

The Use of AI in International Transport and Logistics as a Tool for Creating Added Value for the Customer

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<https://doi.org/10.18267/pr.2026.vol.2587.9>

Abstract: The article will deal with the use of artificial intelligence (AI) as a tool for creating added value in international transport and logistics. Using theoretical frameworks and practical examples, it analyses the benefits of AI in the areas of inventory planning, transport optimisation, warehouse automation or business operations with the common aim to increase customer satisfaction, optimisation of costs and processes, and increasing revenue. The empirical part is based on secondary sources and available case-based information, with attention mainly on how AI is reflected in time reliability, cost efficiency, transparency and service quality. The results also suggest that practical deployment of AI is closely linked with digitalisation and standardisation of data flows (e.g., through EDI), which support interoperability and reduce administrative errors. The paper also proposes a research framework for further empirical investigation of the impacts of AI in logistics systems and sectoral differences, including the possibility to compare performance before and after AI implementation. Artificial intelligence is proving to be a strategic tool for increasing the efficiency and sustainability of supply chains in a global environment, while a limitation is mainly the use of secondary data without direct quantitative verification on a representative sample of companies.

Keywords: AI, delivery, automation, added value, supply chains

JEL Classification codes: L80, R40

INTRODUCTION

In an environment of a digitised and globalised economy, logistics plays a key role in ensuring the efficient movement of goods, data and capital. The traditional logistics model was mainly focused on cost optimisation, but with the onset of the fourth industrial revolution (Industry 4.0), it is becoming an intelligent system capable of quick response, prediction and adaptation to market changes. One of the driving tools of this transformation is artificial intelligence (AI), which is used in warehouse automation, predictive planning, traffic management, big data analytics and customer experience improvement. It is therefore important to focus attention on the implementation of AI in logistics and thus increase the added value for customers.

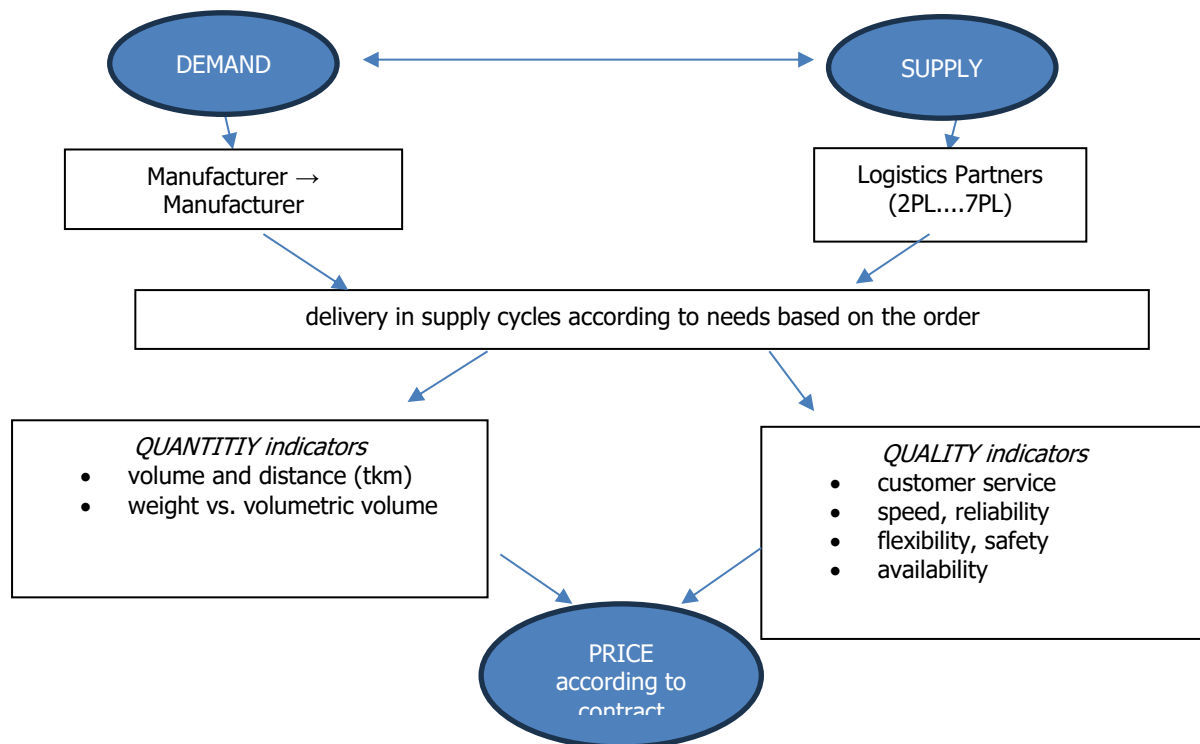
This paper aims to examine how artificial intelligence is applied in international transport and logistics and how these applications translate into added value for the customer, with a specific focus on time, reliability, transparency and cost efficiency. We address the following research question: How does the implementation of AI in international transport and logistics contribute to customer added value, and through which logistics processes are these effects most visible?

