LOGI – Scientific Journal on Transport and Logistics
Vol. 16 No. 1 2025 DOI: 10.2478/logi-2025-0002

Overview of Current Research on Artificial Intelligence in Logistics

Patrik Boršoš[1*] and Gabriel Koman[1]

[1]*University of Žilina, Faculty of Management Science and Informatics, Department of Management Theories, Univerzitná 8215/1, 010 26 Žilina, Slovak Republic; Email: patrik.borsos@fri.uniza.sk, gabriel.koman@fri.uniza.sk*

***Corresponding Author:** Patrik Boršoš

Received: 9 December 2024; Revised: 17 December 2024; Accepted: 19 December 2024;
Published: 20 January 2025

Abstract: This article aims to provide an overview of the current state of research on artificial intelligence in logistics, focusing on identifying key thematic areas addressed by the authors in this field. The article analyzes specific thematic areas that are the subject of individual studies dealing with this issue. Various methodological approaches were used in the analysis, including bibliometric analysis aimed at mapping the development of research and identifying key publications in the field of artificial intelligence in logistics. The PRISMA method was applied to select relevant sources, while qualitative content analysis was used for an in-depth evaluation of the studies' content and for identifying the most frequently covered theoretical areas. The results show that research on artificial intelligence in logistics focuses on diverse thematic areas, such as digital transformation, sustainability and environmental aspects, process optimization within supply chains, and human-machine interaction. This article provides valuable insights for experts and practitioners in the field of logistics and serves as a foundation for further research in this dynamically evolving area.

Keywords: Logistics, supply chain, artificial intelligence, Industry 4.0, sustainability

1. Introduction

Artificial Intelligence (AI) currently represents one of the most significant topics within professional discourse, not only in the business environment but also in the academic sphere. In business contexts, AI is increasingly perceived as a strategic tool for process efficiency [1], optimization of decision-making mechanisms [2], and support for innovation [3]. The implementation of AI enables the automation of complex and repetitive tasks, the processing of large volumes of data, and the creation of personalized solutions, thereby providing organizations with competitive advantages in an increasingly dynamic environment. From the perspective of academic research, AI has become a key subject of investigation [4,5]. Researchers not only explore the possibilities for its further

development [6] but also the risks it poses [7], such as its impact on the labor market and issues related to the security and trustworthiness of these systems. Scholarly discussions often analyze the potential of AI across various sectors, including healthcare [8], finance [9], human resources [10,11], and education [12,13], with particular attention given to the extent to which AI can complement or replace human labor.

One area where the replacement of human labor is becoming an increasingly realistic possibility is logistics [14]. Through AI, logistics companies can significantly enhance their operations by automating warehousing processes [15], implementing robotic systems for sorting and handling goods [16,17], and utilizing intelligent algorithms for supply chain optimization [18]. AI technologies such as machine learning and predictive analytics facilitate better planning of transportation [19] and inventory management [20], leading to reduced costs and increased efficiency. The replacement of manual labor in warehouses and distribution centers is particularly evident in the deployment of autonomous vehicles [20] and drones [21] for deliveries, thereby reducing the need for human drivers and operators. This shift leads to significant changes in the labor market, as AI not only complements but, in many cases, replaces traditional job roles, posing new challenges related to workforce adaptation to these technologies.

From an academic perspective, it is crucial to examine the specific impacts of AI utilization in logistics on job structures and the efficiency of logistical processes. Research should analyze the extent to which AI can replace traditional manual tasks such as warehouse management, transportation of goods, or deliveries, and what implications this will have for employment in the sector. Simultaneously, it is essential to investigate what new job positions may arise in relation to the management and maintenance of intelligent systems and technologies in logistics. This article aims to provide an overview of the current state of research on artificial intelligence in logistics. It analyzes the existing research landscape and identifies key research questions and areas of interest among experts in this field. The focus is on specific aspects of AI being studied, including its impacts on the efficiency of logistical processes, automation of work tasks, and changes in the labor market. The article also evaluates the methodologies and approaches used by authors in analyzing these questions, thereby contributing to a better understanding of the development and implementation of AI in logistics.

