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STRATEGIC GUIDELINES FOR DIGITALIZATION DEVELOPMENT IN TRANSPORT ENTERPRISES

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Abstract. *The article examines the strategic directions of digital transformation in transport enterprises amid dynamic changes in the economic environment, increasing global competition, and rising demands for environmental responsibility. It provides a theoretical generalization of digitalization as a long-term instrument for enhancing the efficiency, adaptability, and innovation capacity of transport enterprises. Key areas of digital infrastructure development are outlined, including intelligent transport systems, big data analytics, integration into digital logistics platforms, implementation of cybersecurity standards, and improvement of employees' digital literacy. The authors substantiate the need for a comprehensive digital strategy that integrates technological, managerial, regulatory, and educational aspects of transformation. Special attention is paid to the formation of digital ecosystems and partnerships that can ensure sustainable positioning of transport enterprises in the European and global economic space. The article also offers recommendations for adapting to the challenges of the digital environment, taking into account the specific Ukrainian context.*

Keywords: *digitalization, transport, transport enterprises, development strategy, digital transformation, logistics, innovation, digital technologies, transport development*

Introduction In the digital era, transport enterprises face the pressing need for profound transformation of their managerial, operational, and service processes. The transport sector is a key component of any country's economic system, as it ensures the mobility of people, the continuity of goods supply, and access to markets. At the same time, in the context of globalization, the rapid development of digital technologies, and increasing geoeconomic instability, traditional approaches to managing transport enterprises are reaching their limits. Current challenges require not only a prompt operational response but also a strategic rethinking of the role of digitalization as a foundation for the sector's innovative development.

Digital transformation is no longer optional—it is a necessity for achieving competitiveness, operational efficiency, and integration into the European transport space. Developed EU countries demonstrate high digital maturity in the transport

sector: intelligent transport systems are being implemented, cloud-based logistics services are widely used, transportation processes are automated, and traffic management is increasingly based on artificial intelligence. In contrast, Ukraine's transport digitalization is still in its early stages, although it has been identified as a priority in the national strategy for sustainable development and post-war recovery.

The relevance of this study lies in the urgent need to define clear strategic guidelines for the digital transformation of transport enterprises. These guidelines should enable not only the modernization of internal business processes but also active participation in European logistics chains. In the context of infrastructure reconstruction, changes in logistics routes, and the transition to a digital economy, the formulation of a long-term digital strategy becomes particularly important. Such a strategy must ensure the stability, flexibility, and innovativeness of transport operators.

The aim of this article is to identify and justify strategic benchmarks for the digitalization of transport enterprises as a key factor in their effective functioning in the face of current challenges and future growth. To achieve this goal, the article analyzes the main directions of digital transformation, outlines the barriers and risks associated with its implementation, and provides recommendations for the development of effective digital strategies at both the enterprise and state policy levels.

Research results

Digitalization in a strategic context is viewed as the systemic implementation of digital technologies into business models, operational processes, and institutional structures with the aim of enhancing efficiency, innovation, and adaptability of enterprises to the challenges of the digital economy. In the transport sector, this implies the integration of intelligent solutions into logistics processes, infrastructure management, transportation information systems, and customer service. The theoretical foundations of strategic digitalization are based on interdisciplinary approaches, including the concepts of digital transformation, strategic management, innovation development, and cyber-physical systems.

One of the core concepts is digital transformation, which—unlike simple automation—implies a fundamental change in how value is created through digital

tools. According to M. Westerman, digital transformation is «the use of digital technologies to radically improve a company's performance» [1]. In the transport sector, this may include the implementation of GPS navigation, electronic document flow, transportation analytics platforms, and big data technologies for forecasting freight flows and passenger transport.

From the perspective of strategic management, digitalization is viewed as a long-term process involving the selection of priority investment areas in digital technologies, transformation of organizational culture, change management, and the development of digital competencies among personnel. Strategic digitalization is not a one-time project but an ongoing process of adaptation to a dynamic technological environment.

In business process theory, the classification of digital sensitivity (high, medium, low digital sensitivity) plays an important role, enabling companies to determine which operations should be prioritized for digital transformation [2]. In transport enterprises, the most digitally sensitive processes include dispatching, route management, fuel accounting, and customer service, which form the basis for creating a digital transformation roadmap.

