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Ports Located in South of Primorsky Territory as Part of International Logistic Chains. Prospects of Digitalization and Establishing Unified Regional System of Effective Management

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Abstract. The ports of the Primorye-1 and Primorye-2 corridors in Primorsky Territory are the most important channels for foreign trade and transit of the Far East with the countries of the Asia-Pacific region. The interest of the leading economies of the Asia-Pacific region, in particular China, in the use of the corridor infrastructure determines their transit potential. As elements of the international commodity distribution chain, ports' infrastructure as well as their management system require modernization. Today, the world's leading logistics operators strive to implement digital technologies in management and automate processes in order to increase their competitiveness. This article outlines the prospects for the implementation of digital technologies in the management of the southern ports of Primorsky Territory. Authors provide a justification for such modernization in terms of increasing the competitiveness of the region's sea transport. The concept of digitalization of the ports located in the south of Primorsky Territory and the establishment of a unified regional management system can become one of the ways to develop sea logistics in the Asia-Pacific region and beyond.

1. Introduction

Logistically speaking, the ports of Primorsky Territory are elements of international transport hubs, the functioning of which contributes to the development of the economy. The port of Vladivostok alone ranks fifth in terms of cargo turnover among the ports of the Far Eastern basin. [1] Against the background of serious competition, the need to modernize Primorsky Territory's sea logistics is becoming an urgent issue of the strategic development of the region. Practically speaking, the effective functioning of the port infrastructure directly depends on the competent analysis of data, including data collected using digital technologies, and management decisions made based on this data.

The purpose of this article is to substantiate the feasibility of digitalization of Primorsky Territory's southern ports and to consider the possibility of creating a unified management system for these ports.

Authors have tried to reach the following objectives:

- to assess digital solutions for sea logistics and determine the possibility of their implementation in the ports of Primorsky Territory;
- to formulate the concept of a unified regional management system;
- to justify digitalization and implementation of a unified management system for the southern ports of Primorsky Territory.



The article's scientific novelty consists in developing the justification for digitalization and the introduction of a unified regional logistics management system in the ports of southern Primorsky Territory.

2. Methodology

We would like to note several authors that have researched the topic; for instance, O.V. Grivanova [1, 12], T.V. Varkulevich [6, 7], T.V. Terentyeva [10, 14, 16], R.I. Grivanov [12], A.G. Kim [13], A.P. Latkin [15], P. Princeton [3], R. Baddaloo, C. Cuttan, H. Foo, and M. Mikhailidis. [11] Among the topics studied in these works are transportation issues and its impact on economic development, the implementation of innovations in business, personnel support for high-tech enterprises, as well as trends in sea logistics. However, this study has highlighted the insufficient knowledge of specific measures for digitalization and optimization of the management system in sea logistics.

3. Results

Today's digital solutions market offers the following options for sea logistics [2, 3]:

1. IOT, or Internet of Things. In the shipping industry, data from satellites and sensors connecting equipment, systems, and machinery are used to support informed decisions on route optimization, asset tracking, and equipment maintenance. Maersk and MSC use these technologies to track the movement of reefer containers. The IOT collaboration is between the port of Rotterdam and IBM, as well as the Singapore Maritime and Port Authority and Fujitsu.

2. Blockchain technology. This technology allows transactions to be recorded securely without involving a central administration or intermediaries. Maersk and IBM intend to jointly develop an open digital data processing platform for tracking international trade shipments.

3. Unmanned vehicles. It functions thanks to electronic maps and a variety of sensors such as heading sensors (GPS), roll and pitch sensors; altitude and speed sensors, video surveillance systems, lidars (rangefinders) and radars. Transmission of information from sensors in real time helps to correct the course along sea routes.

