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ОСОБЕННОСТИ ФУНКЦИНИРОВАНИЯ ЦИФРОВЫХ ИНТЕГРИРОВАННЫХ ТРАНСПОРТНО-ЛОГИСТИЧЕСКИХ СИСТЕМ НА СОВРЕМЕННОМ ЭТАПЕ ЭКОНОМИЧЕСКОГО РАЗВИТИЯ

FUNCTIONING FEATURES OF DIGITAL INTEGRATED TRANSPORT AND LOGISTICS SYSTEMS AT THE PRESENT STAGE OF ECONOMIC DEVELOPMENT

О.А. Ходоскина, М.А. Дорошкова

Аннотация. В статье рассмотрена актуальность цифровой трансформации в системе транспортной логистики, роль интегрированных транспортно-логистических систем как моделей управления экономикой, а также их основные особенности на современном этапе экономического развития.

Abstract. The article provides the relevance of digital transformation in the transport logistics system, the role of integrated transport and logistics systems as models of economic management, as well as their main features at the present stage of economic development.

Ключевые слова: интегрированные транспортно-логистические системы (ИТЛС), цифровая экономика, цифровые платформы, модели жизненного цикла.

Keywords: integrated transport and logistics systems (ITLS), digital economy, digital platforms, life cycle models.

Introduction

In the modern world, there is a constant need for interaction between people and states regarding the exchange of goods, resources, knowledge, cultural values and information in its various forms. International cooperation, intercultural interaction and economic integration act as a kind of foundation for building a transport and logistics system in the context of creating a so-called single «center». The combination of several modes of transport in the process of organizing transportation determines the effective interaction of the transport system and advanced transport and logistics technologies, which is ensured through the geographical and functional distribution of capital and the autonomy of individual parts of the supply network.

It should be noted that the concept of a transport and logistics system includes both advanced technologies for transporting goods and the creation of sustainable interaction based on a variety of life cycle models [2]. At the same time, it is important for the transport and logistics system to provide up-to-date digital and logistics information at all levels of its operation. This relevance of digital transformation in the transport logistics system is determined by the following conditions:

- constant interaction and common goals of supply chain participants;
- common standards in the digital sphere;
- the use of similar information and information management technologies in international interaction.

Despite the large volume of diverse logistics information and approaches to its use, the leading position among economic business models and many logistics technologies is occupied by models for managing integrated transport and logistics systems (ITLS), which have a long time cycle.

Main part

An integrated transport and logistics system (ITLS) is an integral system based on the interaction of infrastructure, resources, supply chain links and integrated logistics support for processes throughout the system life cycle [1]. A highly effective ITLS is based on the integrated interaction of enterprises within the life cycle (LC) stages: «design – application/operation/operational control – verification and corrective actions – management system verification». At the same time, at each stage of the life cycle, unique blocks of decisions are considered: determining what to do (activity W); determining how to do (activity H); execution (activity D). Table 1 presents the types of activities characteristic of each decision block and the connections between the stages of the ITLS life cycle [2].

Table 1 – Relationship between life cycle stages and ITLS activities

Stage name	Type of activity W	Type of activity N	Type of activity D
Planning and creation stage	Development of goals. Definition of strategy. Determining needs for TLS-processes	Requirements development. Definition of the concept. Design of TLS services. Technology planning. Service provision planning	Definition of parts (components). Provision of services. Trial. Delivery of services
Operation (transportation) stage	Determining supply needs. Definition of use	Determination of requirements for the operation of TLS. Defining logistics support requirements	System operation. Engineering and system support for processes
Update (change) stage	Determining the needs for update (change)	Determining upgrade requirements	Services update. Changing operating parameters

Despite the fact that the transport and logistics system is under the influence of such transformation factors as digitalization, technology standardization, improvement of legislation and international economic cooperation, this direction is designed to increase the sustainability of transport, as well as the competitiveness of the infrastructure of the country's national economy [2]. The modular organizational and management mechanism for the sustainable functioning of ITLS is presented in figure 1. It is important to note that a distinctive feature of the new generation ITLS is the ability to operate in turbulent situations based on active control methods. At the same time, assessing the effectiveness of ITLS activities will depend on cargo characteristics, setting strategic and operational objectives to ensure the sustainability of the supply network. To reduce overall costs and losses, it is necessary to carry out a systematic conformity assessment aimed at identifying weaknesses in processes and results, which allows planning to improve the activities of ITLS as a whole in order to increase the efficiency and sustainability of system processes at all levels.

