THE USE OF GENERATIVE AI TOOLS BY LOGISTICS PROFESSIONALS IN GERMANY, CROATIA, AND SERBIA

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Abstract:

The aim of this study is to examine the use of general generative artificial intelligence (AI) tools and generative AI office tools among logistics professionals in Germany, Croatia, and Serbia. To that end, an exploratory analysis about available generative AI tools and their use in logistics is conducted. Then, an empirical study is performed to investigate generative AI tool utilization among German, Croatian, and Serbian logistics professionals. This study provides new insights into the profiles of logistics professionals from these three countries, as well as their utilization and satisfaction with general generative AI tools and generative AI office tools.

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1 Introduction

In the recent few decades, artificial intelligence (AI) has found practical applications in various domains, prompting extensive research into its characteristics, applications, benefits, and shortcomings [1]. This is not surprising, given that AI has the potential to completely transform every sector of the global economy by automating routine tasks and offering previously unattainable insights and capabilities [2]. AI alone has the ability to generate between US$3.5 trillion and US$5.8 trillion in value annually across 19 industries and 9 business functions in the global economy [3]. Logistics is one of the sectors where significant transformations and improvements can be attained with the help of AI as, according to Chui and colleagues [3], it can improve performance in the transport and logistics industry by 89% compared to other applicable analytics techniques.

Logistics operations play an important role in the global economy by providing efficient and timely flow of goods, services, and information. Office-based logistics operations, such as scheduling, planning, procurement, inventory management, and performance management, ensure the required administrative structure for coordination, management and execution, and serve as the basis for other logistics operations. The World Bank estimates that office-based logistics operations make up a significant amount of the 12–15% of global GDP expended on logistics [4].

Considering the complexity of this business, generative AI tool adoption can facilitate and improve office-based logistics operations. These tools can be used for text generation, summarization and translation, data analysis and reporting, meeting protocol generation, voice-to-text transcription, presentation making, time and calendar management, trip organizing, etc. [5]. They are promising increased human creativity, automated productivity, and on-demand content creation [6]. However, there is presently paucity of empirical studies about the benefits, obstacles, challenges, and level of adoption of generative AI tools in logistics and supply chain management [7] – [9].

To fill this literature gap, this study focuses on two categories of generative AI tools – general-purpose generative AI tools and generative AI office tools – which can be used for administrative and analytical

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tasks. The goal is to examine their level of adoption among logistics professionals in Germany, Croatia, and Serbia, based on desk research, an electronic survey, and statistical data analysis. The findings are expected to provide insights into the profiles of logistics professionals from the three countries, the level of use and satisfaction with general generative AI tools and generative AI office tools in these countries, the specific generative AI tools used by logistics professionals, and related differences across the three countries. Accordingly, the following main research questions are addressed:

RQ1: Where do logistics professionals from Germany, Croatia, and Serbia work?

RQ2: Which general generative AI tools do they use?

RQ3: Which generative AI office tools do they use?

RQ4: What are the cross-country differences in the level of use and satisfaction with general generative AI tools and generative AI office tools among logistics professionals?

The remainder of this paper is organized as follows. The next section provides a brief literature review, aiming to elucidate the benefits, challenges, and potential applications of generative AI tools in logistics. The research approach is outlined in Section 3, while Section 4 is designated for the data analysis and research findings related to the profiles of logistics professionals and comparisons of generative AI utilization in logistics across Germany, Croatia, and Serbia. The paper closes by providing a discussion of study results and proposing some directions for future research in this domain.

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2 Literature review: Generative AI in logistics

Logistics generates enormous economic value and plays an important role in today's highly connected business environment by supporting the efficient flow of goods, services, information, and knowledge between companies and customers [10]. Logistics "controls the planning, coordinating and movement of resources, such as people, materials, inventory, and equipment, from one location to another. It includes the forward and reverse movement, handling, and storage of resources between two points" [11].

To enhance logistics processes, logistics professionals are continuously seeking innovative technologies and solutions that enable greater efficiency, resilience, and sustainability, and promote leaner operations. Among the most significant of these technologies is AI, which has emerged as a pivotal solution for transforming logistics processes [2], [12].

