

DEVELOPMENT OF VEHICLE TRANSPORT ACTIVITIES IN THE DIGITAL ECONOMY ON THE BASIS OF DIGITAL TECHNOLOGIES

Nurbek Ulugbekovich Nurutdinov

Affiliation and Position: Head of the Methodology Department
Automobile Transport, Ministry of Transport of the Republic of Uzbekistan

Abstract

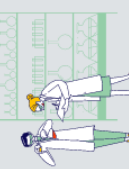
The article analyzes the issues of transformation of the road transport system in the digital economy, the introduction of intelligent transport systems (ITS) and the optimization of freight processes. The impact of digital technologies on economic efficiency is assessed.

Keywords: Digital economy, road transport, logistics, intelligent systems, blockchain, Big Data, efficiency.

Introduction

In the modern global economy, digitalization processes are changing the fundamental foundations of the transport system, as well as all sectors. Road transport is becoming not only a means of transporting goods and passengers, but also a complex ecosystem in which large data flows are exchanged. Within the framework of the "Digital Uzbekistan - 2030" strategy of the Republic of Uzbekistan, automation of transport logistics, creation of "smart" roads and remote monitoring systems are set as a priority task. Digital technologies are of decisive importance in reducing transport costs, increasing transport safety and reducing the environmental load [1, P. 12]. Today, the competitiveness of transport enterprises is increasingly linked to how quickly they transition to digital platforms.

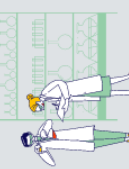
In the context of the development of the digital economy, the use of "Big Data" technologies in the activities of road transport enterprises raises decision-making processes to a qualitatively new level. Big data analytics allows processing huge amounts of information, such as vehicle traffic history, weather conditions, road congestion, fuel consumption, and customer order dynamics. Predictive models formed on the basis of such analytics can predict future cargo flows with 90-95% accuracy. This allows transport companies to optimally allocate their resources (driver work schedules, number of vehicles, maintenance time). Academic studies show that transport companies that implement data-driven analytics reduce operating costs by an average of 12-18% and increase customer service speed by 25% [1, P. 62]. At the same time, Big Data technologies also play a crucial role in ensuring transport safety. Strategies for preventing road accidents are developed by digitally monitoring drivers' driving habits (sharp braking, speeding, signs of fatigue). These systems, integrated with insurance companies, create a mechanism for reducing insurance premiums for carriers with safe driving records



(Usage-Based Insurance). In the digital economy, information is a new type of economic resource, the effective processing of which ensures not a monopolistic position of a transport enterprise in the market, but an innovative advantage. Therefore, identifying and eliminating bottlenecks in the transport system through big data analysis is the highest indicator of economic efficiency [2, P. 95].

The Internet of Things (IoT) technology is the main tool that turns road transport into an integral part of the digital economy. With the help of IoT, each vehicle becomes a "smart object" that not only receives information, but also autonomously exchanges information with the external environment and other systems. For example, smart sensors installed in freight vehicles record in real time the change in the center of gravity of the load, the integrity of the packaging or unauthorized opening, and send a signal to the central dispatching service. This technology guarantees strict adherence to the temperature regime in the "cold chain" logistics, that is, in the transportation of pharmaceuticals and food products. In the digital economy, IoT infrastructure serves as the technical basis for standardizing the quality of transport services and reducing errors associated with the human factor to zero [3, P. 145].

At the infrastructure level, IoT technologies form the concept of "smart roads". Sensors installed on the road surface dynamically measure the load on the axles of vehicles (Weigh-in-Motion), which allows you to control the damage caused by heavy vehicles to the roads and automate fines for overloading. Also, smart traffic lights and road signs change their operating mode depending on the density of the traffic flow, which reduces fuel consumption and environmental impact. Studies confirm that the integration of IoT systems into the management of a transport enterprise increases the asset utilization ratio by 20-30%. This process, in turn, digitizes the management of the life cycle of vehicles (Lifecycle Management) and optimizes the costs of repairs and upgrades [4, P. 182]. In the conditions of the digital economy, the operating model of traditional transport enterprises is transforming into the "Transport as a Service" (TaaS) model. In this model, the main emphasis is not on the ownership of a vehicle, but on the most efficient use of transport services. Digital platforms (logistics aggregators) unite shippers and carriers in a single virtual environment and offer the most favorable price and time using automated auctions and algorithms. This system creates an opportunity for small and medium-sized transport enterprises to enter the large logistics market and strengthens healthy competition in the market. Within the framework of the TaaS model, the consumption of transport services will move to the "pay-per-use" principle, which will reduce the capital costs of enterprises for fixed assets [5, P. 245]. In the future, these digital platforms will become global ecosystems connecting multimodal transport nodes (rail, air and road transport). In this case, the processes of cargo clearance, insurance and customs clearance based on the "Single Window" principle will be carried out using digital signatures and blockchain. The creation of such platforms for the Uzbek economy is a strategic way to increase the country's transit attractiveness in international transport corridors (for example, "One Belt, One Road"). The success of transport enterprises in the digital economy depends on how quickly and effectively they integrate into these global platforms. At the final stage, digital transformation will make