2. Methodology

This article aims to provide an overview of the current state of research in the field of AI in logistics, focusing on identifying the main thematic areas of interest to academic researchers in this domain. To achieve this objective, the following two research questions have been established:

Q1: How can research focused on the utilization of artificial intelligence in logistics be characterized in relation to the business environment?

Q2: What are the main topics addressed by authors in their publications concerning the use of artificial intelligence in logistics?

In relation to the research question Q1, a bibliometric analysis method was applied, focusing on several key aspects. The first aspect is the quantification of publications, which provides an overview of the number of articles addressing the utilization of AI in the field of logistics. Publications were searched in the Web of Science (WoS) database, considering the publication year and keywords. The time frame was set from 2011 to 2023. The choice of 2011 is justified by the ongoing phase of the industrial revolution, characterized by rapid technological development, digital transformation, and the increasing use of AI across various sectors.

The keywords selected were "artificial intelligence," "logistics," and "business." These terms were chosen based on their relevance and connection to the subject of the study. "Artificial intelligence" reflects the current interest in technologies that have the potential to transform processes in various fields, including logistics. "Logistics" is a key sector where the application of AI is becoming increasingly significant, particularly in optimizing supply chains and enhancing operational efficiency. "Business" represents the context in which the impacts of technologies on economic performance and the competitiveness of organizations are analyzed. Together, these parameters provide a comprehensive view of the current state and trends in the utilization of AI in logistics. A total of 507 publications were retrieved, which were subsequently subjected to keyword analysis. The software Vosviewer was utilized for these analyses, enabling the visualization and analysis of bibliometric data.

To address the second research question Q2, a qualitative content analysis method was utilized, focusing on identifying the main research areas within logistics. A key parameter of this analysis was the focus of the research, which examined the topics and issues that are most frequently the subject of scientific investigation in relation to the utilization of AI in logistics. This method allowed for a detailed analysis of the content of publications, revealing trends and dominant areas of interest among researchers.

The selection of articles followed the same criteria as for the first research question—searching in the WoS database, the time frame of 2011-2023, and the keywords "artificial intelligence," "logistics," and "business." A total of 507 publications were retrieved. From this pool, those that were relevant to research question Q2 were selected based on the PRISMA methodology, ensuring they directly addressed the use of AI in logistics. The PRISMA methodology allows for the verification of the relevance of individual publications in three stages: 1) after reading the title, 2) after reading the abstract, and 3) after reading the full text.

3. Results

The research results indicate that researchers have shown an increased interest in the use of AI in business sectors since 2016, see figure 1. This surge in interest can be attributed to significant events and milestones that preceded this period:

- 2011–2014: Voice assistants such as Siri, Cortana, and Google Now began to emerge on the market, capable of recognizing voice commands and responding to queries. These technologies opened new possibilities for interaction with digital devices and the provision of personalized services [22,23].
- 2011: IBM introduced the Watson system, which gained fame after its participation in the popular quiz show Jeopardy!, where it defeated two previous champions. This success demonstrated AI's ability to process and analyze vast amounts of information in real-time [24].
- 2014: This year saw the emergence of a chatbot named Eugene Goostman, designed to simulate a 13-year-old boy. This chatbot demonstrated the ability to communicate convincingly and deceive some evaluators in the Turing test, sparking discussions about advancements in AI [25].

