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The Role of Digital Platforms in Enhancing the Efficiency of Automotive Freight Transportation

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Abstract— *Digital platforms play a key role in improving the efficiency of road freight transportation by automating processes, optimizing routes and improving interaction between participants in the logistics chain. The introduction of digital solutions allows companies to significantly reduce transaction costs, minimize risks and speed up cargo delivery. Special attention is paid to the integration of technologies such as artificial intelligence, the Internet of Things and big data, which contribute to increasing transparency and accuracy of decision-making. The article discusses the economic and environmental benefits of using digital platforms, including reducing CO_2 emissions and reducing fuel costs. The problems of implementing these technologies and the prospects for further development of digital solutions in the logistics industry are also analyzed.*

Keywords— *Digital platforms, road freight transportation, route optimization, automation, ecology, operating costs, artificial intelligence, Internet of things, big data.*

I. INTRODUCTION

Modern road freight transportation plays a crucial role in the global economy, ensuring the movement of goods between producers and consumers at both regional and international levels. However, traditional transportation management systems face numerous challenges, including high operating costs, inefficiencies in route planning, and a lack of transparency in the delivery process. These issues negatively affect the overall performance of companies and increase environmental pressure due to rising carbon dioxide emissions.

Amid rapid digitalization, various industries are increasingly turning to new technologies to address accumulating problems. Digital platforms, such as supply chain management systems and logistics automation platforms, have become key tools in enhancing efficiency and reducing operational costs in road freight transportation. These platforms enable companies not only to optimize planning and management processes but also to integrate advanced technologies, including artificial intelligence, big data, and the Internet of Things, improving coordination among supply chain participants.

The relevance of this study is due to the need to increase the competitiveness of transport companies in the international context and to pay attention to environmental sustainability. Resource optimization, reducing negative environmental impacts, and adapting to changing market conditions are becoming critically important tasks for the logistics industry. The implementation of digital solutions provides an opportunity not only to improve operational efficiency but also to create a more sustainable freight transportation system.

The aim of this work is to explore the role of digital platforms in enhancing the efficiency of road freight transportation, analyze their impact on reducing operating costs and improving environmental sustainability, and identify prospects for the further development of digital technologies in this field.

1. Digital Platforms and Their Role in Supply Chain Management

Digital platforms designed for supply chain management play a key role in integrating data and processes, providing a single point of access for monitoring all aspects of the supply chain in real time. These platforms facilitate the collection, analysis, and utilization of data from various supply chain participants, enabling informed decision-making and operational optimization.

The use of digital platforms in supply chain management contributes to reducing operational costs, minimizing risks, and accelerating the time-to-market for products. Through cloud technologies, such systems are integrated with other applications and databases, providing comprehensive control over processes and constant availability of information. When properly utilized, a digital platform can significantly transform business processes, enhancing their efficiency and transparency.

One of the primary factors driving the adoption of these platforms is increasing competition and changing economic conditions. The impact of globalization, the need for sustainable development, as well as legal and regulatory requirements, create additional incentives for transitioning to digital solutions. For instance, the introduction of new legislation, such as the German Supply Chain Act, requires companies to adhere to human rights and environmental standards when interacting with suppliers from other countries. This drives the need for greater transparency and control at all stages of the supply chain.

Additionally, digital platforms assist companies in tracking sustainability metrics and regulatory compliance, which is becoming a crucial condition for meeting international standards in light of stricter environmental policies. These systems offer automated compliance monitoring and reduce the negative environmental impact, thereby increasing consumer trust.

In today's environment, technological advancements significantly influence the development of digital platforms. Innovations such as artificial intelligence, the Internet of Things, and big data enable the optimization of supply chain management processes, making them more automated and interconnected. The use of real-time data enhances productivity and customer satisfaction, allowing companies to adapt more rapidly to changing market conditions.

Transitioning to digital platforms for supply chain management also helps better control costs, ensuring transparency at all levels. Data integration from various sources allows companies to accurately analyze production, storage, and transportation costs, contributing to increased operational efficiency and profitability [1].