The use of AI in logistics represents a revolutionary turn towards innovation and efficiency, requiring skilful management to handle any foreseen or unforeseen challenges [13]. AI can help in the enhancement of different logistics processes such as demand forecasting, procurement, inventory management, warehousing, manufacturing, transportation, distribution, maintenance, reverse logistics, and more [10], [14], [15]. As a result, AI adoption is becoming increasingly important in automating, monitoring, optimizing, and predicting logistics operations [10].

The synergy of AI and logistics operations has the potential to completely reshape industry standards, supporting innovation, efficiency, sustainability, and resilience in the face of emerging challenges [14]. Some of the potential benefits of integrating AI in logistics are improved customer service, cost reduction and better efficiency, more efficient decision-making and data management, increased organizational agility, decline in CO2 emissions, and enhanced competitiveness [13], [15] – [17]. Although there are many benefits to using AI in logistics, there are also some notable challenges such as high implementation cost, safety, security and privacy issues, data availability and quality, human−AI interaction uncertainty, potential for job cuts and workforce displacement, implementation complexity, etc. [13], [15].

Nowadays, logistics professionals can employ generative AI to enhance and expand the capabilities of traditional AI tools and solutions. Generative AI differs from traditional AI in that it can process different types of data and create new content rather than merely analysing and acting on the existing data. It generates original content based on human−machine interactions, whereas traditional AI performs tasks guided by explicit programming [9]. The goal of generative AI use is on the creation and synthesization of artifacts and data that the system has never seen before. In contrast, traditional AI assists with the decision-making by identifying patterns in data and conducting analysis, classification, and prediction [6]. Thus, generative AI enhances the capabilities of traditional AI such as learning, perception, prediction, interaction, adaptation, and reasoning [8].

The term "generative AI" implies the creative ability of machines to learn from experience, adjust to new information, merge different datasets, produce new data, and perform tasks like humans [18]. It can create a

broad spectrum of novel and realistic content, such as text, images, video, audio, software code, and product designs [19]. As generative AI tools produce probabilistic and non-replicable outputs [20], the same input prompt can yield varying responses with repeated use. As a result, formulating good prompts is crucial for obtaining valid and quality responses. Generative AI models can generally be categorized as unimodal or multimodal, whereby the former create one type of output, while the latter combine two or more types of data as both input and output [6].

Generative AI is expected to boost the global economy by trillions of dollars per year, and the global market size of these technologies is projected to reach US$126.5 billion by 2031 [9]. According to the Statista 2025−2030 forecast [21], the generative AI market size is expected to achieve a compound annual growth rate (CAGR) of 41.52%, corresponding to US$356.05 billion in monetary value by 2030. Hence, the number of generative AI tools on the market is steadily increasing.

Generative AI tools such as ChatGPT, Google Bard, Perplexity AI, etc., can be used for producing human-like text. They are trained on millions of web pages and books, and can write, summarize, and translate any written content. Amazon Titan Image, Canva's AI Image Generator, DALL-E, and other image generators can create original visual content or digital artworks based on textual descriptions [6]. AI tools intended for video generation and synthesis – such as Veed, Pictory, Lumen 5, etc. – learn from existing videos and films, while Stable Audio 2.0, MusicLM, and other audio and music generators can create entirely original music in specific genres and styles or synthesize speech from textual input [6]. Further, generative AI tools such as GitHub Copilot and Open AI Codex are capable of writing software code. When it comes to the generative AI tools that can be helpful in product design, Stable Diffusion, Vizcom, Midjourney, and others can suggest unique product design based on information about the target market, customer needs, and other specific criteria.

Numerous generative AI tools are also available for office applications. They can be used for composing emails (Jasper AI, Copy.ai, Writesonic, Rytr, etc.), summarizing lengthy documents (ChatGPT, SummarizeBot, Resoomer, Quillbot, Fireflies, etc.), data analysis and reporting (Tableau & AI, Power BI & AI, DataRobot, ChatGPT, Looker, etc.), producing minutes of online meetings (Otter.ai, Microsoft Meeting, Recap, Fireflies, etc.), transcribing online meetings (Rev, Trint, Descript, Voice AI, Fireflies, etc.), creating AI-powered presentations (Canva with Magic Write, Beautiful.ai, Tome, SlidesGPT, SlidesAI, Invideo, etc.), time management and calendar optimization (Clockwise, Reclaim.ai, Motion, etc.), travel planning (TravelPerk, BCD Travel, Egencia, Navan, etc.), and other purposes [5]. These tools can improve overall efficiency and decision-making by decreasing manual workload and enhancing knowledge workflows in office environments.