4. Digital platform and digital molds Thanks to the collection of data in the entire technological system, they can forecast the status of equipment and route workload and adopt management decisions based on this data and the forecast. [4]

The importance of introducing digital innovations in the southern ports of Primorsky Territory is outlined in the "Strategy for Social and Economic Development of Primorsky Territory until 2030." Primorye-1 and Primorye-2 internal transportation corridors are see the largest number of investment projects being implemented. These projects provide for the introduction of new capacities for transshipment of goods in regional ports, modernization of border infrastructure (including the construction and expansion of ports, checkpoints, and road and rail infrastructure), and also simplification of border procedures for transit cargo delivered from Russia and China. This strategy is due to the strengthening of the eastern direction in cargo traffic and the formation of a transit corridor for transportation goods to and from China, Mongolia, and other countries of the Asia-Pacific region. Moreover, the possibility of digital modernization is supported by the interest of foreign investors, primarily Asian ones. Of course, there is the stagnation of the Russian economy that holds the investors back. Due to this, the influx of foreign investments from offshore companies is decreasing. [6, 7] However, transportation is a key industry for large-scale investments in the long term.

Today, Primorsky Territory's ports of Vostochny, Nakhodka, and Vladivostok are leaders in terms of cargo turnover. Vladivostok and Nakhodka are also involved in passenger traffic. The total capacity of these ports is 154,179 thousand tons per year for cargo terminals and 369,490 passengers per year for passenger terminals. These ports account for 4 roadstead transshipment centers. All ports are part of the "Free Port of Vladivostok" zone (hereinafter referred to as FPV) and are located in the area of operation of Primorye-1 and Primorye-2 ITCs. [8]

The port of Rotterdam and its digital copy can serve as a benchmark for digital innovation in ports of Primorsky Territory. Various sensors paint a real picture of the terminal workload, current traffic,

and operational status in the digital environment in real time. This measure will help to minimize congestion in ports and speed up cargo turnover twice in about 5 years. In addition, the case of digitalization of the Hamburg port shows that it is possible to reduce operating costs by 75 percent, as well as to reduce the congestion of “ship-train-truck” transport routes by 15 percent. [9]

Technological modernization of ports, as well as digitalization and automation of loading, unloading, and warehouse operations in the near future will undoubtedly be a key element of development of port infrastructure in Primorsky Territory. Based on research conducted, we propose to optimize the management of these ports, namely, to create a unified regional management system. Intensive strategic economic growth is impossible without increasing the efficiency of management using unique modern tools. [10] Below we explain why these measures are useful, in accordance with the latest trends in the global sea transportation market.

The ports of Vladivostok, Nakhodka, Vostochny, Zarubino, and Posyet may be joined with a unified data platform based on PortCDM concept. This platform is a key part of digitalization and allows the exchange of data in order to understand general trends. [11]. Based on the experience of introducing such platforms in other ports, it can be assumed that the port’s technological indicators (namely capacity) will increase to 25% per year, which is reflected in Table 1.

Table 1. Predicted capacity of southern ports of Primorsky Territory after their digitalization.

Port	Capacity of loading terminals, thousand tons/year	Predicted capacity of loading terminals, thousand tons/year	Capacity of passenger terminals, passengers/year	of	Predicted capacity of passenger terminals, passengers/year	of
Vladivostok	31,216.43	39,020.54	195,490		244,362.5	
Vostochny	81,738.00	102,172.50	-		-	
Zarubino	1,202.00	1,502.50	-		-	
Nakhodka	33,786.20	42,232.75	174,000		217,500	
Posyet	6,236.00	7,795.00	-		-	
Total:	154,178.63	192,723.29	369,490		461,862.5	

The first objective of PortCDM-based unified regional management system is to create a single-window solution that will allow parties involved in trading and transport activities and to present standardized information and documents using a single access channel. For example, starting from 2025, the EU plans to replace the old document management system with EMSWe, or European Maritime Single Window environment. [11] The existing system of electronic customs declarations only covers 30% of the arriving cargo to the port of Vladivostok. The national and regional priority is to completely switch to electronic document management, which was noted by L. Korshunova during the “Transport Week” in March 2019. [9]

The second objective is to control the condition of equipment and environmental situation. Digital technologies help control and reduce the emerging risks of carbon pollution of seas.