Furthermore, the theoretical framework of digitalization includes the concept of the smart enterprise, which is based on the implementation of cyber-physical systems, the Internet of Things (IoT), cloud technologies, and artificial intelligence in managing logistics flows, transport vehicles, and infrastructure assets. According to the digital maturity model applied by organizations such as the OECD and the World Economic Forum, transport companies evolve from basic automation to full digital integration, accompanied by the development of new business models, such as Mobility-as-a-Service (MaaS).

From the standpoint of the innovation economy, strategic digitalization acts as a catalyst not only for improving efficiency but also for generating new market opportunities. The innovation activity of transport companies, supported by digital solutions, contributes to value creation, reduction of transaction costs, improved customer experience, and environmental sustainability through emissions reduction and energy efficiency.

Thus, the theoretical foundations of strategic digitalization encompass not only the technological dimension, but also the managerial-organizational, social, and institutional contexts. They form the basis for developing digital transformation strategies for transport enterprises, enabling them to remain competitive, innovation-oriented, and integrated into global logistics ecosystems.

In the context of the growing digital transformation of the transport sector, the strategic guidelines for the digitalization of enterprises should be based on a synthesis of advanced technological solutions, global trends, national strategies, and changes in the structure of demand for logistics services. According to the OECD, a digital transport strategy should not merely be a technical automation program, but rather a structured managerial tool that ensures the resilience, innovativeness, and competitiveness of enterprises [3].

Figure 1 presents the key strategic guidelines for the development of digitalization in Ukrainian transport enterprises in accordance with the directions of national economic development.

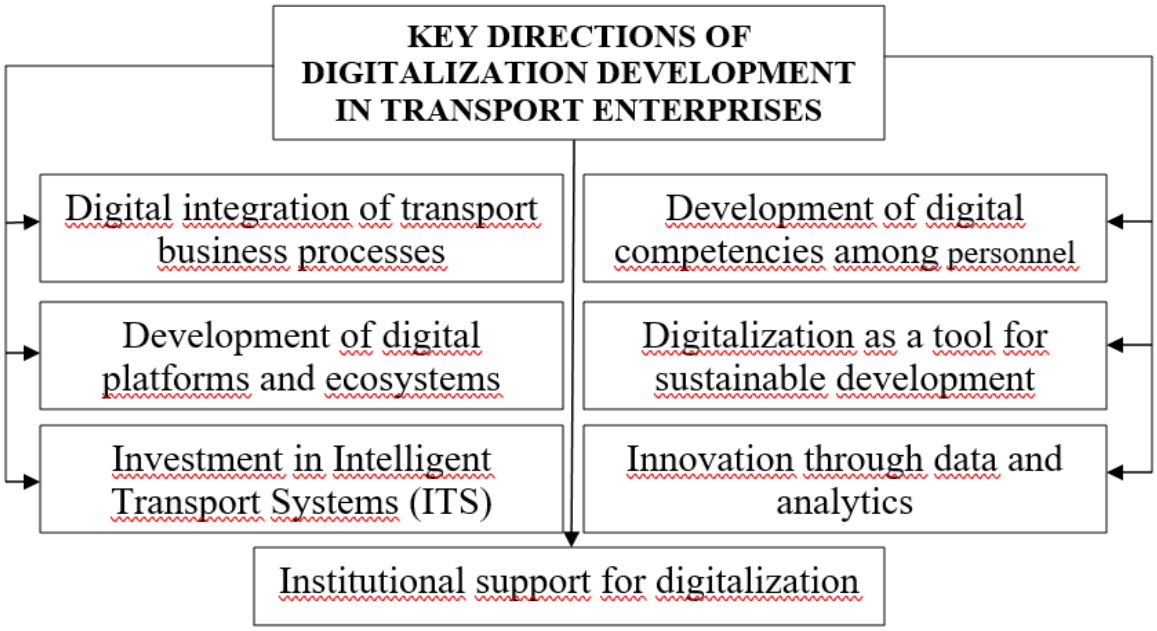

Figure 1. Key directions of digitalization development in transport enterprises

One of the key strategic priorities is the full digital integration of business processes — from supply chain management to operational accounting and customer

interaction. This implies a comprehensive transformation of traditional operations through the implementation of digital solutions at all functional levels — from service ordering, route planning, and fleet management to electronic document workflow, payments, service quality control, and customer feedback. The goal is not only to automate individual processes but to unify them into a single digital ecosystem that ensures data integrity, decision synchronization, and real-time responsiveness to changes. As noted in the *Connecting to Compete* report, countries and enterprises with a high level of digital integration in their logistics chains demonstrate superior performance in productivity, supply reliability, and customer service [4].

