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An approach to assessing the quality of transport service in road logistics

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Abstract. ***Problem.*** *The study addresses the problem of terminological ambiguity and methodological inconsistency in defining and assessing transport service provision in road freight transportation. In practice, the concepts of transport service and transport service provision are often used interchangeably, which leads to incorrect managerial decisions, fragmented quality assessment, and inefficiencies in logistics processes. The need to clarify the structure of transport service provision, determine its components, and establish measurable indicators is intensified by the growing complexity of logistics systems and increasing customer expectations for reliability, flexibility, and transparency of transport operations.* ***Goal.*** *The aim of the work is to develop a structured and theoretically substantiated framework for interpreting transport service provision and to justify methodological approaches for evaluating its quality in road freight transport.* ***Methodology.*** *The methodology is based on critical analysis of scientific literature, systematization of regulatory definitions, decomposition of the service provision structure into transport output, transport process, and customer interaction, as well as examination of modern tools for transport planning, routing optimisation, and digital support of logistics processes using TMS, GIS, and algorithmic methods.* ***Results.*** *The results demonstrate that transport service provision should be interpreted as a complex process encompassing preparation, organization, execution, and coordination of freight transportation, while a transport service represents the final result of this process.* ***Originality.*** *The proposed structured framework enables the identification of quality indicators relevant to different stages of transportation and enhances objectivity in evaluating logistics performance. The originality of the study lies in substantiating the procedural interpretation of transport service provision, distinguishing it from the concept of transport service, and demonstrating the integrative role of digital tools and routing algorithms in improving service quality.* ***Practical value.*** *The practical value is reflected in the possibility of applying the developed approach to optimize transport operations, reduce empty mileage, improve fleet utilization, increase delivery reliability, and support evidence-based decision-making in transport companies. This contributes to strengthening the competitiveness of road freight carriers under modern market conditions.*

Keywords: *transport service provision, service quality, road freight transportation, routing optimization, logistics efficiency, TMS, GIS.*

Introduction

In recent years, the concepts for the development of Ukraine's transport sector and related strategic documents [1–2] have placed significant emphasis on improving the quality of transport services. However, this issue is often addressed selectively – when one factor influences only a particular quality characteristic, while the notions of «transport service» and «transportation service provision» are frequently equated. Due to the complexity and multidimensional nature of the concept of «transport service provision», especially in the freight transport segment, measures aimed at improving service quality do not always yield the expected results. The primary reason lies in the insufficient methodological and theoretical foundation.

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Analysis of publications

Freight transportation services must be provided within the limits agreed with the client and in compliance with transport documentation. Under modern competitive conditions, those road transport enterprises that can offer a wider range of services at a competitive price and with a high level of quality gain an advantage. This necessitates a revision of approaches to the organization of transport company operations – from production to commercial activity. This is grounded in the application of modern delivery technologies, planning methods, and logistics process modelling tools. The development of contemporary approaches to freight transport planning remains a relevant task, as it directly affects the quality level of transport service provision in a competitive market.

The common feature of «freight transportation» and «transport service» is the delivery of cargo. However, significant differences exist between these terms and must be taken into account when organizing the movement of material assets. The key feature of freight transportation is the carrier's responsibility for the timely and safe delivery of goods to the consignee. At the same time, the contract does not always specify who owns the vehicle. Meanwhile, the service provider undertakes to organize the delivery process in accordance with all safety requirements, and their responsibility is clearly defined by contract. It should be noted that the carrier's liability for cargo damage may be waived in the event of unforeseen circumstances.

Transport services encompass a broader range of activities, including pre-transport operations and follow-up services after delivery [2, 3]. Accordingly, contracts for freight transportation and for the provision of transport services have different legal frameworks. In the former case, the obligation is to deliver freight in proper condition, while in the latter to organize the logistics process with the possibility of specifying the freight forwarder's scope of responsibility. This allows customers to better control service quality. Therefore, achieving a high level of transport service quality requires thorough theoretical elaboration of key concepts «transport service provision», «quality of transport service», and «transport service». It is necessary to clearly define their structure, classify them, distinguish them from one another, and justify quality assessment indicators and measurement methods considering cargo specifics. A review of academic sources demonstrates that the concept of «transport service provision» is often equated with «transport service», which is theoretically and methodologically unjustified [3–5]. In practice, «transport service provision» is a complex, multi-level concept evaluated by clients based on the quality of transportation organization, level of interaction with the provider, and the convenience and speed of logistics operations. Meanwhile, a service is the result of one or more actions – an intangible outcome of interaction between the provider and customer.