The contribution of this paper is twofold. First, it synthesises existing knowledge using a value-chain perspective and links AI use cases to customer-value mechanisms in logistics. Second, based on secondary evidence from published case-based sources, it proposes a concept for future empirical research that can quantify changes in logistics performance before and after AI implementation in a European and global context.

1 LITERATURE REVIEW

Logistics services have become an instrument of competition and market success, with a value-based approach and a focus on customer benefits coming to the forefront. On the international logistics market, the demand for and supply of transport and logistics services intersect, and these services are frequently incorporated into KPI metrics (Key Performance Indicator), as illustrated in Figure 1. Among the qualitative indicators that can also be quantified are, for example, reliability (the number of consignments delivered on time) and flexibility (the ability to modify transport routes or optimise transport networks) (Furdová & Hansenová, 2013). Artificial intelligence represents significant potential for enhancing the efficiency of transport and logistics processes.

Fig. 1 International logistics market (key indicators)



Source: Khúlová, 2023, p. 7

Many companies, when evaluating the sources of competitiveness, began to base their assessment on the analysis of the value chain, formulated and popularised by M. Porter in 1985 (Porter, 1998). Logistics thus represents the ability to create value by ensuring the right goods in the right place, at the right time, in the right quantity and at the right price. Furdová & Hansenová (2013) complement this view with the concept of logistics as an element of global competitiveness, emphasising the importance of a systemic approach and the integration of information flows. This fact is further made more effective using artificial

intelligence, which is pointed out by several studies focused on AI in logistics. Wamba et al. (2017) demonstrate that big data analytics and AI significantly increase the dynamic capabilities of firms in the supply chain. Ivanov et al. (2019) focus on the resilience of supply chains, where AI serves as a tool for predicting risks and disruptions. Queiroz et al. (2022) propose a framework for evaluating the impact of AI on operational performance in the context of the COVID-19 pandemic. In this context, the works (Richey et al., 2023; Adesoga et al., 2024; Assimakopoulos et al., 2024) explain in more detail how AI can create value for the customer across upstream and downstream activities, including supplier evaluation, scenario-based risk management, more accurate demand forecasting and the design of replenishment policies (e.g., just-in-time), as well as decision-making in transport and warehousing (route optimisation and proposals of warehouse layouts) under explicitly defined cost and service constraints; these capabilities can also be reflected in customer communication through chatbots that provide order status updates and delivery time estimates.

From the point of view of selected companies, the implementation of AI in logistics can be identified as significant. For example, Amazon, FedEx or UPS already use AI to optimise the entire supply chain, including "last-mile delivery", where AI is able to predict delays and change routes in real time based on historical data (Sifted Team, 2024; Robert, 2024; Marr, 2018). This corresponds with the "smart supply chain" perspective, in which AI supports predictive and real-time inventory management with the aim to reduce availability disruptions and excess inventory, while route optimisation explicitly considers traffic, weather and delivery time constraints to increase speed and cost efficiency. At the same time, warehousing is increasingly perceived as a key place of value creation through automation (e.g., AS/RS), robotics and visibility ensured by IoT, which is illustrated by examples such as robotic picking and packing in Amazon or AI-supported route optimisation and smart warehousing solutions in DHL (Adesoga et al., 2024).

From an economic efficiency perspective, a review of current research shows that companies which implemented AI into supply chains recorded a reduction of logistics costs by approximately 15%, a reduction of inventory levels by 35%, and an increase of service levels (e.g., delivery accuracy, customer satisfaction) up to 65%. These data come from published analyses by McKinsey & Company. The results confirm the high potential of AI as a tool for increasing the efficiency and performance of logistics systems in real conditions of the global market (Asel, 2023).

2 METHODOLOGY

This article uses a secondary literature analysis and proposes a concept for future empirical research aimed at quantifying the impacts of AI on logistics in a European and global context. The methodology of the paper is based on secondary analysis of literature, while the empirical part draws on published case-based information on the implementation of digitalisation and AI in transport and logistics. The sources of data are contributions (case studies) published in the specialised journal, "Systémy logistiky", complemented by the Barometer mobility and fleets 2024.

