (in China - the platform of logistics and trade services «Long Trade»). The introduction of such practices in Russian transport and logistics organizations is possible provided that a digital trading platform is created with the consolidation of market, government, and value-added services. At the same time, the launch of a cross–border portal is recommended to be implemented primarily with the state from among potentially long-term partners - with South Africa. Commercial relations with this country are based on trade in coal, precious metals, vehicles, equipment and chemical products. Among other things, Russia is actively investing in the development of the economy of South Africa, and the launch of the digital platform contributes to the concentration of large logistics, trade and industrial enterprises in the north-east of the country, as well as accelerates the build-up of operational capacity for the development of specialized and market-oriented potential in trade with Russia.

• using the latest digital technologies (artificial intelligence, big data, Internet of things, cloud computing). The Russian transport and logistics system has the potential to integrate such technological solutions into transportation logistics to ensure efficiency, transparency and control of the process.

• focus on the end result and the consumer, rather than on the "formal" provision of transportation services and obtaining a «dry» profit. Russian operators/carriers are able to complement the range of services provided with options with a focus on sustainability and customer orientation.

• comprehensive integration of participants in the logistics chain, including manufacturers, suppliers, carriers and end users. It is recommended to develop partnerships and unite with various companies-players in the logistics sector to ensure a unified operational synthesis and synergistic effect in general.

• regularity of strategic planning and analysis of forecast data in the current/operational mode. The use of continuous data diagnostics methods is aimed at optimizing logistics processes by promptly making changes to the plan and making effective decisions;

• high level of efficiency of organizational measures and warehouse logistics processes. Russian logistics needs to integrate and develop modern technologies for automating warehouse processes, which will increase the speed of cargo handling and reduce the cost of warehouse operations such as, in particular, the Warehouse management System (WMS) and the transportation management System (TMS).

An example of a Chinese logistics 5PL system, the components of which can be applied in the realities of the Russian market of transport and logistics services, is the shipment tracking platform in e-commerce and logistics companies «JD Logistics» (structural division «JD.com») is one of the largest logistics companies not only in China, but also in the world with the provision of a full range of logistics services, including the entire delivery route from placing an order to receiving it by the consumer. One of the key advantages of JD Logistics is the use of advanced technologies with the active introduction of artificial intelligence, big data analytics and process automation. This allows us to ensure high efficiency and accuracy in supply chain management, as well as improve interaction with customers and partners. The experience and achievements of JD Logistics can serve as a starting point in the development and implementation of such innovations in the Russian logistics industry:

• in 2021, the company's revenue increased by 43%, amounting to 104.7 billion yuan ($16.4 billion);

• In 2022, JD Logistics acquired 66.5% of the shares of «Deppon Logistics», which was one of the largest transport and logistics companies in China;

• At the beginning of 2023, JD Logistics has more than 1,300 warehouses, more than 7,200 delivery stations and a staff of more than 200,000 employees [9-10].

Certainly, each country has its own geographical, economic and climatic features, and therefore it is necessary to adapt and test examples of the Chinese 5PL system before their widespread use in Russia.

4 Discussion

The implementation of 5PL systems processes will optimize and improve logistics processes with clear planning and management of all supply chains, which is confirmed by the authors [16]. China's transport and logistics activities have already proven their effectiveness and superiority, which can become an example for the development and adaptation of some of its elements in the Russian market. In addition, the implementation of the 5PL system helps to increase flexibility and speed of response to changes in the external environment. This is especially important in today's dynamic economy, where fast and accurate logistics solutions can be an advantage over competitors. In addition, the development of the 5PL system will reduce costs and increase the efficiency of logistics companies. Optimization of supply chains and better resource planning will help reduce the cost of transportation and warehousing of cargo, as well as improve the quality of customer service [17]. Finally, the implementation of the 5PL system will allow logistics companies to work internationally, establishing stable and long-term partnerships with large multinational companies. This opens up new opportunities for business development and increasing competitiveness in the market.