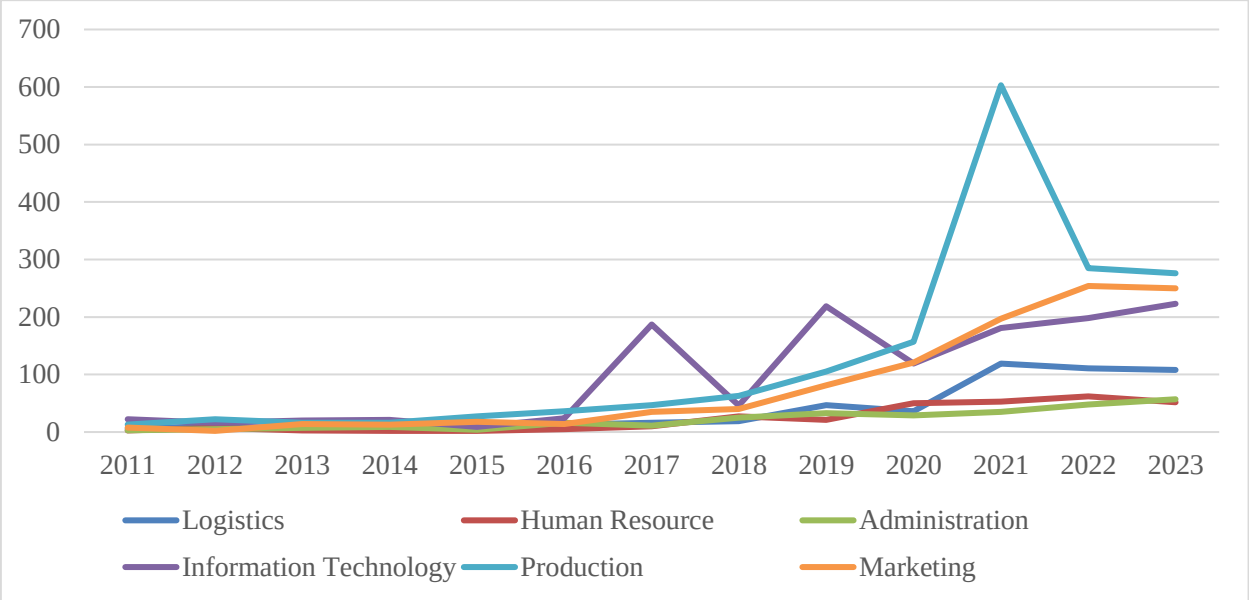

Fig. 1 The Development of the Number of Publications Focused on Artificial Intelligence in Relation to Specific Business Areas. Source: authors

These milestones contributed to strengthening public and professional interest in AI and its applications, creating favorable conditions for more intensive research and application of AI across various business sectors. The following figure 2 illustrates the development of the number of publications focused on AI and specific business areas, including logistics.

As can be seen, the most significant increase in the number of publications focused on AI in business areas occurred in 2020. This surge can be attributed to major technological advancements, such as the introduction of advanced language models like GPT-3 from OpenAI [26], which enabled

significant improvements in natural language processing, and BERT from Google [27], which revolutionized the understanding of text context. These technologies opened new possibilities for AI applications in businesses, including data analysis, process automation, and enhanced customer service.

In the field of logistics, the largest increase in the number of publications was observed in 2020, followed by a stable maintenance of this number over the next three years. Despite this growth, logistics lags behind other business areas such as manufacturing, marketing, and information technology, which are at the forefront of research. These sectors have garnered more significant interest from researchers, particularly due to their key importance in the digitalization and optimization of business processes. Conversely, researchers pay less attention to the application of AI in human resources and administration compared to logistics.

