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Integrating Artificial Intelligence into Digital Logistics Coordination: a Model Based on the Viber Ecosystem in the United States

Abstract

Various models of process coordination are used in logistics, including organisational coordination based on the enterprise and focused on internal business processes, project coordination focused on achieving goals, and coordination of systems to achieve the common goals of various participants in logistics activities. In the context of digitalisation, researching digital coordination in logistics is becoming increasingly relevant in order to understand the key advantages, disadvantages and complexities of the different co-operation models. This article studies the integration of artificial intelligence into digital logistics coordination, including a model based on the US Viber ecosystem. The article highlights trends in the US logistics industry, focusing on transportation and warehousing efficiency. It discusses the characteristics of the domestic logistics services market, focusing on co-operation and coordination. The decline in the efficiency of the logistics sector between 2018 and 2023 was due to infrastructure problems, such as a reduction in the quality of international transport and issues with timely delivery. The domestic logistics services market is characterised by a growing reliance on "third-party" logistics amid high demand for domestic deliveries and an increase in international shipments. The outsourcing of warehousing and storage services for manufacturers' goods is becoming increasingly important and is contributing to the development of "multilateral" logistics. Under these conditions, coordination and information exchange in logistics will become more important, necessitating the development of digital communication channels to enable the rapid transfer of information between the various parties involved in logistics processes. One area of digitalisation in logistics is the integration of artificial intelligence (AI) into processes, contributing to changes in coordination and connections within the industry. AI technologies improve logistics functions by enabling automated demand and supply forecasting, optimising delivery routes, reducing operating costs and automating warehouse processes to reduce order processing times. This paper examines the advantages and disadvantages of digital coordination in logistics using a model based on the Viber ecosystem to establish informal communication. The Viber ecosystem-based communication model is proposed as part of the digital coordination process in logistics. It is a practical approach to the remote synchronisation of simple actions and operations, which are important for the continuity of complex processes and actions.

DOI: <https://doi.org/10.30525/2500-946X/2026-1-3>**1 Introduction**

Over the past few decades, the global economy has seen an increase in multimodal freight and passenger transport volumes. This has contributed to the development of integrated logistics management and new models for coordinating, harmonising and consolidating information and data. Information symmetry is an important factor in the effective management of material flows in the global economy. In supply chains, coordination is defined as synchronising the activities of companies of

different types and sizes based on agreements. This type of interaction between companies is based on partnership and allows issues of inventory to be solved and information to be shared in order to harmonise logistics operations (Kotzab et al., 2019). New coordination models are based on an intellectual foundation that ensures the speed and uninterrupted delivery of operations.

In light of the emergence of novel coordination and co-operation models in logistics, this article aims to examine the practical implications of integrating artificial intelligence technologies to enhance digital

Keywords

logistics, coordination in logistics, artificial intelligence, coordination models, transport industry, environmental efficiency, sustainable logistics

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coordination in logistics, with a particular focus on the Viber-based relationship model in the United States.

2 Literature Review

The concept of coordination in logistics began to develop during the 1980s and 1990s. It covered issues and questions relating to the exchange of information for coordinating data between the various participants in organisational processes. This concept evolved as logistics flow design processes expanded beyond organisational boundaries, necessitating coordination of internal company processes with various stages of the supply chain involving external manufacturers and suppliers of goods to end users (Kotzab et al., 2019). Conventional methods of providing one-time logistics services have undergone a transition towards long-term collaborations between logistics operators and manufacturers (Kotzab et al., 2019). In this context, various models of logistics flow coordination began to emerge, which are regarded as a tool for coordinating the actions of logistics participants to achieve common goals (Kotzab et al., 2019). Information exchange at both horizontal and vertical levels is becoming an integral part of coordination and co-operation in logistics. The advent of technology has led to the emergence of the concept of "digital coordination".