There is no unified definition of freight transportation service in the national regulatory framework. In scholarly literature, transport service provision is predominantly interpreted as a process rather than merely a result of activity. Summarizing existing approaches, transport service provision can be defined as the result of delivering a transport service that meets the needs of the shipper, consignee, or passenger in accordance with applicable requirements. A service is the result of an activity aimed at satisfying demand without transferring ownership of a material object. Service provision, in turn, is the process of delivering a service; therefore, a service is an integral element of service provision. It is the end result of a transport company's activity in fulfilling contractual obligations [6].

Some authors [4, 5, 7] interpret transport service provision as «transport service» – activity related to the movement of goods or passengers and the provision of auxiliary services. Other researchers emphasize the procedural aspect and consider transport service provision as a set of actions in accordance with established norms and requirements. Given these approaches, preference should be given to the procedural interpretation. Transport service provision can be characterized as a process within the system of economic relations in the sphere of distribution and circulation of goods, implemented through a set of elements – transport output, transport process, and customer interaction.

Considering the complexity of the category «transport service provision» and the customer-oriented approach to its assessment, it is appropriate to apply a structured framework. It allows for detailing key elements of service provision and identifying relevant quality indicators. The first structural element is transport output, which includes the physical movement and associated intangible services: transportation, loading/unloading operations, warehousing, labelling, vehicle rental, forwarding, and

other related services. The second element is the transport process – a set of actions and technical means enabling spatial movement of cargo. This includes agreeing transportation conditions, cargo preparation, route selection, documentation, and interaction among logistics chain participants. The third element is interaction between the customer and the transport company: service flexibility, communication quality, information on tariffs, timelines, conditions, and transport execution.

Road transport remains one of the key components of Ukraine's foreign economic activity, ensuring efficient transportation of freight and passengers, supporting international trade, and facilitating the country's integration into the global economy. Road freight transportation plays a crucial role in ensuring efficient functioning of enterprise logistics systems, as it ensures mobility of material flows, timely supply of production resources, and fulfillment of end-consumer demand for finished products. Effective organization of road transport operations enables achieving an optimal balance between transportation costs and customer service levels – an important factor of enterprise competitiveness. In modern business conditions, with increasing demand for fast, flexible, and reliable transportation, a comprehensive approach to planning and executing transport operations incorporating advanced technologies, digital solutions, and management tools becomes particularly important.

Purpose and Tasks

The purpose of this study is to substantiate a structured and theoretically consistent approach to understanding transport service provision in road freight transportation and to develop methodological foundations for assessing and improving service quality. To achieve this purpose, the research aims to clarify and differentiate the concepts of transport service and transport service provision, determine the structural elements and relevant quality indicators, analyse contemporary approaches to organizing road freight operations, and justify the use of routing optimization, digital tools, TMS and GIS. This allows formulating practical methodological recommendations for enhancing service quality and strengthening the competitiveness of road transport enterprises

Measuring the zone of soil density when it is punctured by an asymmetric cylindrical tip

The primary task is to select the optimal type of vehicles, based on the characteristics of the cargo, route, distance, and transportation conditions. For instance, isothermal or refrigerated vehicles should be used for transporting perishable goods, while oversized and heavy cargo requires specialized platforms or vehicles with reinforced load-carrying capacity. If an enterprise lacks its own transport resources or their use is economically unjustified, third-party vehicles may be engaged or contracts may be concluded with logistics operators on outsourcing terms.

Another important aspect of transport organization is the formation of cargo consignments. Consolidating small shipments into consolidated loads allows for maximum utilization of vehicle load capacity, reducing the number of trips and, consequently, lowering costs. In practice, logistics centers are used for sorting, assembling, packing, and labeling cargoes in accordance with route sheets. Additionally, proper organization of loading and unloading operations must be ensured, including the use of specialized equipment, compliance with occupational safety regulations, and minimization of vehicle idle time at loading and unloading points.

Special attention should also be given to the accounting and analysis of road transportation costs. Continuous monitoring of such costs helps identify inefficient processes and implement measures to optimize expenditures. In this regard, it is advisable to use Transport Management Systems (TMS), which enable real-time vehicle tracking, automated cost calculation, delivery scheduling, and analysis of logistics performance.