3 Methodology

As the study aim was to examine the use of general generative AI tools and generative AI office tools among logistics professionals in Germany (Bavaria & Baden Württemberg), Croatia, and Serbia, a multi-stage approach was adopted (Figure 1). The first phase involved desk research by using academic databases (e.g., WoS, Scopus, IEEE Xplore, Google Scholar) and interviews with selected logistics professionals to gather scholarly and practitioner insights. This literature review and exploratory interviews served as a foundation for the subsequent empirical study and questionnaire design, despite the fact that it was not a systematic formal study.

A 19-item questionnaire was created using Google Forms. The questionnaire comprised four parts: (1) general information about the participating logistics professionals (gender, industry field, position, years of experience, and company size); (2) their use of general generative AI tools at work; (3) their use of generative AI office tools at work; and (4) their use of automation solutions. The instrument was pilot-tested on a sample of logistics professionals that did not take part in the main study to make sure that the questions were clear and reflect the study aims. Following minor revisions to the wording and layout, the questionnaire was translated into the respondents' native languages for convenience.

Thus, the research approach included the use of literature review and interviews with logistics professionals for questionnaire design, reliance on validated measurement scales, and pilot testing and translating the final data collection instrument to ensure methodological rigor and data reliability.

Logistics professionals that were invited to partake in the survey were identified through LinkedIn Sales Navigator, targeting the following five key position categories: Logistics Manager, Supply Chain Manager,

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Logistics Planner, Logistics Controller, and Transport Manager. When searching for the prospective respondents, all potential linguistic and functional variations of the aforementioned position titles were included (e.g., Logistikmanager, Supply-Chain-Koordinator). The initial search returned 13,123 contacts, which were input into the Evaboot scraper to gather 6,851 publicly accessible email addresses, in accordance with the relevant privacy rules. These emails were utilized to send invitations for participation in the survey, prompting 371 logistics professionals to respond. Their survey responses were screened before proceeding with the data cleansing and harmonization steps. This process resulted in 241 valid responses (93 of which were from Germany, 54 from Croatia, and 94 from Serbia). Consequently, the response rate (3.72%) is very low and is attributed to the reluctance to participate in this voluntary survey. Some of the logistics professionals cited work overload, varying levels of familiarity with generative AI tools, and doubt about data confidentiality as the reasons for refusing to take part. The final dataset was subsequently analysed using SPSS software to address the main research questions. This research approach contributed to the relevance and validity of the collected data despite the low response rate.

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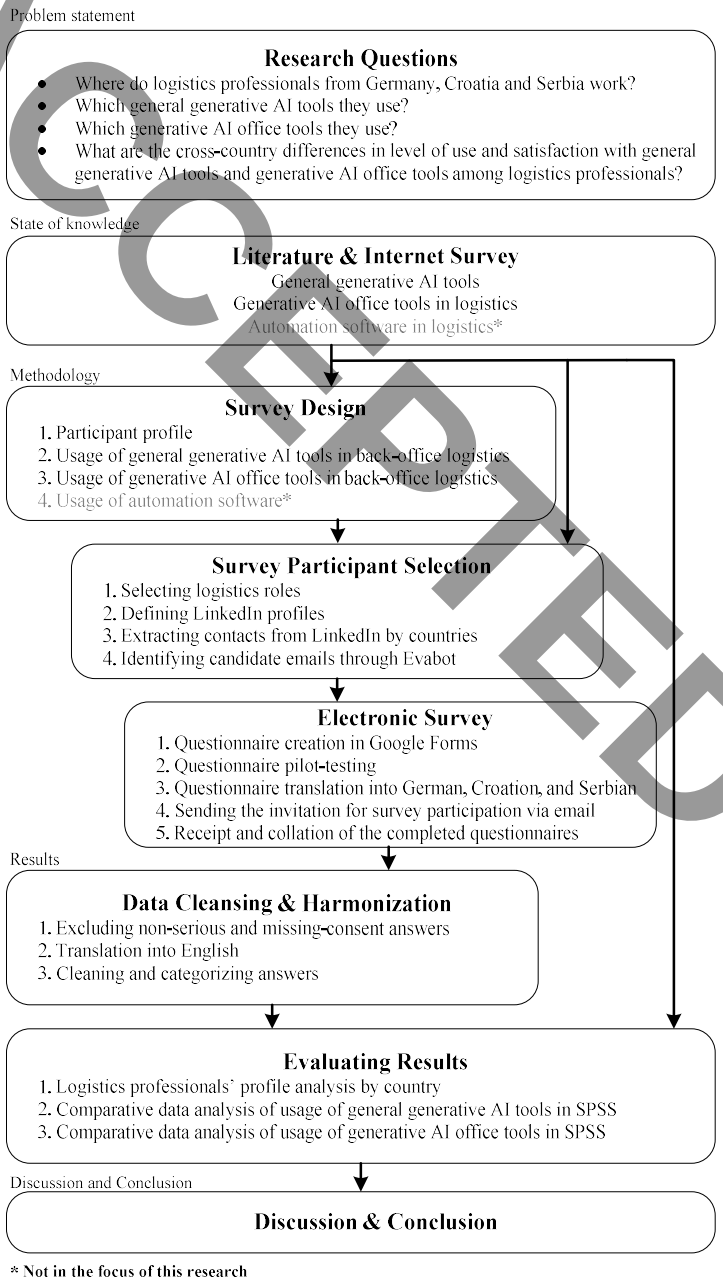