the transport system so flexible that it can ensure the continuity of logistics chains, despite any economic crisis or external influences [7, P. 112].

LITERATURE REVIEW AND METHODOLOGY

A number of foreign and domestic scientists have made a significant contribution to the study of digital economy and transport integration. For example, V.S. Lukinsky in his works proved that the "delivery time" indicator can be improved by 20-30 percent by digitizing the logistics chain [2, P. 45]. Also, domestic researcher N.S. Ziyayev touched upon the role of information systems in the transport services market [4, P. 88].

The research methodology used systematic analysis, comparative economic assessment and statistical forecasting methods. The data collection was based on state statistical reports and digital indicators of private enterprises providing transport services.

DISCUSSION AND RESULTS

The introduction of digital technologies in road transport is carried out mainly in three areas: management automation (ERP systems), monitoring (GPS/GLONASS) and customer service (CRM/Mobile applications). Studies show that enterprises that have implemented digital technologies have significantly reduced fuel consumption and empty runs.

In Table 1, the main economic indicators before and after the implementation of digital technologies are compared.

Table 1. Efficiency of Implementing Digital Technologies in Transport Enterprises

| Indicators | Traditional Method | Digital System | Change (%) |
|--------------------------------------|--------------------|----------------|------------|
| Fuel consumption (liters per 100 km) | 38.5 | 32.7 | -15% |
| Share of empty runs (%) | 25 | 12 | -52% |
| Document circulation time (hours) | 4.0 | 0.5 | -87% |
| Vehicle utilization coefficient | 0.65 | 0.82 | +26% |

The data indicate that, in particular, the transition of document circulation to a digital format (E-Waybill) has significantly reduced bureaucratic obstacles.

Table 2 presents an analysis of the share of various digital platforms in the freight transportation volume.

Table 2. Share of Digital Platforms in Uzbekistan's Freight Transport Market (approximate)

| Year | Aggregators (Yandex, UzLogistics) | Private ERP Systems | Other Methods |
|-----------------|-----------------------------------|---------------------|---------------|
| 2021 | 18% | 12% | 70% |
| 2023 | 32% | 24% | 44% |
| 2025 (forecast) | 45% | 35% | 20% |

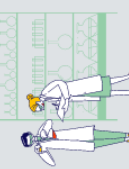
The flow of data, which is the fundamental basis of the digital economy, is becoming the main asset of road transport enterprises today. The introduction of digital technologies in transport logistics is primarily aimed at reducing transaction costs and increasing the efficiency of resource use. Theoretically, the digitalization of the transport system means the transition to the "data-driven management" model. In this model, each vehicle, cargo and route have a digital identification, which are interconnected in a single information space. From an economic point of view, such a system eliminates uncertainties in the freight transport chain and minimizes the risk of the "bullwhip effect" (logistical disruptions caused by sharp fluctuations in demand). In the context of digital transformation, the main drivers of reducing the cost of transport services are the intellectual optimization of routes and the reduction of idle vehicles [1, P. 45].

The socio-economic significance of this process is that digitalization ensures the transparency of the transport system, which serves to reduce the share of the hidden economy. As a result of the integration of road transport enterprises into digital platforms, they will be able to establish direct communication with customers, abandon the services of intermediaries and increase the speed of service provision. Academic analyses show that investments in digital infrastructure increase the market value of a transport enterprise in the long term and provide access to global logistics networks. Also, ensuring the environmental sustainability of transport services in the digital economy, that is, the implementation of the principles of "green logistics", directly relies on digital monitoring systems. This, in turn, allows for the control of fuel consumption and the analysis of the amount of harmful gases emitted into the atmosphere [2, P. 78].