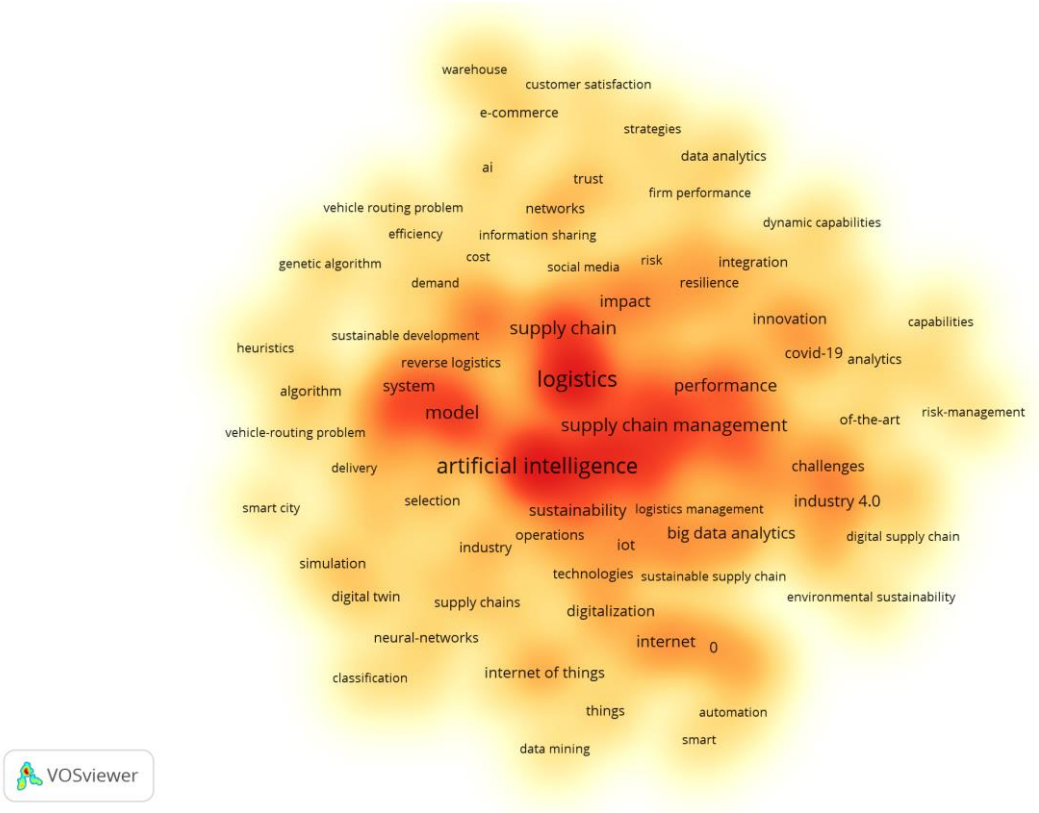

Fig. 2 The Development of the Number of Publications Focused on Artificial Intelligence in Relation to Specific Business Areas. Source: authors

When we focus exclusively on the field of logistics, the most frequently occurring keywords in these publications include "supply chain management," "performance," "model," and "system." These terms reflect the main focus of research on optimizing supply chain management, assessing the performance of logistics processes, creating models for simulation and prediction, and implementing systemic solutions. Researchers aim to identify ways to leverage AI to improve the efficiency and reliability of logistics operations within the business environment. In relation to AI, several other key

technologies are often mentioned in the field of logistics, such as Big Data, digital twins, the Internet of Things (IoT), data mining, and neural networks. These technologies play a crucial role in the collection, processing, and analysis of large volumes of data necessary for the functioning of AI systems. Big Data provides data for prediction and optimization, digital twins create accurate digital replicas of logistical processes for simulation, the Internet of Things enables monitoring and data collection from physical devices, data mining uncovers hidden patterns within the data, and neural networks facilitate advanced modeling and learning from complex data structures, thereby enhancing the accuracy of predictions and decision-making processes.

Furthermore, publications focused on logistics and AI frequently include keywords such as sustainability, smart cities, digitalization, and innovation. These terms reflect current trends in corporate and logistical practices, where there is an emphasis on the efficient use of resources, the implementation of intelligent solutions in urban areas, the digital transformation of processes, and the introduction of innovative technologies. These topics indicate that research in the field of logistics is increasingly focusing not only on performance optimization but also on broader social and environmental goals. For the qualitative content analysis employed to address the second research question, it was necessary to identify publications that directly related to the application of AI in logistics. Based on the PRISMA methodology (further detailed in the methodological section), an initial total of 507 publications were identified. In the first phase, after reviewing the titles of the articles, 236 publications were selected, while 271 publications were excluded because their titles did not directly pertain to the issue of AI application in logistics. In the second phase, after reading the abstracts, an additional 71 publications were excluded. Although these articles mentioned AI or logistics, their main theme did not relate to the application of AI in logistical processes. This left 165 publications for further analysis.