Figure 1. Research approach

4 Results and analysis

The present study, exploring the use of generative AI tools by logistics professionals in Germany, Croatia, and Serbia, was conducted from December 2024 to January 2025. At 79.66%, males predominated in the total sample, while comprising 81.72% of the respondents from Germany and Croatia, and 76.59% from Serbia.

4.1 Profile of logistics professionals

As shown in Figure 2, logistics professionals from the three countries where the survey was conducted mostly work in logistics (16.18%) and the industrial sector (16.18%), followed by automotive (13.28%), retail (6.64%), transport (5.39%), food (5.39%), pharmaceutical (4.98%), and other sectors. They are also employed by companies of different sizes (Figure 3). Chi-squared test of independence revealed significant differences among the countries according to the company size ($\chi^2(6) = 21.685$, $p = 0.001$). Further, statistical power analysis yielded phi = 0.300, which is considered as moderate effect size, and Cramer's V = 0.212 is also indicative of moderate effect size. For instance, in Germany, 48.39% of these professional's work in large companies (1000 + employees) only 11.83% are employed by small companies (under 50 employees). In Serbia, these percentages are similar at 36.17% and 15.96%, while in Croatia logistics professionals mainly work in small companies (33.33%) and less frequently in large companies (14.81%).

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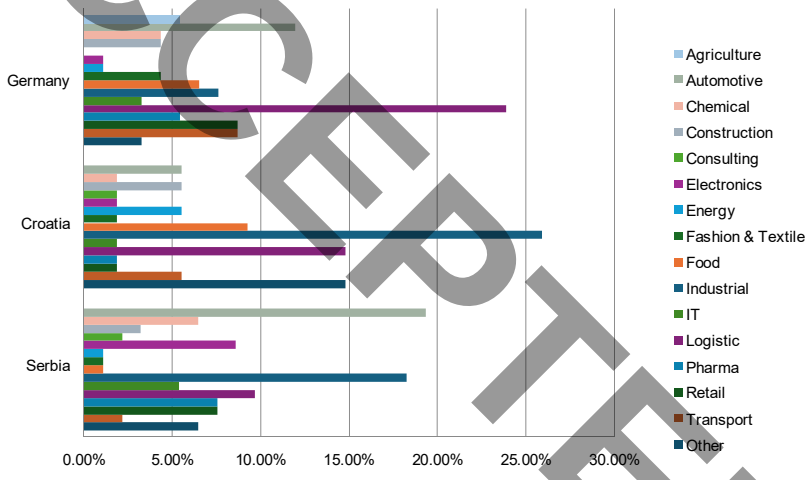


Figure 2. Distribution of the participating logistics professionals across different industry sectors in Germany, Croatia, and Serbia

