Digital Technologies of Transportation and Logistics Systems Visibility

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ABSTRACT

The article discusses the introduction of digital traceability technologies in transport and logistics systems, examines the legal framework for digital labeling and traceability of goods, substantiates the platform management concept of transport and logistics systems. According to this concept, the focal point of the transport chain is not the logistics operator, but an integrated digital platform management of transport and cargo flows, uniting all participants and providing a high degree of transparency and traceability through the supply chain, evaluated the efficiency of the transport and logistics systems based on extensive use of modern digital information and communication technologies, with which it is possible to control orders to carry out the planning, organization, monitoring and control throughout the delivery procedure of goods.

KEYWORDS:
digital marking, traceability, transport and logistics system, supply chain management, digital platform.

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In today’s economic environment, in order to ensure the flexibility of supply chains, many companies transfer part of their business processes to outsourcing, which often leads to loss of control and ability to track the performance of various logistics operations. It is possible to solve this problem by introducing modern digital technologies for end-to-end traceability of supply chains, including transportation and logistics services at the stage of delivering goods from manufacturers to end consumers.

Traceability is a procedure of continuous monitoring of the material flow movement in supply chains in real time. It is necessary for the further formation and development of an efficient logistics system of delivery of goods, including internationally. Digital traceability involves working with extensive arrays of structured and unstructured data, establishing integration processes and inter-organizational logistical coordination between supply chain entities, as well as designing and implementing modern digital systems that automatically, quickly and safely process incoming orders for the transportation of goods to ensure availability goods to intermediate the final consumers.

The methodical basis of the study was the platform concept of the development of digital economy, statistical and comparative analysis, scientific analysis and synthesis, graphic methods and generalization.

In recent years, the evolutionary-revolutionary nature of economic development is associated with the advent of breakthrough technologies and digitalization. In Russia, digitalization is regulated and maintained at the legislative level (Ordinance, 2017, Ordinance, 2017). Digital platforms are the quintessence of the modern tools of the digital economy, because they integrate a significant number of innovative technologies and provide users (producers, intermediaries, consumers) with access to various digital tools, which predetermines a qualitative change in business practices (Keshelawa, Khaet, 2018). With regard to transport and logistics systems, it can be stated that the focal point in the supply chain is now not the entity itself (logistic operator), but an integrated digital transport and cargo management platform uniting all participants and providing a high degree of transparency and cross-cutting traceability of the supply chain.

In the context of global competition, the ability to innovate is becoming a new factor in the development of transport and logistics infrastructure and an effective way to overcome crisis trends. Digital technology management of transport and logistics processes are innovative themselves. For now, their implementation is facing administrative and legal barriers, but they will certainly become a catalyst for radical changes in the economy, organization and coordination of the delivery of goods, change of technical regulations for admitting rolling stock to the carriage of goods and passengers, and transform rules and practices indirectly related to logistics, in particular environmental requirements, rules of transport and cargo insurance, the practice of dealing with the consequences of traffic accidents, the specifics of customs control (Balchik, Kalinina, Barykin, 2018). In addition, innovative technologies of Industry 4.0, in particular, the Internet, big data, artificial intelligence also serve as catalysts for digital transformation, which allows building a sequence of dominant paradigms...
of industrial revolution: mechanization - technologicalization - digitalization - intellectualization.

To achieve these goals, there is a need to move as quickly as possible from analog technologies, on the basis of which most of the transport logistics business processes are still implemented into the digital environment. Digitization of the economy in general and the transport and logistics sector in particular raises a number of controversial issues, for example, the level of digitization of the economy in the overall structure of Russia's GDP is still quite far behind the indicators of the industrialized countries of the world (Fig. 1) (Banke, Butenko, Mishenina, etc., 2017).

According to B.Yu. Titov, an expert from Stolypin Growth Economy Institute, in terms of the development of digital economy, Russia lags behind the leading states, there is an imbalance between the digitalization of the state, including the creation of new “fiscal” information systems, and the development of private initiatives in this area (Russia, 2018).