The key technologies enabling the integration of transport business processes include ERP systems, CRM platforms, transportation management systems (TMS), cloud services, and big data analytics. The adoption of such tools allows enterprises to obtain a real-time, holistic view of operational activities, monitor deviations, forecast workloads, and make informed decisions. Kane et al. emphasize that digital integration empowers transport companies to achieve flexibility and scalability — both of which are essential in the context of global challenges and disruptions in logistics chains [5]. This approach transforms digital technologies from merely supportive tools into core drivers of the enterprise's strategic development.

The development of digital platforms and ecosystems is a critically important direction for transforming the transport sector amid the digitalization of the economy. Digital platforms enable the integration of suppliers, logistics service providers, customers, and regulators into a shared information environment where data circulates in real time. This facilitates a reduction in transaction costs, accelerates operational processes, and minimizes the number of logistical errors. In particular, «single window» platforms significantly simplify customs clearance procedures and optimize interagency coordination — which is especially relevant for international transportation. Examples of such solutions include European digital logistics hubs (e.g., RailFreight or the Digital Transport and Logistics Forum initiated by the EU), which offer unified services for the exchange of transport-related information [6].

In Ukraine's transport sector, the development of digital ecosystems is at an early

stage, but promising initiatives are emerging. These include pilot projects for implementing e-CMRs (electronic consignment notes), digital document exchange between carriers and customers, and the integration of Ukrainian railway and maritime systems with European platforms. Importantly, digital ecosystems involve not only technological integration but also the coordination of IT infrastructure development strategies, alignment of data exchange standards, and legal harmonization. The ecosystem approach makes it possible to build sustainable digital logistics systems capable of adapting to crises while ensuring cybersecurity, transparency, and continuity of supply chains [3].

Investments in Intelligent Transport Systems (ITS) are becoming a key driver of infrastructure modernization and traffic flow management in the context of digital transformation. ITS encompass a wide range of technologies — from automated traffic control and vehicle monitoring systems to digital platforms for route planning, electronic fare collection, and traffic forecasting. The implementation of ITS can lead to significant resource savings, reduced travel times, fewer road accidents, and improved environmental conditions in urban areas. In EU countries, intelligent transport systems form part of the broader «Smart Mobility» digital strategy, which aims to create a safe, accessible, and sustainable transportation network [6].

For Ukraine, investment in Intelligent Transport Systems (ITS) is not only a tool for the efficient management of transport processes but also a critically important condition for increasing integration potential with European transport networks. Currently, several ITS implementation projects are underway in urban centers (e.g., smart traffic light systems, GPS tracking of public transport, and e-ticketing), as well as within road infrastructure modernization programs supported by the EBRD, EIB, and the World Bank [4; 7]. Priority areas should include the development of traffic management centers, digital dispatching of freight transport, integration with navigation services and European data exchange standards, as well as the creation of a regulatory framework for scaling such systems at the national level.

In the current context, digitalization serves not only as a means of improving the efficiency of transport enterprises but also as a powerful tool for implementing the

principles of sustainable development. Through digital technologies, enterprises can manage resources more effectively, reduce emissions, and optimize routing and logistics processes. For instance, the use of real-time transport monitoring systems allows for reduced downtime, lower fuel consumption, and diminished environmental impact. Digital solutions in the transport sector support the transition to a low-carbon economy, aligning fully with the United Nations Sustainable Development Goals, particularly Goal 9 (Industry, Innovation and Infrastructure), Goal 11 (Sustainable Cities and Communities), and Goal 13 (Climate Action) [5; 7].

Moreover, digitalization in the transport sector contributes to greater transparency in management processes, which is a key factor in ensuring accountability and the effective use of both public and private investment in infrastructure development. Digital monitoring tools, automated reporting platforms, and digital passports for infrastructure assets contribute to more effective oversight of the technical condition of transport systems and enhance the safety of transportation. As highlighted in reports by the UNECE [7] and the European Commission [6], digital tools are critically important for achieving a balance between economic efficiency, social inclusion, and environmental sustainability.

Another important component of a successful digital transformation of transport enterprises is the development of employees' digital competencies. The introduction of advanced technologies requires not only an update of technical infrastructure but also a qualitative transformation of human capital. According to studies by the OECD [3] and the EBRD [8], a lack of digital skills is one of the main barriers to effective digitalization in logistics and transport. Therefore, enterprises must invest in continuous professional development, including training programs in the use of information management systems, data analytics, and cybersecurity, among others.