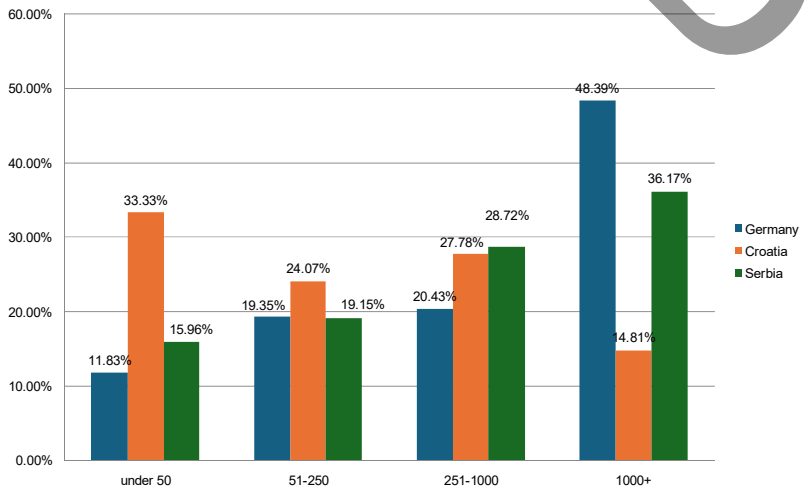


Figure 3. Distribution of the participating logistics professionals across companies of different sizes in Germany, Croatia, and Serbia

Logistics professionals mainly hold managerial positions, accounting for 77.14% of the respondents from Serbia, 62.50% from Croatia, and 51.85% from Germany. Office workers comprise 25.93%, 25.00%, and 11.43% of the German, Croatian, and Serbian cohort, respectively, while a smaller number of respondents work as a planner, consultant, analyst, controller, etc. As shown in Figure 4, categorization by length of professional experience is similar across the three countries, as confirmed by the Chi-squared test of independence ($\chi^2(6) = 11.087$, $p = 0.08$). Those with 10+ years of experience predominate (72.34% in Serbia, 56.99% in Germany, and 53.70% in Croatia), followed by respondents with 4−6 years, 7 – 9 years, and 1 – 3 years of experience.

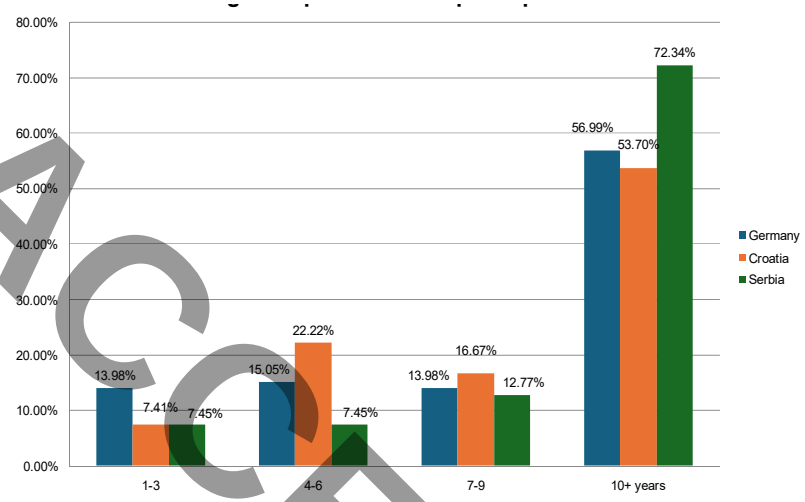


Figure 4. Distribution of the participating logistics professionals based on experience in three countries

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4.2 Use of general generative AI and generative AI office tools

As shown in Table 1 and Table 2, logistics professionals from Germany, Croatia, and Serbia primarily use ChatGPT. Some of the respondents use general generative AI tools such as GitHub Copilot, Gemini, Canva's AI, DALL-E, etc., as well as generative AI office tools such as Power BI, Canva with Magic Write, Tableau & AI, Grammarly, SummarizeBot, TravelPerk, etc. Although a few professionals use specific AI tools such as Trade AI, Imnoo, Volt AI, and Captain AI, 38 professionals from Serbia (40.43%), 19 from Croatia (35.19%), and 24 from Germany (25.81%) have never used general generative AI tools.

Table 1. Use of specific general generative AI tools by country

AI Tool	Germany (N = 93)	Croatia (N = 54)	Serbia (N = 94)
ChatGPT	56	32	51
GitHub Copilot	28		7
Gemini	3	3	
Canva's AI	1	3	1
DALL-E	2		2
Perplexity	1	1	
Synthesia	1		
Bing	1		
DeepL Write	1		
Firefly	1		
Google Bard		1	
MidJourney		1	
Gamma			1
None	24	19	38