Today, for the functioning of transport and logistics systems, it is necessary to apply modern digital information and communication technology to manage orders, plan, organize, monitor and control all procedures for the delivery of goods in real-time.

Proliferation of digital technologies encourages transport companies to analyze their market opportunities and explore the competitive environment to determine potential growth opportunities. Technology and models innovations related to digitalization are transforming the transport industry in terms of increasing its efficiency and increasing the capacity to form modern transport logistics architecture (Management, 2016).

The digital transport logistics ecosystem provides access to highly interactive web technologies, through which you can directly connect to the transportation and warehousing system, plan enterprise resources, carry out any kind of interaction with contractors (suppliers, intermediaries, consumers). In this case, the information flow has an advance on the delivery process, that is, it does not appear as a derivative of the material flow, but is the main flow in the transport and logistics system. After connecting to the service, the user will be able to calculate the cost of transporting the goods, immediately send a request for organizing the delivery of goods and then monitoring the transportation process both domestically and internationally.

At the end of 2018, the World Bank has compiled a logistics efficiency rating in various countries of the world (Transportation, 2018) (see Table). The methodology for determining the place in the rating on a five-point scale takes into account the efficiency of the customs authorities, the state of the transport and logistics infrastructure, the speed of international transportation, the timeliness of delivery and the ability to track cargo. At the moment, Russia takes the 75th position in the ranking among 160 countries, following Costa Rica and Paraguay and slightly ahead of Benin and Montenegro. Oddly enough, the lowest indicators (97th place) in our country refer to customs administration efficiency (4.24 points) and supply chain traceability (2.65 points). By the parameter “international transportation”, Russia ranked 96th (2.64 points). It is also necessary to improve the work in the field of ensuring the timeliness of delivery, infrastructure development and logistics quality (3.31, 2.78 and 2.75 points and 66, 61 and 71th places, respectively).

In practice, the improvement of components as a whole, specified in Table. 1, is quite a complicated and difficult task, because cargo owners often do not have complete information about the goods movement and cannot track their cargoes online, which may indicate technical unpreparedness of transport and logistics systems subjects to complete and even partial transition to digital cargo delivery technologies. Participants in the process of transport and logistics services do not always receive alerts about the shipment of goods, their location and time of arrival at their destination in time. The current situation significantly reduces the quality of trade and supply chain management.

The supply chain tracking technology helps to quickly respond to changes, allowing interested users, including suppliers, logistics operators, consumers, to take action and change demand, redirect the material flow and respond to any changes in the supply chain. The integration of digital traceability tools and systems allows different parts of the supply chain to obtain accurate information on current stocks, incoming orders and goods being in transit in real time.

One of the directions of state regulation of transport and logistics processes is the introduction of digital traceability technologies as the Unified National Digital Marking and Traceability System developed by the Center of the Development of Promising Technologies (Unified, 2019) (Fig. 2). In December 2017, the President of Russia V.V. Putin approved the decision of the Government to create the Unified National System of Continuous Marking of Goods till 2024. The Center for Development of Promising Technologies was designated as the operator of the project, which is a joint project of USM Technology (50%), Rostec State Corporation (25%) and Elvis Plus Group (25%), established on the basis of state & private partnership and acts as an authorized operator, assigning each product a unique code (DataMatrix or marking of a different type) so that the manufacturer or importer places it on the packaging of the goods. It is assumed that by 2024 the system will cover most industries, primarily the production of tobacco products, medicines, clothing, shoes, baby food, etc.
The DataMatrix code is divided into two parts: an identification code that determines the position of the goods in the system and a single product catalog, and a verification code, or a cryptographic check that is generated on the basis of the integrated cryptographic technologies. Due to fixation of movement at every stage in the Signs, the availability of goods that do not have permits for the use of the specified trademark or trade name, or are registered with infringement of copyright, and the possibility of the goods reappearing on the market, including expired ones, is excluded. The digital marking code is unique and unalterable. When receiving the DataMatrix code on the packaging of the product ensures effective counteraction to counterfeit and smuggling, protection to conscientious and law-abiding entrepreneurs and consumers, and tax collection. On April 8, 2018, the Government of the Russian Federation approved the list of goods that are subject to mandatory marking. From March 2019, they will mark tobacco products, from July 2019, shoes, from December 2019 - perfumes and toilet water, some light industry goods, in particular, coats, short coats, raincoats, jackets, knitted blouses, windbreakers, jerseys, table, bedding, kitchen, toilet linen, cameras and flashlights, tires and pneumatic tires, from January 2020 - medicines (System, 2019).