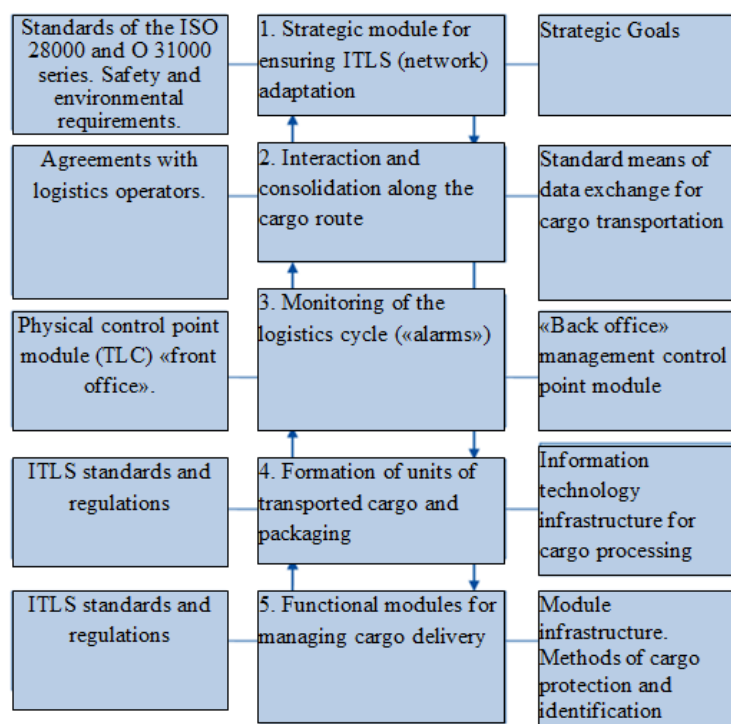


Figure 1 – Organizational and managerial mechanism for sustainable functioning of ITLS

For example, in the “autonomous control” mode, operating modules interact with equipment and vehicles, which ensures communication between all technological processes to achieve the required product delivery option.

In order to obtain maximum benefits and occupy the most stable position in the global market of transport and logistics services, that is, to create a profitable transport and logistics system, transport organizations can unite into an association or holding company, which would allow them to interact more effectively in the market and, accordingly, -Responsibly, get more profit. At the same time, for the timely detection of deviations and irregularities in the supply chain, as well as for the creation of a unified information space, information integration is important, which, on the principles of adaptability, safety and sustainability, contributes to the formation of a high-quality and comprehensive cargo service system.

This integration process can be carried out in the following ways:

1) The introduction of artificial intelligence, which will reduce the delivery time of cargo due to the effective construction of the route, which allows for more intelligent use of available resources, spending less money. As a result, the final cost for the consumer decreases [3].

2) Installation of sensors allows you to maintain communication between devices used to perform logistics processes by including tasks in a single logistics system. Sensors help to successfully monitor traffic flows and detect possible problems in advance.

3) The use of specialized applications allows you to visualize logistics processes, identify potential risks and take measures to eliminate them.

4) The using of cloud services, which allows you to collect and process large volumes of logistics information.

It is advisable to use the following as systems that simplify the execution of daily transport and logistics tasks of an enterprise [1]:

- ERP system that allows you to manage labor resources and assets, optimize enterprise resources using integrated software;

- WMS system that automates warehouse processes;

- CRM system that automates interaction with clients.

The using of digital services is aimed primarily at organizing the efficient operation of the enterprise both in the field of direct production activities and part of transport and logistics services, which will also significantly increase the volume of sales of manufactured products and services.

Conclusion

A consolidated approach to the development of transport and logistics systems at the present stage of development of economic systems at various levels puts forward new requirements related to the digital market environment, new approaches to the organization and management of the transportation sector, which should become organically interconnected with trade and production. To create and use new generation digital platforms covering a huge number of different markets and enterprises, various digital platforms are combined into interconnected ecosystems, covering key areas of the economy: transport, industrial production, energy, finance, healthcare, education, trade, agriculture, etc. At the same time, the main factor in the development of the transport and logistics system is the need for highly efficient transport and logistics technologies for servicing shippers and consignees, which can be achieved using integrated transport and logistics systems (ITLS) of the new generation, which combine subsystems of transport and logistics services, supply chains and ensure sustainability and customer focus at a qualitatively more efficient level. Integration of transport and logistics processes and production assets will ensure a higher level of productivity growth of both production and transport systems, and the economic system of the region (country) as a whole.

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ОЦЕНКА АДЕКВАТНОСТИ СОСТОЯНИЙ ОБЪЕКТОВ В ИНФОРМАЦИОННО-ФИЗИЧЕСКОЙ МОДЕЛИ ЖЕЛЕЗНОДОРОЖНОЙ СТАНЦИИ

ASSESSMENT OF THE ADEQUACY OF THE STATES OF OBJECTS IN THE INFORMATION AND PHYSICAL MODEL OF THE RAILWAY STATION

С.П. Вакуленко, А.К. Головнич

Аннотация. Рассматриваются возможность и условия формирования информационно-физической модели железнодорожной станции с динамическим развитием процессов и контролем над изменением состояний объектов инфраструктуры и подвижного состава. Результатом работы модели является визуализация выполняемых технологических операций, адекватных прототипируемой системе.

Abstract. The possibility and conditions of forming an information and physical model of a railway station with dynamic development of processes and control over changes in the conditions of infrastructure facilities and rolling stock are considered. The result of the model is the visualization of the technological operations performed, adequate to the prototyped system.

Ключевые слова: железнодорожная станция, информационная модель, технология, трехмерная визуализация, адекватный образ.

Keywords: railway station, information model, technology, three-dimensional visualization, adequate image.

Введение

Информационно-физическая модель станции предполагает визуализацию объектов пути и подвижного состава, функционирующих с целью выполнения технологических операций с вагонами на станции в соответствии с требованиями технологии и физическими законами, действующими в реальном мире. Все объекты железнодорожного пути и подвижного состава в процессе выполнения технологических операций изменяют своё пространственное положение и состояние, которые отражаются через соответствующие динамические визуальные образы.

Модель функционирующей железнодорожной станции с реконструкцией технологических процессов в трёхмерной визуализации реализуется благодаря программным процедурам анализа возникающих и развивающихся, граничных и опасных состояний станционных объектов. Использование возможности задания скорости таймера вплоть до обращения шкалы модельного времени вспять позволяет прототипирующей технологической системе 3D-модели станции обладать исключительными возможностями. Создание