The procedure of digital supply chain management encompasses multiple stages, starting from the planning phase and ending with customer interaction after the completion of the order. To ensure the efficiency of the digital supply chain, organizations need to implement appropriate technological solutions at each stage of this process. Without transparent information on orders and transactions, companies expose their supply chain to risks and delays.

The planning phase in digital supply chain management involves the development of inventory management strategies and production processes before moving on to order fulfillment. The primary focus at this stage is on material accounting and organizing the production cycle. Depending on the specific industry and technologies applied, this stage may vary. Companies focused on modern technological solutions must be prepared to ensure timely resource provision for production.

In the supplier search phase, enterprises engage in the selection and evaluation of reliable suppliers of goods or services necessary for order fulfillment. The goal of this stage is to establish partnerships with companies that provide high-quality and timely supply.

During the production stage, the emphasis is on using digital tools to optimize team performance and complete tasks related to the creation of the final product. This process requires a high level of coordination and automation, which contributes to cost reduction and productivity improvement.

The final stage includes the delivery of the finished product or service to the end consumer. It is crucial that the digital solutions applied in the delivery process promote the most convenient and transparent interaction with customers. This involves providing up-to-date information at every stage, minimizing manual operations, and creating a positive customer experience. Customer satisfaction should be based not only on order fulfillment but also on ensuring comfort and transparency at all levels of interaction [2].

However, like any new technology, the implementation of digital tools in supply chain management can face a number of challenges, as well as resistance from employees. Although such difficulties may complicate the initial stage of the process, the advantages of integrated digital systems far outweigh the obstacles encountered along the way. The main problems that organizations often face when implementing digital platforms for supply chain management are presented in Table 1.

TABLE 1. The main problems in the implementation of digital platforms in supply chain management [3].

Problem	Description
Low initial support	Employee and management motivation to adopt new technologies can become a significant challenge. Training personnel to work with the new platform often encounters resistance, as changes are met with reluctance. This stage is often accompanied by concerns about relinquishing control over supply chain processes to digital tools. However, such objections are common in many organizations. Over time, with support, both management and the team begin to recognize the clear benefits of using a digital platform for supply chain management.
Lack of cross-functional interaction	It is common for organizational departments to be evaluated based on their internal metrics, such as order fulfillment timeliness, units produced, or unit costs. These isolated metrics can lead to fragmentation, with each team focused solely on achieving its own goals, creating tension within the company. This hinders the integration of procurement, storage, and service processes.

Despite these challenges, organizations can successfully implement digital technologies in the supply chain, provided they actively support their employees and partners at every stage of the process. Timely training and comprehensive support will help ensure the sustainable and effective integration of new solutions.

The process of digitalization had been gaining momentum for several years, but the pandemic significantly accelerated it. Restrictions caused by disruptions in cash flow and the shift of enterprises to remote work highlighted the necessity of implementing digital trade platforms. In addition to the obvious advantages for trade, companies are increasingly pursuing digitalization for the following reasons:

• Increased transparency — The digitization of data and operations ensures a higher level of transparency, improving visibility at all stages of the supply chain and enhancing the value of interactions with partners and customers.

• Access to real-time data — Companies need up-to-date information to make quick and accurate decisions. Digital technologies enable efficient management of inventories and orders, providing better control over all processes.

• Improved efficiency — To achieve a high level of control and transparency (70–90%), organizations need to use digital tools. Such platforms speed up order processing, reduce delivery times, and contribute to higher satisfaction among customers and suppliers.

As digital technologies evolve, so does the need for reliable tools to support them. Tradeshift offers solutions that help companies successfully adapt to the new digital landscape [3].

2. Automation and Optimization of Processes Using Digital Platforms

Digital Process Automation (DPA) is a technique that aims to automate business processes to increase efficiency and productivity. In this context, it is not only about simplifying task execution but also about improving the coordination of all process participants. DPA creates digital workflows that help teams focus on key aspects of their work.

The DPA-Deep methodology emphasizes the deep transformation of complex business processes. This approach

involves a small group of highly skilled specialists who design and optimize processes to implement innovations. Within the DPA-Deep framework, particular attention is paid to standardization and monitoring using metrics, which contributes to continuous improvement.