In the final phase, following a quick screening of the full texts, another 83 publications were excluded. These publications did not primarily discuss applications of AI in logistics but addressed other connections with AI or logistics, and thus were not relevant to answering the second research question. The final count of publications included in the detailed analysis was 82. These 82 publications were subsequently subjected to qualitative content analysis, with the researcher focusing on specific thematic areas of research for each publication. A total of 29 thematic research areas were identified, which are displayed in the following table. Within some publications, researchers focused on multiple thematic areas, either comparing or combining them. Each of these areas was assessed separately to ensure accuracy and clarity in the categorization of the research.

4. Discussion and Conclusion

The most frequently researched topic in logistics is digitalization. In logistics, digital data processing enables more efficient management of supply chains, ranging from demand forecasting to the automation of warehouse and transportation processes [28]. Digital technologies enhance communication between individual supply chain entities, which leads to reduced error rates and increased flexibility in solving real-time issues [29]. Digitalization also supports the use of technologies such as blockchain, big data, and AI, significantly contributing to the optimization of logistics. In the context of process digitalization in logistics, AI is increasingly coming to the forefront, playing a key role in automating, optimizing, and predicting logistical operations. However, the introduction of AI in this sector also brings new challenges and raises questions regarding human-machine collaboration. Some experts e.g., [30,31], fundamentally criticize such collaboration, highlighting risks related to job loss, excessive dependence on technologies, and ethical concerns regarding decision-making that is left to algorithms without sufficient human oversight. On the other hand, some experts e.g., [32,33] argue that the implementation of artificial intelligence and other modern information technologies in cooperation with humans can significantly increase process efficiency, improve decision-making mechanisms, and enable faster and more accurate solutions to complex logistical tasks. This approach can also free up human capacities for more creative and strategic tasks, leading to greater innovation and flexibility in supply chain management. At the same time, it can reduce the workload of employees, allowing them to focus on more complex, strategic tasks or spend more leisure time, thus improving not only productivity but also job satisfaction and overall quality of life. The question remains whether people will choose to use technologies for personal gain or general prosperity in the future.

Interest in general prosperity is one of the main aspects of another key theme—sustainability. Companies are increasingly facing pressure to reduce their environmental footprint and use resources more efficiently. Sustainable logistics includes solutions such as optimizing routes to reduce CO2 emissions, utilizing renewable energy sources, and adopting circular economy principles, which lead to waste minimization and efficient resource management [34]. One of the main issues that authors frequently discuss when addressing sustainability in logistics is the increasing complexity of the entire supply chain. With rising demands for rapid delivery [35,36] and reducing environmental impacts [37], companies face challenges in implementing sustainable solutions that do not compromise efficiency and economic performance. This paradox [38] creates the need for innovations in logistics, where a constant balance between costs and sustainability is required. The authors also highlight difficulties associated with the implementation of sustainable technologies [39], which often necessitate collaboration between multiple actors across the supply chain and investments in new

infrastructures, something not easily attainable for all organizations. These issues manifest not only in enterprises [40] but also in public administrations at the state and municipal levels [41,42].