Data derived from the published case studies were synthesised into a structured overview table (Table 1) that functions as a standardised analytical instrument for the systematic content analysis and coding of secondary sources on the applications of artificial intelligence in logistics. This procedure enables the consistent extraction, categorisation, and comparison of information across case studies and scholarly literature, thereby providing an empirically grounded basis for addressing the research question.

A methodological limitation of this approach lies in its dependence on the quality, completeness, and transparency of secondary sources, as well as the restricted ability to verify

original data or the methodological procedures employed by the authors. Despite these constraints, the chosen method offers a reproducible framework for transforming heterogeneous secondary evidence on the use of AI in transport and logistics. The subsequent coding process facilitates the identification of key thematic domains relevant to understanding the modes of AI implementation within the sector.

To ensure terminological consistency, translation accuracy, and formal linguistic refinement, AI-supported language tools—specifically Copilot, ChatGPT, and QuillBot—were employed in preparing the English version of the manuscript. These tools were used exclusively to support translation and grammatical proofreading.

3 RESULTS AND DISCUSSION

The results from the analysed cases indicate that the implementation of AI and related digital technologies in international transport and logistics is reflected in customer added value through several recurring mechanisms. These mechanisms differ depending on the sector, the type of logistics network, and the level of regulatory requirements. In an international environment, the need for interoperability, stable data infrastructure, and the ability to manage variability (time windows, congestion, process deviations) becomes more visible.

The individual areas of AI application in transport and logistics were developed on the basis of data derived from case studies published in the specialised journal *Systémy logistiky*, supplemented by findings from the Barometer Mobility and Fleet 2024, and based on qualitative indicators in the international logistics market according to Figure 1 reported in the literature review: customer service, speed, reliability, flexibility, safety, and availability. We have divided the indicators according to their meaning into the following areas:

Time reliability and adaptive response (reliability and flexibility)

The most visible value mechanism is linked with increasing the reliability and predictability of deliveries. In practice, this is mainly represented by planning and optimisation of routes and capacities based on historical as well as real-time data. Dodo Group uses AI for vehicle capacity planning, real-time evaluation of possible routes regarding traffic conditions and vehicle type, prediction of courier allocation, and automation of communication with customers (Čapek, 2025b). This logic is supported by demand planning through order forecasting, where Dodo Group forecasts customer orders two weeks ahead by combining historical and predictive data and reports an error rate below 10%, which supports more accurate capacity sizing and more stable fulfilment of service targets (Maťo, 2025a). At the level of daily operations, the benefits of optimisation are also shown by Geis SK, where route-planning efficiency is evaluated daily regarding vehicle utilisation (kg), number of shipments, and number of loading/unloading operations; efficient route planning is linked with minimising delays and increasing customer satisfaction (Maťo, 2025b). In a regulated environment, time reliability has a specific form: Phoenix focuses on digitalisation of the last mile and on planning and optimising delivery routes while emphasising GDP compliance and supervision of distribution of temperature-sensitive shipments (Břeň, 2025c). From the perspective of international logistics, these applications respond to the variability of the environment (traffic restrictions, time windows, service requirements) and support a shift from reactive handling to more proactive management.

Cost efficiency and process productivity (availability)

The second value mechanism is related to cost efficiency and process productivity, supported by automation and data-driven coordination. A basic precondition is the digitalisation and standardisation of information flows. EDI enables the exchange of orders, invoices, and delivery notes across industries, and the main reason for its implementation is the efficient processing of a large volume of orders (Maťo, 2023). Retail examples show EDI

implementation in Lidl Slovak Republic (since 2010) and the use of EDI orders and EDI invoices in Kaufland (Maťo, 2023), which supports interoperability and reduces administrative errors. In intralogistics, productivity and efficiency are strengthened through robotics and warehouse automation. Locus Robotics uses AI and real-time data within the LocusOne platform for dynamic task assignment, workflow management, and coordination of multiple robots according to the current situation, which increases throughput and flexibility of warehouse operations (Břeň, 2025a). EET Group uses Autostore in shipment processing (80% of shipments) with warehouse accuracy of 99.6% and centralises European warehousing in Copenhagen with distribution to 26 European countries; AI and digitalisation are linked with automated picking, packing, and labelling (Břeň, 2025b). In an international context, this type of centralisation and automation supports stable output quality across multiple markets and reduces cost per unit of performance through higher productivity.