Ensuring transport safety is another key priority. This includes both the protection of goods during transport (prevention of damage, loss, and theft) and road safety. Enterprises should develop and implement measures for vehicle maintenance, driver condition monitoring, compliance with hazardous cargo transportation regulations, and cargo security during transit.

Evaluation of the performance of transport services, including the role of road transport, is based on a set of criteria classified into technical-operational, economic, and integrated indicators. These criteria provide a comprehensive assessment of logistics efficiency and make it possible to objectively evaluate service quality from both the carrier's and the customer's perspectives. Proper justification and selection of indicators require clearly defining the

boundaries of the research object, as this determines not only the relevance of the applied criteria but also affects the volume, structure, and accuracy of results. For the road transport sector, important service quality parameters include delivery speed, reliability, cargo safety guarantees, and continuity of the logistics chain [11]. Customers, in turn, prefer services that ensure order accuracy and completeness, ease and convenience of order processing, flexible payment options (discounts, deferred payments, credit), and the efficiency of technologies used during loading and unloading.

The production activities of a road transport enterprise involve various types of resources: material, labor, and financial. Indicators reflecting these expenditures are represented by technical-operational performance measures, which significantly affect the level of transport service. These include production capacity, resource utilization levels, and energy efficiency. Economic criteria include total logistics costs, transportation cost per unit, total revenue, profitability level, and business efficiency. Integrated indicators combine technical and economic aspects for a comprehensive evaluation.

A key direction for improving transport service efficiency is the implementation of optimization approaches to routing [6, 7, 11]. Routing refers to establishing and organizing the most efficient route between the origin and destination points. A well-designed routing system significantly reduces transportation costs, optimizes resource utilization, minimizes empty runs, shortens delivery time, prevents delays, and enhances overall logistics quality. Key factors include shipment volume, geographical structure of routes, transportation duration, road conditions, service sequence at intermediate points, and other technical-organizational specifics.

Route development requires assessing route feasibility, stability of freight flows, adequacy of road infrastructure in terms of safety and load capacity, and availability of infrastructure facilities such as parking areas, turnaround sites, and dedicated service zones [11]. The next stage is the technical and economic justification of introducing a new route or adjusting an existing one. Achieving strong performance in this area ensures timely delivery, enabling customers to reduce inventory volumes and storage costs. This also enhances logistics flexibility and adaptability to demand fluctuations.

Significant attention is paid to the use of modern software solutions that automate routing processes and performance analysis. Such systems include Microsoft AutoRoute, ArcLogistics, and TruckStops [6, 11]. These tools support data import on customer orders, calculation of optimal routes considering geographical, temporal, and technical constraints, route sheet generation, reporting, and vehicle utilization analysis. Implementing such systems improves delivery transparency, reduces empty runs, increases customer service levels, and enhances fleet management efficiency.

Both exact and heuristic methods are applied in routing. Exact methods ensure a global optimum, while heuristic approaches provide near-optimal solutions within shorter timeframes under constraints. These methods rely on specialized algorithms for solving logistics problems. Local optimization techniques involve incremental improvement of route options based on predefined transformation rules. Geographic Information Systems (GIS) play an important role by enabling spatial data visualization, infrastructure constraint analysis, and alternative delivery route development.

The ultimate goal of route planning is to minimize vehicle mileage. However, mileage reduction does not always guarantee minimum total time. In urban environments, delays due to road congestion, time restrictions for freight traffic, breakdowns, and administrative barriers must be considered. The choice of routing method depends on various factors: one approach relies on geographic data and actual transport routes, while another involves analyzing road networks to identify the shortest paths between specified points. Such approaches significantly improve transport service efficiency, ensure stability and predictability of logistics operations, and enhance the competitiveness of transport enterprises.

Conclusions

In summary, ensuring a high level of transport service quality in the road freight segment is a complex task requiring a well-established theoretical and methodological foundation. The conducted analysis confirms the existence of terminological ambiguity and frequent substitution of the concepts «transport service» and «transport service provision», which leads to methodological inconsistencies and weakens managerial decision-making. It is justified that transport service provision should be interpreted as a process of organizing and ensuring the execution of transportation, while a transport service represents the final result of this activity and interaction between the carrier and the customer. A structured approach is essential for effective transport service provision, en-

compassing the formation of the transport product, organization of the transport process, and client interaction. Such a framework enables detailed understanding of service components, determination of relevant quality indicators, and objective evaluation of logistics performance.