The formation of a digital culture at the organizational level—particularly among middle and senior management—is becoming especially relevant, as it ensures support for innovation and data-driven decision-making. Employee digital competencies also include skills in interacting with platform-based solutions, cloud services, and mobile applications, which are already widely used in the transport sector of EU countries.

Developing these competencies enables enterprises to increase their flexibility, quickly adapt to changes, implement innovations, and maintain competitiveness in the digital economy [1; 9].

A significant driver of digitalization in the transport sector is the implementation of data- and analytics-based innovations. Modern transport enterprises increasingly utilize big data, analytics platforms, and machine learning to optimize routes, forecast demand, monitor fleet technical condition, and assess risks. Data obtained from telematics devices, GPS systems, and Internet of Things (IoT) sensors provide deep insights into logistics processes, enabling strategically sound real-time decision-making. This contributes to cost reduction, efficiency improvement, and higher transparency in interactions with clients and partners [10; 7].

Moreover, analytics plays a vital role in the long-term development planning of transport companies. In particular, the use of predictive analytics and scenario modeling allows enterprises to adapt to changes in the market environment, identify strategic risks, and develop adaptive logistics strategies. Analytical solutions also foster the creation of innovative services—such as personalized digital platforms for clients, “smart transport” services, or digital operator dashboards. Thus, data utilization becomes not only a control tool but also a powerful resource for generating competitive advantages in the digital economy.

The development of digitalization in the transport sector is impossible without active institutional support from the government, international organizations, and relevant industry associations. In Ukraine, fostering a favorable environment for digital transformation in transport involves the adoption of strategic documents (including the National Digital Strategy and Recovery Plan), updating the regulatory framework, and creating conditions for implementing digital services in logistics, transport management, and safety control [6; 12]. Such initiatives should be accompanied by the development of state institutions for digital transformation capable of coordinating reforms, implementing standards, ensuring data openness, and promoting digital innovation in the sector.

International institutions also play a special role in supporting digitalization—

particularly the European Bank for Reconstruction and Development (EBRD), the World Bank, the European Commission, and the Organisation for Economic Co-operation and Development (OECD). They provide funding for digital initiatives, technical expertise, best practice exchange, and support Ukraine's integration into European digital platforms (notably TEN-T and eFTI) [13; 14]. Their involvement in projects for modernizing digital infrastructure and developing smart transport systems lays the foundation for sustainable and technological growth of Ukrainian transport enterprises in line with European standards.

Thus, the identified guidelines demonstrate that digitalization is not a one-off project but a long-term strategy encompassing all levels of transport enterprise functioning—from internal processes to external logistics interaction. Successful implementation of such strategies is only possible with a systemic approach, political will, and active participation of enterprise leadership.

Conclusions The conducted analysis of the strategic guidelines for digitalization in transport enterprises confirms that digital transformation is a key factor in enhancing the competitiveness and efficiency of the transport sector under current conditions. The implementation of digital technologies and platforms enables the optimization of business processes, improvement of logistics service quality, transparency, and promptness in tracking cargo and passengers, as well as the reduction of operational costs. At the same time, digitalization contributes to improving transport safety, integration into international transport corridors, and the implementation of sustainable environmental initiatives.

Among the key strategic directions defining the development of digital transformation in transport enterprises are the integration of digital business processes into logistics, development of digital platforms and ecosystems, investments in Intelligent Transport Systems (ITS), formation of digital competencies among personnel, innovation through data use and analytics, and the establishment of effective institutional support mechanisms. The realization of these directions requires a comprehensive approach combining state programs, partnerships with international organizations and the private sector, as well as active involvement of digital startups

and research institutions.

Particularly relevant is the use of digital technologies as a tool for sustainable development, allowing for the simultaneous increase of economic efficiency and reduction of the negative environmental impact of transport, in accordance with European and global environmental standards. The formation and development of employees' digital competencies provide not only the technical capacity to implement new solutions but also foster an innovation culture, which is essential for long-term success.

Despite its significant potential, digitalization of transport enterprises in Ukraine still faces challenges, including insufficient institutional support, limited investments, and fragmentation of digital initiatives. To overcome these problems, it is necessary to strengthen state policy, focus on standard unification, develop multifunctional digital platforms, and actively participate in European digital integration programs.

Thus, the strategic implementation of digital technologies in transport enterprises is not merely a demand of the time but a foundation for ensuring their sustainability, competitiveness, and integration into global logistics chains. A comprehensive approach to digitalization that takes into account technological, personnel, organizational, and institutional aspects can provide Ukraine's transport sector with an effective and sustainable future.

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