Introduction of this system involves obtaining benefits for all interested parties (the win-win model):

- Consumers will be assured that they acquire certified, legal and high-quality products, they are provided with protection of life and health, the tools of public control and the protection of consumers, and tax collection.
- Entrepreneurs will be able to predict revenue growth and competitiveness in the market, optimize business processes, increase efficiency and productivity, implement a pilot project on the introduction of marking tobacco products, from July 2018, implementation of a pilot project on the introduction of marking tobacco products, from July 2019. As part of the transport and logistics process, tracked objects can be transformed. For instance, in supply chains, a marked box with a specific consignment note was moved to a specified destination in a cargo unit formed on one pallet, in a distribution center it could be redistributed to another pallet and sent with another consignment note to a new destination. The tracking system should provide for reorientation of the material flow and ensure that all production, trade, storage and other features of the logistics of cargo flows are taken into account and correctly reflect all possible changes.

Currently, the ideology of pass-through digital traceability of marked goods is supported by the Non-Commercial Organization European Article Numbering (EAN), established in 1974, with the aim of identifying and marking goods (international code for marking and logistic units accounting), an identification system, which should replace the American UPC and European EAN, in order to increase the efficiency of supply chains and logistics. As part of the transport and logistics process, tracked objects can be transformed. For instance, in supply chains, a marked box with a specific consignment note was moved to a specified destination in a cargo unit formed on one pallet, in a distribution center it could be redistributed to another pallet and sent with another consignment note to a new destination. The tracking system should provide for reorientation of the material flow and ensure that all production, trade, storage and other features of the logistics of cargo flows are taken into account and correctly reflect all possible changes.

Digital traceability systems are also extremely important from the point of view of transport and logistics services, which are crucial for economic activity, both international, in international shipments, traceability is determined by documentary accounting and control of product movement at all stages of turnover, starting with the customs import documentation and control, inclusion of the customs control technology control instead of (Voronetsyova, Tultseva, 2018). Thanks to the transition to digital form, trade procedures will be simplified, there will be opportunities for more active use of electronic commerce. In perspective, digital transformation will also affect the integrated EAEU market: the development of the digital market will allow for the movement of goods, services, capital and labor. On the territory of the EAEU Member States, the acquisition, storage, use, transportation and sale of goods included in the list will be governed by an agreement on the implementation of a pilot project (contingent of goods with identification mark) (identification mark). Trade of goods without marking or with violation of the established procedure for applying control marks will be prohibited, which will also increase the transparency of supply chains and increase the efficiency of business processes in transport and logistics systems.

Digital traceability technologies are being introduced in the field of wood accounting and transactions with it. Since 2015, the United State Automated Information System, created primarily for the purpose of control, security and accountability, has been operating. The Federal service for state registration of goods has also been established, containing goods, has also been used to account for woodturner (Federal Law 2013). The wood accounting system was lastly used by the customs control. In 2018, the Russian Federation received in a timely manner information about the volumes of wood turnover both in Russia and abroad, from the point of export and import. The provisions of the Law on economic, industrial and energy security (Federal Law 2013, Art. 50.4) allow to prepare the necessary data for implementation of the information infrastructure of the Digital Economy to improve the Quality of Statistical Data. Economics, 15 (4), 77–86. (In Russ.).

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