In addition to these main thematic areas, the authors also addressed the global COVID-19 pandemic in their publications, which had a significant impact on all business sectors worldwide, including logistics and other fields [43]. The pandemic led to disruptions in supply chains, shifts in demand, and the need to adapt to new conditions and challenges. Researchers analyzed how logistics processes and technologies had to adjust to these changes and identified key strategies to ensure resilience and efficiency during the crisis. These analyses contribute to a better understanding of how external factors, such as a global pandemic, can influence the functioning and development of logistics and what measures need to be implemented to manage similar situations in the future. Based on the aforementioned facts, it is evident that the use of AI in logistics represents a promising research area for the future, with the potential to significantly impact not only the efficiency and productivity of logistics operations but also the way these processes are organized and managed. With the increasing complexity of supply chains and growing demands for sustainability, new opportunities are emerging for AI applications that can enhance predictive models, optimize processes, and enable intelligent real-time decision-making. These factors suggest that research on AI in logistics will continue to be relevant and crucial for adaptation and innovation in this dynamically evolving sector.

Acknowledgments

"This publication was realized with support of Operational Program Integrated Infrastructure 2014 - 2020 of the project: Intelligent operating and processing systems for UAVs, code ITMS 313011V422, co-financed by the European Regional Development Fund".

References

[1] Kovshova, T., Trifonov, P. & Ramirez-Asis, E. (2023). Improving the efficiency of intellectualisation processes in enterprise management systems. Systems 11, 266. DOI: 10.3390/systems11060266.

[2] Fragapane, G., Ivanov, D., Peron, M., Sgarbossa, F. & Strandhagen, J.O. (2022). Increasing flexibility and productivity in Industry 4.0 production networks with autonomous mobile robots and smart intralogistics. Ann. Oper. Res. 308, 125–143. DOI: 10.1007/s10479-020-03526-7.

[3] Trocin, C., Hovland, I.V., Mikalef, P. & Dremel, C. (2021). How Artificial Intelligence affords digital innovation: A cross-case analysis of Scandinavian companies. Technol. Forecast. Soc. Change 173, 121081. DOI: 10.1016/j.techfore.2021.121081.

[4] Ahmed, S. (2020). Environmental sustainability coding techniques for cloud computing. Int. J. Adv. Comput. Sci. Appl. 11, 231–237.

[5] Langer, M. & Landers, R.N. (2021). The future of artificial intelligence at work: A review on effects of decision automation and augmentation on workers targeted by algorithms and third-party observers. Comput. Hum. Behav. 123, 106878. DOI: 10.1016/j.chb.2021.106878.

[6] Zhao, G., Li, Y. & Xu, Q. (2022). From Emotion AI to Cognitive AI. Int. J. Netw. Dyn. Intell. 65–72. DOI: 10.53941/ijndi0101006.

[7] Sirojiddinova, I.M. (2023). Scientific and Technological Progress, Problems and Solutions In the Application of Artificial Intelligence. Am. J. Lang. Lit. Learn. STEM Educ. 2993-2769 1, 49–53.

[8] Cecchi, R., Haja, T.M., Calabrò, F., Fasterholdt, I. & Rasmussen, B.S.B. (2024). Artificial intelligence in healthcare: Why not apply the medico-legal method starting with the Collingridge dilemma? Int. J. Legal Med. 138, 1173–1178. DOI: 10.1007/s00414-023-03152-5.

[9] Goodell, J.W., Kumar, S., Lim, W.M. & Pattnaik, D. (2021). Artificial intelligence and machine learning in finance: Identifying foundations, themes, and research clusters from bibliometric analysis. J. Behav. Exp. Finance 32, 100577. DOI: 10.1016/j.jbef.2021.100577.

[10] Holubčík, M., Vodak, J. & Soviar, J. (2018). How to manage business in a collaborative environment – a case study of multinational companies. Communications in Computer and Information Science 877, 299–311.

[11] Štaffenová, N. & Kucharčíková, A. (2023). Digitalization in the Human Capital Management. Systems 11, 337. DOI: 10.3390/systems11070337.

[12] Brown, M., Anderson, B. & Murray, F. (2007). E-learning policy issues: Global trends, themes and tensions.

[13] Khan, B. (2005). Managing e-learning strategies: Design, delivery, implementation and evaluation. Information Science Publishing.