Until the 2010s, coordination was viewed from a process-based approach as a targeted process of coordinating the interdependent actions of supply chain participants. This approach involves synchronising logistics business processes to improve basic and extended types of logistics service outsourcing. Synchronised actions can increase labour productivity in the logistics industry (Liu et al., 2015). More recently, in the 2010s, scientists proposed the concept of logistics coordination as a means of improving the efficiency of transportation processes and reducing the use of resources in service provision (Hedborg Bengtsson, 2019). The work of Kmiecik (2022b) offers a different approach to interpreting this scientific category, defining 'logistics coordination' as the planning of goods transportation. At the macro level, the study (Yan et al., 2021) considers coordination within the concept of high-quality logistics development. The authors define coordination as a means of ensuring a high level of service in order to achieve logistical advantages at the national level, provided that developed capacities, an industrial sector and an environmental protection system are in place. In addition to innovation, sustainability, openness, and other specific features of logistics, coordination is considered one of the characteristics of high-quality logistics development (Yan et al., 2021). More specifically, Susanna Hedborg Bengtsson defines different models of coordinated

logistics as instruments of efficiency and identifies the differences between company-based, project-based and system-based models. Within a company, logistics is considered a support function, and internal business processes focus on logistics coordination models that reduce operating costs. Project-based models are developed to implement a specific project, regardless of implementation complexity, and can be used for other projects thanks to experience gained from distributing tasks and budgets for logistics operations focused on project goals. In addition, coordinating logistics processes within the framework of project implementation ensures the generation of additional income by third-party logistics providers (3PLs), which design, manage and control the processes of other companies. Empirical research (Kmiecik, 2022b) shows that a centralised network involving 3PLs is one of the most effective logistics coordination models, enabling the creation of value-added processes. System-based models involve coordinating many participants in different projects that are focused on achieving common goals rather than generating revenue or reducing operating costs (see Table 1).

In the context of digitalisation, the integration of technology in the logistics industry has led to changes in the way coordination and information exchange are carried out. The concept of digital coordination in logistics has emerged, meaning the use of technologies for the digital exchange of data and the remote coordination of actions between participants in logistics processes. Digitised logistics data allows for the optimisation of goods transportation routes, reducing operating costs. Digital coordination can be viewed as an additional function of the transport and warehousing sector. Based on digital technologies and solutions, it improves the synchronisation of logistics activities. In logistics systems with numerous formal and informal links, digital coordination facilitates informal communication between participants within the confines of their legal agreements.

3 Summary of the Main Provisions

The US logistics industry is considered one of the most efficient in the world in terms of customs procedure speed, international transport, transport tracking, delivery timeliness, logistics staff competence and infrastructure development (World Bank Group, n.d.). However, in 2023, US logistics efficiency deteriorated compared to 2018 due to infrastructure deterioration, a decline in the quality of international transport and delays in deliveries (see Table 2). In 2023, business logistics costs in the US are estimated to have amounted to 2.3 trillion USD (8.7% of GDP), while foreign direct investment in the industry and transportation sector totalled

TABLE 1 Logistics coordination models (summarised by the author)

Type of logistics coordination model	Feature	Objectives	Orientation
Between organisational models operating within the enterprise	Built within the organisation by engaging external logistics firms, logistics as a support function	Improving efficiency and increasing revenue within the company by engaging contractors and reducing logistics costs	Focus on internal business processes
Project models	Initiated for a specific project characterised by its high level of complexity due to the involvement of various co-operating organisations	Coordination of actions of organisations within the project to achieve common goals	Focus on project goals, removal of transportation obstacles
System models	Coordination takes place in an open system between many participants in different projects.	Coordination is used as a tool for co-operation and sustainability	Focus on the common goals of many logistics participants

TABLE 2 US Logistics Performance Index, 2016-2023

Subindex	2016	2018	2023
Assessment of the effectiveness of customs procedures	3,75	3,78	3,7
Assessment of infrastructure development effectiveness	4,15	4,05	3,9
Assessment of logistics competencies and quality	4,01	3,9	3,9
Valuation of international shipments	3,65	3,4	3,4
Timeliness assessment	4,25	3,8	3,8
Tracking assessment	4,20	4,2	4,2

155.4 billion USD (Official Website of the International Trade Administration, n.d.).

In the US, the logistics services subsector mainly focuses on outsourcing logistics as a support function provided by third-party logistics companies. This includes fleet management, inbound and outbound transportation management, materials handling, order fulfilment, logistics network design, warehousing, inventory management, third-party logistics management, and supply and demand planning, as well as other support services. The third-party logistics sector in the US has grown rapidly since 2010, with the transport of both domestic and international freight most often being outsourced to third parties. The growth of e-commerce has led to an increase in demand for warehouse storage outsourcing services and an increase in the number of companies in this sector (Statista, n.d.). Logistics services are used at all levels of management in the US economy, particularly for planning and executing the transportation of goods. This emphasises the importance of logistics coordination and information exchange as key logistics functions. As of 2022, 55,045 companies were providing logistics services in the US. Foreign companies employed 114,200 people in the US logistics industry in 2022. By mid-2024, this figure had increased to 854 thousand (Official Website of the International Trade Administration, n.d.).