Quality and compliance requirements (safety and speed)

The third value mechanism is most visible in sectors with high requirements for quality and regulatory compliance. In pharmaceutical logistics, customer added value is strongly linked with traceability and control. Phoenix focuses on digitalisation of the last mile, i.e., overview and supervision of transport to customers with emphasis on GDP compliance for prescription medicines, opioids, and temperature-sensitive shipments, while also planning and optimising delivery routes (Břeň, 2025c). In such an environment, AI and digitalisation do not create value mainly through speed but rather through reduction of deviations, stronger control, and the ability to demonstrate compliance within distribution processes. In a broader logistics context, the quality dimension is also supported through standardised data flows that reduce administrative errors and increase process stability (Maťo, 2023).

Transparency, visibility, and customer experience (customer service)

The fourth value mechanism is linked with transparency of processes and the quality of information for the customer, which is important in international flows for managing expectations and building trust in the service. In parcel logistics, this is visible in the use of chatbots and AI tools in customer communication and in managing contact points of the network. Zásilkovna uses AI in customer service through chatbots, in monitoring pick-up points, and in evaluating suitable locations, while DPD uses AI in administrative positions (Vampulová, 2025). Transparency and predictability are also supported by yard solutions: integration of YMS with security elements enables real-time vehicle tracking in the yard, online booking of time slots, licence plate recognition, detection of unauthorised movement, and control of loaded goods, while AI should improve the ability to predict situations before they occur (Čapek, 2025c). In an international environment, this type of visibility is important because it reduces operational bottlenecks and supports more stable fulfilment of time windows in subsequent transport links.

Based on individual examples of AI use, we can evaluate the use of AI in transport and logistics by arranging codes related to the area of AI implementation and then based on qualitative indicators in the logistics market listed on Fig. 1. Thus, Table 1 defines that AI is of considerable importance in terms of availability.

Tab. 1 The importance of AI in transport and logistics according to indicators

Code	Example	Indicator
Route optimisation	"route optimization explicitly considers traffic, weather and delivery time constraints"	reliability
Predictive planning	"forecasts customer orders two weeks ahead by combining historical and predictive data"	reliability

Code	Example	Indicator
Risk prediction	"AI serves as a tool for predicting risks and disruptions"	reliability
EDI and standards	"EDI enables the exchange of orders, invoices, and delivery notes across industries"	availability
Robotics coordination	"LocusOne platform for dynamic task assignment, workflow management, and coordination of multiple robots"	availability
Inventory optimization	"predictive and real-time inventory management with the aim to reduce availability disruptions and excess inventory"	availability
Warehouse automation	"Autostore in shipment processing"	availability
Real-time visibility	"integration of YMS with security elements enables real-time vehicle tracking in the yard"	customer service
Chatbots	"chatbots that provide order status updates and delivery time estimates"	customer service
CO2 optimisation	"optimised routes contribute to reducing fuel consumption and carbon emissions"	customer service
Compliance	"overview and supervision of transport to customers with emphasis on GDP compliance"	safety
Temperature monitoring	"control temperature in real time, reducing the risk of damage to goods"	safety

Source: Authors

Sector comparison and conditions for effective implementation

Sector differences are clearly visible in the analysed cases. In retail (Lidl, Kaufland), the focus is mainly on digitalisation of data flows (EDI) and efficient processing of a high volume of orders (Maťo, 2023). In e-commerce and parcel logistics (Zásilkovna, Dodo Group), a combination of customer communication (chatbots) and adaptive planning/optimisation (routing, capacities, courier allocation) dominates, which is directly linked with time reliability and customer information (Vampulová, 2025; Čapek, 2025b; Maťo, 2025a). In pharmaceutical logistics, the key dimension is quality and compliance (GDP) together with last-mile supervision (Břeň, 2025c). In intralogistics and warehousing (Locus Robotics, EET Group), the core value is productivity, accuracy, and throughput through automation and robotics (Břeň, 2025a; Břeň, 2025b). Finally, in the pet segment (ABC-ZOO), AI is also used in expansion to new markets through language and legislative aspects, which indicates that in international logistics, value is also created through the capability to quickly adapt processes and customer communication to local conditions (Maťo, 2025c).

At the same time, the benefits of AI depend on technological readiness and security conditions. In transport optimisation, risks are explicitly mentioned, mainly related to data security, infrastructure availability (e.g., 5G), and cyber-attacks (Čapek, 2025b). This is connected with the human resources dimension: logistics is moving towards a high-tech sector, but the human factor remains important, especially in crisis decision-making and in ensuring reliable use of AI in the organisation (Čapek, 2025a). An indicative view on AI diffusion is provided by a survey from the LinkedIn profile of the journal Systémy logistiky, where 70% of respondents use AI, 15% plan to use it, and 15% do not plan to include it in company processes; reported areas include automation and robotisation of warehouse operations, predictive demand analysis, and optimisation of transport routes (Čapek & Břeň, 2025). Although this result is not

a representative measurement, it supports the interpretation that AI is perceived in logistics as a relevant tool across several types of processes.