[14] Boute, R.N. & Udenio, M. (2023). AI in logistics and supply chain management. In R. Merkert & K. Hoberg (Eds.), Global logistics and supply chain strategies for the 2020s: Vital skills for

the next generation (pp. 49–65). Springer International Publishing. DOI: 10.1007/978-3-030-95764-3_3.

[15] Dhaliwal, A. (2020). The rise of automation and robotics in warehouse management. In Transforming management using artificial intelligence techniques. CRC Press.

[16] Tripathi, S., Shukla, S., Attrey, S., Agrawal, A. & Bhadoria, V.S. (2020). Smart Industrial Packaging and Sorting System, in: Kapur, P.K., Singh, O., Khatri, S.K., Verma, A.K. (Eds.), Strategic System Assurance and Business Analytics. Springer, Singapore, 245–254. DOI: 10.1007/978-981-15-3647-2_18.

[17] Zhang, Y. & Cheng, W. (2019). Vision-based robot sorting system. IOP Conf. Ser. Mater. Sci. Eng. 592, 012154. DOI: 10.1088/1757-899X/592/1/012154.

[18] Alomar, M.A. (2022). Performance optimization of industrial supply chain using artificial intelligence. Comput. Intell. Neurosci. 2022, 9306265. DOI: 10.1155/2022/9306265.

[19] Sohn, K. (2021). AI-Based Transportation Planning and Operation. MDPI.

[20] Willems, L. (2021). Understanding the Impacts of Autonomous Vehicles in Logistics, in: The Digital Transformation of Logistics. John Wiley & Sons, Ltd, 113–127. DOI: 10.1002/9781119646495.ch8.

[21] Lee, H.-W. (2022). Research on multi-functional logistics intelligent unmanned aerial vehicle. Eng. Appl. Artif. Intell. 116, 105341. DOI: 10.1016/j.engappai.2022.105341.

[22] López, G., Quesada, L. & Guerrero, L.A. (2018). Alexa vs. Siri vs. Cortana vs. Google Assistant: A Comparison of Speech-Based Natural User Interfaces, in: Nunes, I.L. (Ed.), Advances in Human Factors and Systems Interaction. Springer International Publishing, Cham, 241–250. DOI: 10.1007/978-3-319-60366-7_23.

[23] Tulshan, A.S. & Dhage, S.N. (2019). Survey on Virtual Assistant: Google Assistant, Siri, Cortana, Alexa, in: Thampi, S.M., Marques, O., Krishnan, S., Li, K.-C., Ciuonzo, D., Kolekar, M.H. (Eds.), Advances in Signal Processing and Intelligent Recognition Systems. Springer, Singapore, 190–201. DOI: 10.1007/978-981-13-5758-9_17.

[24] Chandrasekar, R. (2014). Elementary? Question answering, IBM's Watson, and the Jeopardy! challenge. Resonance 19, 222–241. DOI: 10.1007/s12045-014-0029-7.

[25] Warwick, K. & Shah, H. (2016). Can machines think? A report on Turing test experiments at the Royal Society. J. Exp. Theor. Artif. Intell. 28, 989–1007. DOI: 10.1080/0952813X.2015.1055826.

[26] Alto, V. (2023). Modern generative AI with ChatGPT and OpenAI models: Leverage the capabilities of OpenAI's LLM for productivity and innovation with GPT3 and GPT4. Packt Publishing Ltd.

[27] Samarinas, C., Hsu, W. & Lee, M.L. (2020). Latent Retrieval for Large-Scale Fact-Checking and Question Answering with NLI training, in: 2020 IEEE 32nd International Conference on Tools with Artificial Intelligence (ICTAI). Presented at the 2020 IEEE 32nd International Conference on Tools with Artificial Intelligence (ICTAI) (pp. 941–948). DOI: 10.1109/ICTAI50040.2020.00147.