The US Bureau of Transportation Statistics is responsible for managing data within a programme designed to optimise logistics and freight transport at a national level. The programme was established through a public-private partnership between the

government and industry, with the aim of creating data sets and facilitating the exchange of information about the country's supply chain. The programme has been in effect since March 2022, responding to disruptions in the country's logistics by forecasting future demand based on current capacity and throughput indicators for the sector. The programme collects data and information from cargo owners, ports, railways, terminals, maritime carriers and other stakeholders, facilitating information exchange and coordination of actions across the supply chain at a macro level (Bureau of Transportation Statistics, n.d.).

In the context of digital logistics coordination, a model based on the Viber ecosystem is worth highlighting. This model uses Viber messenger capabilities as a unified means of communication between supply chain participants, facilitating the transfer of information through established channels, geolocation and payment information. This integrated approach to logistics management enables the combination of communication processes for the transfer of logistics information within the framework of coordinating and harmonising logistics activities, as well as the analysis of information using artificial intelligence technologies and the transfer of information to TMS, WMS, ERP and IoT systems. The main idea is to facilitate the simple and informal transfer of information within a formal logistics coordination structure. This communication model, which is based on the Viber ecosystem, facilitates the expeditious transfer of information and the prompt responses to requests. It also ensures the rapid transfer and recording of unstructured information,

TABLE 3 Factors influencing the development of digital logistics coordination in the United States (summarised by the author based on (Official Website of the International Trade Administration, n.d.))

Demand factors	Supply factors
Demand for transportation, fleet, inventory, order processing, and warehousing services, and other support services	Offering fast, urgent, comprehensive express delivery services, particularly for small and medium-sized businesses as a result of the growth of e-commerce
Growing demand for large-scale freight transportation over long distances	Offer of oversized cargo transportation management based on available assets
Growth in demand for maritime transport and shipping as a result of trade liberalisation	Proposal for multimodal transport management based on available assets
High demand for road freight transport within the country	Proposal for managing road freight transport, routes, and planning transport supply and demand based on available assets

TABLE 4 Integration of artificial intelligence into digital logistics coordination in the United States (summarised by the author)

Main functions	Characteristics
Demand and supply forecasting management	Artificial intelligence technologies analyse historical data to determine future demand and enable the creation of logistics service offerings based on regional throughput indicators and the current capacity of third-party logistics companies.
Route optimisation in logistics	Artificial intelligence technologies can be used to create optimal routes that take traffic and weather conditions into account, thereby reducing logistics costs.
Warehouse management	Artificial intelligence technologies are used to automate warehouse processes, such as movement and inventory, using image recognition systems. This optimises product placement, reducing manual labour, errors and order processing time.

all without the need for additional investment in enterprise software. However, this communication model has several drawbacks, including cybersecurity and confidentiality issues, overloading of communication channels with unstructured information, the complexity of transferring and collecting high-quality structured information, low prevalence of the communication model, and its inappropriateness for coordinating complex logistics activities and processes, as well as formal communication and information exchange (see Table 5).

A process-based approach can be used to view the communication model based on the Viber ecosystem as a component of the digital coordination process in logistics. This approach focuses on practical logistics activities, where establishing remote synchronisation of simple actions and operations is important for ensuring the continuity of complex business processes. In order to implement the communication model based on the Viber ecosystem in practice, it is necessary to take into account the following local characteristics of logistics activities: the prevalence of technology

TABLE 5 Main advantages and disadvantages of digital coordination in logistics using a model based on the Viber ecosystem to establish informal communication

Key benefits	Main disadvantages
The operational transfer of information is essential for the coordination of even the simplest logistics activities.	Cybersecurity and data privacy issues prevent confidential information from being transmitted through the poorly secured Viber ecosystem.
Quick responses to immediate requests for information, such as payment confirmation, geolocation and goods arriving at the warehouse.	The overflow of unstructured information on messaging platforms and in ecosystems.
The fast transfer and recording of unstructured information in enterprise information systems (TMS, WMS and ERP) streamlines logistics processes.	The complexity of transmitting and collecting high-quality structured information.
There are no additional costs involved in implementing a communication and coordination model based on the Viber ecosystem.	There is a low prevalence of communication and coordination models based on the Viber ecosystem.
The communication and coordination model is easily scalable based on the Viber ecosystem.	It is not suitable for coordinating complex logistics activities and processes, or for formal communication and information exchange.

use in individual US states; data security issues when transmitting information via Viber; and the ability to quickly transfer data to other enterprise information systems.