Intelligent transport systems (ITS) are a complex digital solution that provides real-time information exchange between vehicles, infrastructure and users. The main task of ITS is the safe and efficient management of transport flows, which includes GPS/GLONASS navigation, touch sensors and artificial intelligence algorithms. During the transportation process, ITS technologies allow for remote monitoring of the condition of the cargo (temperature, humidity, vibration), which is especially vital for perishable and high-value cargo. "Smart sensors" created on the basis of digital technologies constantly analyze the technical condition of the vehicle (tire pressure, engine temperature, oil level) and help plan preventive work before unexpected breakdowns. This leads to significant savings in operating costs [3, P. 112].

In addition, the application of blockchain technology to the transport sector allows for the digital management of consignment notes and other accompanying documents (e-CMR). This system guarantees the security and immutability of data, which significantly speeds up customs and border crossing processes in international cargo transportation. The signing of "smart contracts" between cargo owners and carriers through electronic logistics platforms ensures timely and secure payment. Also, "V2V" (Vehicle-to-Vehicle) and "V2I" (Vehicle-to-Infrastructure) technologies used within the framework of ITS serve to reduce road accidents and increase traffic safety to a high level. Such an integrated approach allows road transport enterprises to create competitive logistics chains and gain customer trust [4, P. 156].

The strategy of digital transformation of road transport enterprises is a complex process that must be implemented in stages. First of all, it is necessary to create virtual models of real



objects and optimize them by introducing the "Digital Twin" technology in enterprises. This technology allows the enterprise to forecast possible risks in managing its fleet and avoid errors in resource allocation. An important direction of strategic development is the training of highly qualified "digital personnel", since a modern logistics manager is required to have excellent knowledge not only of the transport process, but also of IT tools and analytical programs. In the process of digital transformation, enterprise management moves from a vertical hierarchy to horizontal, networked management, which increases the speed of decision-making [5, P. 201].

In terms of future prospects, the role of innovative solutions based on driverless (autonomous) vehicles and "Maglev" systems in the field of road transport is increasing. In the conditions of Uzbekistan, the development of digital transport corridors is a key factor in increasing regional transit potential. This requires the integration of all types of transport services into a single "Digital Ecosystem". In such an ecosystem, artificial intelligence analyzes cargo flows and offers the most effective multimodal (mixed) transportation schemes. The success of the digital transformation strategy depends not only on technological equipment, but also on the improvement of the regulatory and legal framework at the state level and cybersecurity issues. Consequently, the sustainable development of road transport enterprises in the digital economy is determined by their adaptability to innovations [6, P. 89]. Also, the creation of digital infrastructure on the basis of public-private partnerships serves the overall growth of the country's economy [7, P. 54].

CONCLUSION

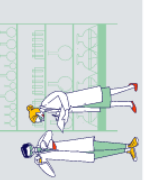
The results of the study show that the development of road transport in the digital economy is not just a technical upgrade, but a driver that increases the efficiency of the entire economic system. The introduction of digital technologies provides transport enterprises with the following opportunities:

Firstly, the efficiency of resource use increases. Through GPS monitoring and route optimization algorithms, fuel and lubricant consumption is saved by up to 15-20 percent.

Secondly, transparency is ensured. Maintaining shipping documents based on blockchain technology strengthens trust between cargo owners and carriers and puts an end to corruption.

Thirdly, the quality of customer service rises to a new level. The ability to track cargo online increases the reliability of the logistics chain.

At the same time, the issue of personnel in the industry remains relevant. In the future, it is necessary to improve state programs to improve not only driving skills, but also IT literacy of transport workers. The digitization process is the only way to increase the export of transport services and fully realize the transit potential of Uzbekistan.



REFERENCES

1. Mirziyoyev Sh.M. — New Uzbekistan Development Strategy — Tashkent: Tasvir, 2022. 240 p.
2. Lukinsky V.S. — Logistics and management of separate deliveries — Moscow: Yurayt, 2020. 459 p.
3. Gulyamov S.S. — Blockchain technologies in the digital economy — Tashkent: Finance, 2019. 210 p.
4. Ziyayev N.S. — Transport logistics: textbook — Tashkent: Economics, 2021. 315 p.
5. Ivanov V.V. — Digital economy: textbook — St. Petersburg: Piter, 2021. 192 p.
6. Kasimova M.S. — Marketing Strategy — Tashkent: Science and Technology, 2018. 280 p.
7. Shokhov I.P. — Intellectual Transport Systems — Novosibirsk: Science, 2022. 150 p.