In contrast to DPA-Deep, the DPA-Wide approach focuses on widespread usage. The main goal of this method is to expand the circle of process design participants by involving business users, not just small expert groups. These projects are typically business-driven and implemented using low-code or no-code platforms, as well as agile development methodologies.

TABLE 2. Popular solutions in the field of process automation using digital platforms [4].

Solution Name	Description
Image Processing API	A versatile automation tool suitable for various sectors. This platform helps companies manage content efficiently by integrating existing systems (e.g., ERP) and streamlining workflows. The software allows for centralized data management, simplifying processes and reducing operational costs.
Process Street	Ideal for small businesses and startups, offering a free version for small teams. This tool is convenient for automating daily tasks and provides access to key project management and workflow features. It is a simple solution that becomes indispensable for teams with limited resources, enabling task monitoring without significant financial investments.
Asana	A cloud-based platform focused on project management. The system allows the breakdown of large projects into specific tasks, assigns them to team members, and tracks progress. Automation in Asana helps streamline task execution and timely notify employees of new responsibilities. However, despite its strengths, users point out the lack of features like time tracking and data export.
Kissflow	Stands out for its ease of use. The platform allows automation of key business functions, such as bill payments or employee onboarding. Despite reporting deficiencies, Kissflow offers reliable solutions for daily tasks, making it an attractive option for companies seeking efficient tools without high implementation complexity.
Hootsuite	Targeted at companies actively working on social media. It allows optimizing posts, planning content, and managing multiple accounts simultaneously. While Hootsuite has several useful features, its automation is best suited for those who actively use multiple platforms for content distribution.
monday.com	Provides solutions for personnel management and internal processes. The platform helps HR departments automate processes such as recruitment and employee termination, as well as manage performance. Although the software offers many templates, users often complain about the complexity of customization, which can make it difficult to use.
Zendesk	A platform aimed at improving customer service. With Zendesk automation, companies can handle customer requests around the clock, increasing efficiency and customer satisfaction. The main advantage of the platform is the ability to automatically route requests, though its cost may be a barrier for smaller companies.
bill.com	Offers automation of accounting processes for medium-sized businesses. The program simplifies payment processing by integrating with popular accounting systems like QuickBooks and Xero. An important feature of bill.com is the two-way data synchronization, reducing the likelihood of errors and saving time. However, some users experience issues when dealing with suppliers and corporate credit cards, which may negatively impact operational efficiency [5].

At first glance, digital process automation (DPA) may seem similar to business process automation (BPA); however, these approaches have significant differences. Unlike BPA, which comes into play after processes are documented and subsequently automated, DPA focuses on the initial digitization of processes. Moreover, DPA extends beyond the business sphere, encompassing other areas, which broadens its application potential. The focus of DPA is aimed at the operational aspect of the process, rather than its outcome.

According to research by Forrester [4], Robotic Process Automation (RPA) is one of the components of DPA. Unlike DPA, which optimizes processes as a whole, RPA focuses on automating specific tasks, replacing human involvement in routine operations through the use of bots. RPA can be applied, for instance, in filling out spreadsheets, testing, data consolidation, and performing other repetitive tasks. As an example, eight popular solutions, each offering unique capabilities, are considered (Table 2).

3. Economic and Environmental Benefits of Using Digital Platforms

One important example is the growth of e-commerce. Platforms such as Amazon and Alibaba have radically transformed the concept of shopping by introducing new approaches to online sales. This transformation has led to significant changes in retail and has stimulated the development of innovative solutions in the field of commerce.

Companies are also actively employing omnichannel strategies to interact with customers, combining online sales with mobile applications. This allows for efficient analysis of consumer preferences, enhances their brand interaction experience, and boosts loyalty and sales metrics [6].

A key aspect of the development of the digital economy is digital payments. Payment platforms like PayPal and Venmo have changed the way financial transactions are conducted, making them more convenient and accessible.

It is also important to consider the significant impact of digital entertainment. Platforms like Netflix and Spotify have radically altered how media content is consumed, providing users with instant access to a variety of services.

No less important is the field of telemedicine, which saw significant growth during the pandemic. This segment has become crucial in providing remote medical services and continues to evolve, improving healthcare accessibility for a wide range of people.