Enhancing service quality requires comprehensive planning, route optimization, adoption of modern Transport Management Systems (TMS), and the use of Geographic Information Systems (GIS) for spatial analysis. Implementation of both exact and heuristic routing algorithms contributes to minimizing empty mileage, improving fleet utilization, reducing overall logistics costs, and enhancing delivery reliability. At the same time, consideration must be given to infrastructure constraints, urban traffic limitations, and fluctuating demand patterns.

The organization of road freight transportation should be based on rational vehicle selection considering cargo characteristics, transportation conditions, and the economic feasibility of using own versus outsourced fleet resources. Equally important are measures ensuring transport safety, including cargo protection and compliance with road safety regulations. Transport service performance should be evaluated through a system of technical, economic, and integrated indicators, including delivery speed, reliability, service flexibility, cost efficiency, resource productivity, and customer convenience. Properly selected metrics support transparent managerial decisions, cost optimization, and value creation for clients. Ultimately, the competitiveness of road transport enterprises is defined not only by reliable cargo delivery but also by their ability to provide comprehensive logistics solutions, deploy digital tools, maintain flexible routing and scheduling, and ensure customer-oriented service quality control across all stages of transportation. Future research should focus on developing integrated evaluation methodologies for transport service quality and exploring effective instruments for digital transformation of logistics processes in road freight transportation.

Conflict of interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Підхід до оцінювання якості транспортного обслуговування в автомобільній логістиці

Анотація. Проблема. *У дослідженні розглянуто проблему термінологічної неоднозначності та методичної неузгодженості щодо трактування й оцінювання надання транспортних послуг у сфері вантажних автомобільних перевезень. На практиці поняття «транспортна послуга» та «надання транспортних послуг» часто ототожнюються, що призводить до некоректних управлінських рішень, фрагментарного оцінювання якості та неефективності логістичних операцій. Зростання складності логістичних систем і підвищення вимог клієнтів до швидкості, надійності, гнучкості та прозорості транспортних процесів актуалізує потребу у чіткому визначенні структури надання транспортних послуг, виокремленні його складових та формуванні системи вимірюваних показників.* ***Мета.*** *Метою роботи є розроблення структурованого й теоретично обґрунтованого підходу до трактування надання транспортних послуг та обґрунтування методичних підходів до оцінювання їх якості в автомобільних вантажних перевезеннях.* ***Методологія.*** *Методологія дослідження ґрунтується на критичному аналізі наукових джерел, узагальненні нормативних трактувань, декомпозиції структури надання послуг на транспортний продукт, транспортний процес і взаємодію з клієнтом, а також аналізі сучасних інструментів планування перевезень, оптимізації маршрутів і цифрової підтримки логістичних операцій із використанням TMS, GIS та алгоритмічних методів.* ***Результати.*** *Отримані результати підтверджують, що надання транспортних послуг доцільно тлумачити як комплексний процес підготовки, організації, виконання та координації перевезення, тоді як транспортна послуга є кінцевим результатом цієї діяльності. Запропонований структурований підхід забезпечує можливість визначення релевантних індикаторів якості на різних етапах перевезення та підвищує об’єктивність оцінювання логістичної ефективності.* ***Оригінальність.*** *Оригінальність досліджень полягає в обґрунтуванні підходу до трактування надання транспортних послуг, у розмежуванні цього поняття з терміном «транспортна послуга» та у висвітленні інтегративної ролі цифрових інструментів і маршрутних алгоритмів у підвищенні якості обслуговування.* ***Практичне значення****. Практична цінність полягає у можливості застосування розроблених положень для оптимізації транспортних процесів, скорочення порожніх пробігів, підвищення ефективності використання рухомого складу, зростання надійності доставки та підтримки обґрунтованих управлінських рішень у транспортних компаніях, що сприяє зміцненню їх конкурентоспроможності в сучасних умовах*

Ключові слова: *надання транспортних послуг, якість транспортного обслуговування, автомобільні вантажні перевезення, оптимізація маршрутів, логістична ефективність, TMS, GIS.*

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