The third objective is to optimize capacity allocation. For example, the port of Vladivostok is more suitable for passenger traffic, and the port of Posyet for coal transshipment. A unified control system will have the data needed to regulate departures and arrivals at the terminals, depending on the specialization of a particular port. A phased implementation of PortCDM is possible in the southern ports of Primorsky Territory. Another option is to design and implement an in-house management platform. It can unite only the ports of FPV, or all Russian ports in the Far East and the Eastern Arctic, or link Primorsky Territory with “world ports”, thereby providing better synchronization of sea transportation in international trade.

Among the factors hindering the digitalization of sea logistics in Primorsky Territory is the overall underdevelopment of the Russian cloud logistics market. Similar problems were noted in road transportation during the implementation of the ERA-GLONASS system. [12] The functioning of digital logistics systems presupposes constant monitoring of the digital infrastructure, the serviceability of technical equipment, updating of software products, and advanced training of managers and service personnel. Without these measures, carried out continuously and in combination with one another, the costs may exceed the possible effects. However, at the moment, many companies prefer hiring cheap labor instead of investing into digitalization and automation of logistics.

Another important problem for Primorsky Territory is the exodus of young and promising talent. 82,567 people left Primorsky Territory in 2018. It is worth mentioning that only 46.6% of young people prefer to study in local universities while 30% of migrating graduates are convinced that it is easier to find a job elsewhere. [13] It is obvious that the Territory government and educational institutions should make university education relevant among employers in the region. For instance, they can establish a comprehensive partnership, which, among other things, involves the development of networking between universities and various business entities [14]. Logistics companies that use the most advanced technologies can become a an attractive place of employment for local young specialists, also providing an influx of qualified personnel into the region.

4. Conclusion

In conclusion, we would like to note that the introduction of innovations is a promising direction. It is noted in the "Strategy for Social and Economic Development of Primorsky Territory until 2030" that, by 2024, the capacity of seaports may increase by 111.5 million tons to 237 million tons. [5] Taking into account the directions of modernization indicated above, digitalization could be used to support new capacities, automation of infrastructure operation (for example, berths or checkpoints), simplification of border and in-port document flow etc.

Digitalization and automation makes the production process more effective and, consequently, highly competitive. The transition from an economic system that requires significant amounts of time and labor to high-tech industries is the driver of economic modernization. [15] It is obvious that digitalization can not only bring sea transport to a new level, but also provide many opportunities for improving the efficiency and sustainable development of regional logistics. The leading drivers of digitalization are investments in technology and cooperation aimed at facilitating information exchange and improving collaboration, which are often viewed as stumbling blocks in highly competitive environments. It is important to attract not only the government but also other stakeholders like private entities and the business community to financing innovation projects. [16]

Thus, it would be impractical to improve capacities of specific Primorsky Territory ports. The optimal effect may be achieved by combining the management of the southern ports and creating a platform which would make it possible to effectively monitor the workload and status of terminals and make management decisions faster. These measures will consequently increase the competitiveness of Primorsky Territory ports compared to other logistics operators in the Asia-Pacific region.

5. References

- [1] Grivanova O V 2019 Influence of the transport component on the socio-economic development of Vladivostok Text: electronic eLIBRARY URL: <https://elibrary.ru/item.asp?id=41506118&> (date of treatment 06/14/2020)
- [2] Digitalization in maritime transport: ensuring opportunities for development UNCTAD, forthcoming, Review of Maritime Transport **75** 2019 Jun URL: https://unctad.org/en/PublicationsLibrary/presspb2019d4_en.pdf (date of access 06/14/2020)
- [3] Patrick Prinston 2018 Top 4 trending technologies in the maritime industry SeaRates Oct. 18 URL: <https://www.searates.com/blog/post/it-technologies-in-the-marine-industry> (date accessed 17.06.20)