5 Conclusion

Researching results confirm the potential and prospects for the development of the 5PL system in the Russian Federation, which leads to optimization and improvement of logistics processes with clear planning and management of all supply chains. The example of China's logistics sector in the 5PL segment is a significant lever for establishing a vector for further development and international cooperation in this area. This will allow Russia to reduce the lag in the development of the transport and logistics sector and increase its competitiveness in the international area.

References

1. Gulyi, I. (2023) Lecture Notes on Data Engineering and Communications Technologies, 2023, **157**, pp. 79-87 https://doi.org/10.1007/978-3-031-24434-6_8.
2. Volkova E. (2022) *Development of shared consumption economic forms in urban transportation systems.* In: International Scientific Siberian Transport Forum TransSiberia - 2021. Switzerland, 2022. P. 1-9. DOI: 10.1007/978-3-030-96380-4_1.
3. Volkova, E. (2023) Lecture Notes on Data Engineering and Communications Technologies, 2023, **157**, pp. 59-67 https://doi.org/10.1007/978-3-031-24434-6_6.
4. Panyushkina E. (2023) E3S Web Conf., **383** (2023) 03008 DOI: https://doi.org/10.1051/e3sconf/202338303008.
5. Zhuravleva, N.A., Kliestik, T. (2023) Lecture Notes in Networks and Systems, 2023, **805**, pp. 123-146 https://doi.org/10.1007/978-3-031-46594-9_8.

6. Materials of the information portal «DKnews.kz» [Net resource] URL: https://dknews.kz/ru/xinhua/284591-v-kitae-cifroviziruyut-avtomobilnye-gruzoperevozki (27.03.2024).
7. Results of the Data Insight study «eCommerce Market in Russia 2023: market assessment, trends and forecasts» [Net resource] URL: https://datainsight.ru/sites/default/files/DI_FedorVirin_EcomRetailWeek_2023.pdf (27.03.2024).
8. Materials of the information portal "ir.jd.com " [Net resource] URL: https://ir.jd.com/news-releases/news-release-details/jdcom-announces-proposed-acquisition-deppon-logistics-co-ltd-jd (27.03.2024).
9. Materials of the information portal «Forbes.com» [Net resource] URL: https://www.forbes.com/sites/yessarrosendar/2022/03/14/china-e-commerce-giant-jd-to-acquire-courier-company-deppon-for-14-billion/?sh=78b9660f69bf (accessed 18.01.2024).
10. Data from the annual analytical report «Economics of the Runet 22/23» [Net resource] URL: https://tenchat.ru/media/1298515-ekonomika-runeta-20222023-issledovaniye-raek (27.03.2024).
11. Kazanskaya, L., Chetchuev, M. (2023) E3S Web of Conferences, 2023, **460**, 03015 https://doi.org/10.1051/e3sconf/202346003015.
12. Vorobiev, A., Sivertceva, E. (2023): E3S Web of Conferences, 2023, **460**, 06039 https://doi.org/10.1051/e3sconf/202346006039
13. Data from the information portal «RG.RU» [Net resource] URL: https://rg.ru/2023/08/02/reg-dfo/v-habarine-prezentovali-torgovo-logisticheskuiu-platformu-po-vzaimodejstviiu-mezhdu-rossiej-i-knr.html (27.03.2024).
14. Data from the information portal «Tomorrow.<url>» [Net resource] URL: https://zavtra.ru/books/rossijsko-kitajskoe_sotrudnichestvo_v_oblasti_transporta_i_logistiki_v_novih_geopoliticheskih_usloviyah_v_20222023_gg (27.03.2024).
15. Gulyi, I., Shavurskaya, V. (2023) E3S Web of Conferences, 2023, **383**, 01015 https://doi.org/10.1051/e3sconf/202338301015.
16. Zhuravleva, N., Gulyi, I. (2023) E3S Web of Conferences, 2023, **460**, 03014 https://doi.org/10.1051/e3sconf/202346003014.
17. Kazanskaya L., Rizakulov S. (2022) *Analysis of organizational and managerial factors for ensuring traffic safety in a national railway company*. In: International Scientific Siberian Transport Forum TransSiberia - 2021. Switzerland, 2022. P. 483-492. DOI: 10.1007/978-3-030-96380-4_53.