4 Discussion

The Viber-based communication model in logistics should be considered part of digital coordination processes, enabling participants to quickly transfer necessary information. Various studies empirically demonstrate that logistics structures in which digital technology-based network connections are widespread enable the expansion of existing opportunities for social communication development and improvement of information exchange methods (Shcherbakov & Silkina, 2021). A communication network based on the Viber ecosystem enables the swift and efficient transfer of information, helping organisations to solve urgent business problems and coordinate basic activities. This ensures the continuity of complex business processes, optimising the supply chain (Meng, 2021). The present study puts forward the proposition of considering the model based on the Viber ecosystem as a component of the digital coordination model. In this model, a network of connections and a community of various participants in the logistics process are created. This model facilitates the transmission of unstructured information through digital communication channels, which is crucial for addressing information gaps. In accordance with the model of coordination between organisations (Hedborg Bengtsson, 2019), the model based on the Viber ecosystem facilitates the establishment of a communication channel for data exchange, thereby addressing the information needs of participants. The Viber ecosystem-based model is particularly important in emergencies or crises (Meng, 2021), when different parties need to exchange information instantly in order to take quick measures to counteract the negative consequences of such events. Other studies demonstrate the importance

of coordination mechanisms in logistics that are based on established network connections (Kmiecik, 2022a). One such coordination mechanism is considered to be the coordination of actions using a model based on the Viber ecosystem for information exchange. The identification of the range of issues that may arise when utilising a model based on the Viber ecosystem in the structure of each coordination model allows for the proposition of methodologies to resolve them, with the objective of enhancing information exchange and communication (see Table 6).

In the inter-organisational logistics coordination model, communicating with various subcontractors can be difficult, but using the Viber ecosystem improves communication with subcontractors and internal processes. Project models require rapid information transfer, so creating a Viber ecosystem for each project enables rapid information exchange and access to updates on project progress. In system coordination models with many participants, the focus is on information and communication. Problems often arise from the lack of communication between different participants. In this case, creating a Viber ecosystem is important for resolving issues relating to the instant transfer of information for each project, as well as facilitating fast communication with different project participants.

5 Conclusions

The purpose of the article was to study the integration of artificial intelligence into digital logistics coordination, including a model based on the US Viber ecosystem. A distinctive feature of the US logistics industry is the decline in logistics efficiency amid deteriorating transport infrastructure, the need to invest in various types of assets, and a decline in the quality of international transport and the timeliness of deliveries. The US domestic logistics services market demonstrated growth between 2010 and 2023, driven by the expansion of e-commerce,

TABLE 6 Practical application of the Viber ecosystem in various logistics coordination models (summarised by the author)

Type of logistics coordination model	Main problems (shortcomings)	Practical application of the Viber ecosystem
Between organisational models operating within the enterprise	The complexity of coordinating with various subcontractors.	Improving communication processes with subcontractors and internal communication.
Project models	The need for the project to transfer information quickly.	The ability to quickly exchange and access new information about project progress through the Viber ecosystem.
System models	Focus on information and communication. There are problems with communication between participants in different projects.	The creation of a Viber ecosystem addresses the issue of transferring information instantly for each project. It enables quick communication with various project participants.

the increasing demand for expeditious delivery, and the demand for freight and associated transport services. Consequently, the third-party logistics sector is experiencing dynamic growth due to the increasing demand for the domestic and international transportation of goods, as well as for outsourcing warehouse storage services. In such conditions, the coordination and information exchange functions of logistics are becoming increasingly important. Artificial intelligence enables the development of digital coordination to improve the provision

of logistics services by automating demand and supply forecasting management, route optimisation processes and warehouse management processes. The advantages and disadvantages of digital coordination in logistics are examined in detail using a Viber-based ecosystem model for establishing informal communication. This model is proposed as a practical approach to the remote synchronisation of simple actions and operations in logistics, which are important for the continuity of complex actions and processes, and as part of the digital coordination process.

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