- [4] The main trends in digital technologies in transport Text: electronic *Journal "Bulletin of digital transformation of Russian Railways" Issue 1* 2020 April 16 URL: <https://gudok.ru/vestnik-cki/?ID=1501039&archive=2019.03.23> (date of access 06.17.20)
- [5] Strategy of socio-economic development of Primorsky Krai until 2030 Text: electronic *Investment portal of Primorsky Krai*: [site] 2018 URL: <https://invest.primorsky.ru/files/guide/strategy/strategy2030.pdf> (date of access 06/25/2020)
- [6] Andreev V A, Varkulevich T V, Sultanova E V 2020 Does Russia overcome the processes of capital flight economy? *International Journal of Management* **5** May URL: <https://ssrn.com/abstract=3629012> (date of access 06/25/2020)
- [7] Andreev V A, Varkulevich T V, Arnaut M N 2020 Supply Chain Strategies in Russia's Special Administrative Regions: Does It Recover the National Economy? *International Journal of Supply Chain Management* Vol 9 Part 2 pp 786 - 791 Apr. URL: <https://ojs.excelingtech.co.uk/index.php/IJSCM/article/view/4717> (date of treatment 07/04/20)
- [8] Ports of Primorsky Krai and the Eastern Arctic Text: electronic Ministry of Transport of the Russian Federation Federal Agency for Sea and River Transport: [website] URL: http://www.morflot.ru/deyatelnosti/portyi_rf/reestr_mp/portyi_primorskogo_kraya_i_vostochno_y_arktiki.html (date of treatment 07/04/20)
- [9] Ports are switching to "digital": on the introduction of digital technologies Text: electronic Association "Assistance to the development of foreign economic activity": [site] 2019 March 21 - URL: <http://www.np-srv.ru/news/porty-perechodyat-na-cifru-o-vnedrenii-cifrovych-technologiy.html> (date of access 07/10/20)
- [10] Terentyeva T V, Konvisarova E V, Levchenko T A, Borovitskaya M V 2018 Theoretical and methodical approaches for control introduction in the management system of industrial organization *Amazonia Investiga* URL: <http://www.udla.edu.co/revistas/index.php/amazonia-investiga/issue/view/89> (date of access 07/11/2020)
- [11] Digitalizing the port call process / Transport and Trade Facilitation Series UNCTAD DTL TLB 2019/2 eISBN: 978-92-1-004933-7 URL: https://unctad.org/en/PublicationsLibrary/dtltlb2019d2_en.pdf (date of access 07/11/2020)
- [12] Grivanova O V, Grivanov R I and Reshetnikov R A 2020 GLONASS technologies as innovative development of road transport: social and economic impact IOP Conference Series: Materials Science and Engineering URL: <https://iopscience.iop.org/article/10.1088/1757-899X/632/1/012050> (date of treatment 07/11/2020)
- [13] Petruk G V, Kim A G, Vaschuk A S 2019 Regional Aspects Of Russian Migration (On The Example Of Primorsky Region) *Revista Turismo Estudos* URL: <http://natal.uern.br/periodicos/index.php/RTEP/article/view/212>
- [14] Baturina O A, Terentyeva T V 2019 Networking Of Strategic Partnerships In Higher Education: Prerequisites And Readiness Of Universities *Revista Turismo Estudos* **1** URL: <http://natal.uern.br/periodicos/index.php/RTEP/article/view/213> (date of access 07/12/2020)
- [15] Latkin A P, Maidanevych Y P, Komarov P I 2018 Russian Industrial Complex in the Context of Global Competitiveness *International Journal of Supply Chain Management*
- [16] Nedoluzhko O V, Terentyeva T V, Shumik E G 2019 El potencial innovador como factor en el desarrollo dinámico del espíritu empresarial en el Lejano Oriente ruso (Innovative Potential as a Factor in the Dynamic Development of Entrepreneurship in the Russian Far East) *Revista Dilemas contemporáneos: Educación, Política y Valores* ISSN: 2007-7890 URL: https://dilemascontemporaneoseduccionpoliticayvalores.com/_files/200009042b4f92c4ac/EE%2019.06.127%20El%20potencial%20innovador%20como%20factor%20en%20el%20desarrollo...pdf (date accessed 17.07.20)