Based on secondary data based on a literature review and available case studies on the example of selected companies, we can answer the research question (How does the implementation of AI in international transport and logistics contribute to customer added value, and through which logistics processes are these effects most visible?) and cite the following as the main benefits of implementing AI in logistics, such as: reduction of distribution costs through route optimisation and automation of order processing, shortening of delivery times, reduction of errors and complaints thanks to temperature-monitoring sensors, shipment tracing and address verification using AI, increasing customer loyalty thanks to accurate shipment status information, predictive notifications and personalisation options, reducing the CO₂ footprint – optimised routes contribute to reducing fuel consumption and carbon emissions, increasing transparency in the chain – the use of blockchain together with AI ensures shipment tracking, verification of the authenticity of goods and fraud prevention. If we focus on sectoral differences, we can define the benefits of AI as follows: (Marr, 2018; Baryannis, 2018; Ahmad, 2024; Robert, 2024; Sifted Team, 2024).

- In cold chain logistics, used mainly in the pharmaceutical and food industries, AI is deployed to control temperature in real time, reducing the risk of damage to goods.
- In the automotive sector, AI is used to manage Just-In-Time inventory and monitor component quality.
- In the consumer industry, retail, wholesale, it improves demand prediction and reduces waste.

The results obtained based on secondary data clearly confirm that artificial intelligence (AI) significantly affects the performance of logistics processes and the quality of supply chains. In line with value chain theory (Porter, 1998), AI can be considered a key element in reducing operational costs, increasing predictability, and building customer loyalty. Empirical evidence shows that AI is the biggest contributor in the areas of decision automation, predictive planning, inventory management, and distribution operations. Compared to traditional logistics models, it allows for more adaptive and accurate responses to changes in demand, external fluctuations (e.g., during the COVID-19 pandemic) or climatic conditions. These benefits are consistent with a study by Ivanov et al. (2019), which points to AI's ability to increase supply chain resilience through real-time risk analysis. In terms of competitive advantage, AI shifts logistics from a reactive model to proactive management. This is particularly important in e-commerce, healthcare and food, where high demands are placed on speed, reliability and transparency. In this context, the findings of Furdová & Hansenová (2013) can be confirmed that logistics is not only an operative but also a marketing and value-creating tool. Despite the positive results, however, there are fundamental challenges such as the high investment intensity of implementing AI systems (e.g., sensor networks, predictive platforms), dependence on data – its quality, volume and integration between partners in the chain, the lack of a qualified workforce capable of interpreting and setting up AI systems, and ethical and legal issues related to decision automation, privacy protection and cybersecurity. In addition, sectoral differences must be considered. AI has different impacts in the automotive, healthcare or fashion industries. The subject of further research is to supplement the secondary data with primary data through the primary survey and subsequently to compare the results before and after the introduction of AI in logistics in selected companies with the logistics performance index in the countries where the companies operate.

CONCLUSION

Artificial intelligence represents a fundamental shift in the understanding and performance of logistics systems. It is not only a means to optimise operations but also a strategic source of competitive advantage. In an environment of globally interconnected supply chains, where there is pressure for speed, accuracy, and sustainability, AI is becoming an essential tool. However, risks and constraints such as high upfront costs, dependence on quality data, regulatory uncertainty and the need for skilled workers also need to be considered. Future research should examine the impact of AI on performance in various sectors, as well as the environmental and societal implications of this technological transformation.

Limitations. The interpretation of the results is limited by the fact that the article is based on secondary sources and case-based information, and therefore it does not provide a direct quantitative verification of AI effects on a representative sample of companies. In addition, when implementing AI, it is necessary to consider risks and constraints, mainly high investment intensity, dependence on data quality and availability, regulatory uncertainty, the need for a qualified workforce, and issues related to privacy protection and cybersecurity.

ACKNOWLEDGEMENT

This paper is a part of the research project VEGA No. 1/0102/24 Positions and perspectives of mutual trade and economic cooperation of the Visegrad Group countries under the influence of geopolitical changes in the world economy, and VEGA No. 1/0254/25 Artificial Intelligence and FDI-invested Business Service Centres: Selected Macroeconomic and Corporate Aspects.

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