In 2024, Happy Nation LLC signed a long-term 3-year contract with a major broker, Circle Logistics Inc., and is currently working on transporting 20,800 vehicles annually (or 62,400 vehicles over three years) from Laredo, Texas, to other destinations.

To improve the efficiency of daily operations, the PrePass electronic clearance system was implemented and is being used. This system allows its trucks and drivers to bypass weigh stations for weight checks and vehicle/driver inspections. The method has enabled the company to save time and increase profitability.

To ensure transparent and accurate operations and track profits, Askar implemented the professional freight platform

EzLoads. This platform provides clear insight and information about the company's assets, drivers, cargo, operations, profits, and more.

Additionally, Happy Nation LLC participates in the FMCSA-approved Drug and Alcohol Clearinghouse program, which conducts random drug and alcohol tests for company drivers. It uses Corra Group resources for driver background checks and employs an electronic logging device (ELD) service that collects important data on engine use, miles driven, and overall vehicle movement at any point along the route. The system records what is known as Hours of Service (HOS), the amount of time drivers are on duty, including driving time.

Furthermore, the company uses various portals to obtain the necessary permits for operating trucks on roads in specific states according to local regulations.

All the methods and technologies mentioned above were never used in the mid-market freight segment before Happy Nation LLC began adopting and implementing them.

TABLE 3. Environmental and economic benefits from the introduction of automation [7].

Category	Description
Economic benefits	
Fuel cost reduction	Digital platforms enable route optimization, avoiding traffic jams and unnecessary stops, leading to reduced fuel costs.
Load optimization	Platforms provide more efficient cargo allocation, maximizing vehicle load capacity and reducing the number of empty trips.
Reduction of operating expenses	Digital platforms can predict the need for vehicle maintenance, reducing costs associated with unforeseen repairs.
Increased delivery speed	Automating the planning and cargo flow management process reduces delays and improves delivery times.
Profitability increase	By more accurately calculating routes and schedules, companies can complete more orders in less time, increasing profitability.
Environmental benefits	
Reduction of CO_2 emissions	Route optimization and increased vehicle load capacity reduce the number of trips and fuel consumption, lowering carbon dioxide emissions.
Decreased traffic congestion	Digital platforms help distribute traffic flows, reducing road congestion and associated emissions and noise pollution.
Reduced use of natural resources	Fewer trips lead to less vehicle wear and tear, decreasing the demand for materials needed for maintenance.
Reduction of paper documentation	Automation and digitalization of freight processes minimize the use of paper documents, reducing deforestation.

Work is currently underway on methodological guidelines (manual) on how to legally and safely start and operate a vehicle transportation business. This can improve the industry literacy of auto carriers and create safe, transparent, and accountable conditions for new entrants into this large but inadequately regulated market. Additionally, work is being done on an application and online resource that can help drivers understand the requirements for the length, width, height, and weight of trucks and trailers across all states in the country to obtain the necessary permits and operate legally in these states. This is a significant issue, and there is high demand for such a service in the industry.

Moreover, the implementation of these methods and innovations across the country will attract more professional owner-operators and drivers to the vehicle transportation industry, reduce the number of illegal or semi-legal carriers on the roads, make the market more transparent and accountable, increase tax payments, stimulate the insurance market, enhance road safety, and provide clients with reliable and trustworthy auto carriers.

Thus, the digital economy opens new opportunities for companies that focus on digital transformation. This allows for process optimization, cost reduction, and the creation of additional revenue streams. However, its essence lies not only in process automation but also in leveraging technologies to enhance operational efficiency [7].

Further, Table 3 presents the environmental and economic benefits of implementing automation.

Thus, the digital economy offers vast opportunities for modernizing existing processes, creating new solutions, and improving interactions between companies and their clients.

II. Conclusion

Digital platforms in road freight transportation represent a crucial tool for enhancing the overall efficiency of logistics processes. They contribute to cost reduction, increased environmental sustainability, and improved customer service quality. However, the implementation of such solutions requires overcoming several organizational and technological barriers. Nonetheless, the dynamic development of digital technologies indicates significant potential for further improving road transportation, making it more efficient, environmentally sustainable, and competitive.

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