[28] Paksoy, T., Kochan, C.G. & Ali, S.S. (2020). Logistics 4.0: Digital Transformation of Supply Chain Management. CRC Press.

[29] Kredina, A., Akhtanova, M., Bekturganova, M., Tsoy, A. & Spankulova, L. (2022). The relationship between logistics and information and communication technologies and their impact on the economy of Kazakhstan. Probl. Perspect. Manag. 20, 344–355. DOI: 10.21511/ppm.20(4).2022.26

[30] Leonhard, G. (2017). Technology vs. Humanity: Unsere Zukunft zwischen Mensch und Maschine (1st ed.). Vahlen.

[31] Stacho, Z., Stachová, K., Lukáč, M., Kupec, V. & Petrů, N. (2023). Management Reflections on Innovations in Digitalization, with an Emphasis on Degree of Work Autonomy. E M Ekon. Manag. 26, 78–93. DOI: 10.15240/TUL/001/2023-1-005.

[32] Vodak, J., Soviar, J. & Lendel, V. (2014). Identification of the Main Aspects of Cooperation Management and the Problems Arising from their Misunderstanding. Commun. - Sci. Lett. Univ. Zilina 16, 93–101. DOI: 10.26552/com.C.2014.3.93-101.

[33] Kusnirova, D., Durisova, M. & Bubeliny, O. (2024). Enhancing stakeholder value: Managerial activities in the value creation process for suppliers and buyers – Evidence from Slovak enterprises. Adm. Sci. 14, 186. DOI: 10.3390/admsci14080186.

[34] Kušnírová, D., Bubelíny, O. & Ďurišová, M. (2024). Value management: Enterprises' interest in stakeholders and its impact on creating sustainable relationships with suppliers and buyers. Sustain. 16. DOI: 10.3390/su16167148.

[35] Engesser, V., Rombaut, E., Vanhaverbeke, L. & Lebeau, P. (2023). Autonomous delivery solutions for last-mile logistics operations: A literature review and research agenda. Sustainability 15, 2774. DOI: 10.3390/su15032774.

[36] Juraeva, G., Mirzaev, N., Hamroev, R. & Rustamov, M. (2023). Transport features of logistics. E3S Web Conf. 402, 01016. DOI: 10.1051/e3sconf/202340201016.

[37] Sahoo, S. & Goswami, S. (2024). Theoretical framework for assessing the economic and environmental impact of water pollution: A detailed study on sustainable development of India. J. Future Sustain. 4, 23–34.

[38] Šulyová, D., Vodák, J. & Kubina, M. (2021). Effective management of scarce water resources: From antiquity to today and into the future. Water Switz. 13. DOI: 10.3390/w13192734.

[39] Mahardhani, A.J. (2023). The Role of Public Policy in Fostering Technological Innovation and Sustainability. J. Contemp. Adm. Manag. ADMAN 1, 47–53. DOI: 10.61100/adman.v1i2.22.

[40] Vodák, J., Soviar, J. & Lendel, V. (2013). The evaluation system proposal of the businesses preparedness for cooperative management implementation. Bus. Theory Pract. 14, 315–322. DOI: 10.3846/btp.2013.33.

[41] Beresecká, J., Vicianová, J.H., Hronec, Š. & Lapuník, R. (2023). The issue of small municipalities - The possibility of applying the principles of socially responsible management. Lect. Notes Comput. Sci. Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinforma., 13957, 516–540. DOI: 10.1007/978-3-031-36808-0_37.

[42] Malatinec, T. (2021). Local barriers in the efficient use of Green Public Procurement-case of Slovakia. Juridical Trib. 11, 524–534. DOI: 10.24818/TBJ/2021/11/3.07.

[43] Tittelbachová, Š., Čajková, A., Lukáč, M. & Lžičař, P. (2022). Impact of the COVID-19 pandemic on tourism in the Czech Republic. Terra Econ. 20, 133–145. DOI: 10.18522/2073-6606-2022-20-3-133-145.