Table 2. Use of specific generative AI office tools by country

AI Office Tool	Germany (N = 93)	Croatia (N = 54)	Serbia (N = 94)
ChatGPT	32	7	19
Power BI	11		2
Canva with Magic Write	1	2	1
Tableau & AI	2		1
Grammarly	2		1
SummarizeBot			2
TravelPerk			2
Joule	1		
MS Meeting Recap	1		
Mercedes-Benz Direct Chat	1		
Jasper AI		1	
Fireflies		1	
Cohere For AI		1	
Beautiful.ai			1
Darktrace / EMAIL			1
Geodis GPT			1
None	41	43	72

The use of generative AI office tools among the surveyed professionals is far less prevalent, as it was reported by only 52 respondents from Germany (55.91%), 22 from Serbia (23.40%), and 11 from Croatia (20.37%). However, based on the feedback provided by the logistics professionals from these three countries, these tools are likely to find much broader application over time. For instance, when asked if they plan to use generative AI office tools in the future, 89.36% logistics professionals from Serbia, 87.04% from Germany, and 86.02% from Croatia responded affirmatively.

4.3 Cross-country differences in AI tool use and satisfaction

The survey results concerning the level of use and satisfaction with general generative AI tools and generative AI office tools among the logistics professionals from Germany, Croatia, and Serbia are shown in Figure 5. The reliability of the constructs formed from these items was evaluated using Cronbach's alpha. The results showed good internal consistency for all three countries ($\alpha = 0.860$), Germany ($\alpha = 0.850$), Croatia ($\alpha = 0.817$), and Serbia ($\alpha = 0.882$). A one-way ANOVA revealed a statistically significant difference in the adoption of general generative AI tools across these countries ($F(2) = 3.656$, $p = 0.027$). According to the Tukey's post-hoc test results, the utilization level was significantly higher in Germany (2.45 ± 1.18 min, $p = 0.35$) compared to Croatia (1.98 ± 1.06 min). No other significant differences related to the use of these tools were noted. Further analysis showed no significant differences in the knowledge of general generative AI tools across the three countries ($F(2) = 0.093$, $p = 0.911$). On the other hand, a cross-country difference was noted with respect to the level of satisfaction with these tools when used in practice ($F(2) = 3.115$, $p = 0.046$). The Tukey's post-hoc test results indicate that the satisfaction level was significantly higher in Germany (3.08 ± 1.23 min, $p = 0.042$) than in Croatia (2.54 ± 1.31 min), but comparisons with Serbia were not significant.

Further, a one-way ANOVA revealed a difference in the level of use of generative AI office tools by logistics professionals from the three countries ($F(2) = 5.827$, $p = 0.003$). As indicated by the Tukey's post-hoc test, the degree of adoption was higher in Germany (2.41 ± 1.06 min, $p = 0.018$; $p = 0.008$) compared to Serbia (1.99 ± 1.03 min) and Croatia (1.87 ± 1.05 min). Significant differences were also noted in the level of satisfaction with AI office tools across the three countries ($F(2) = 3.447$, $p = 0.034$), which was higher in Germany (2.91 ± 1.14 min, $p = 0.029$) compared to Croatia (2.36 ± 1.29 min) based on the Tukey's post-hoc test.

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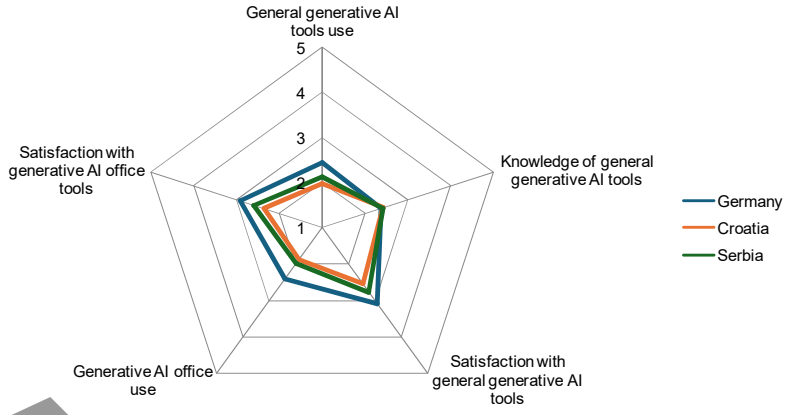


Figure 5. Use of general generative AI tools and generative AI office tools

5 Discussion and conclusion

AI tools have emerged as a transformative force, promising to improve logistics processes in the Industry 5.0 era. However, many logistics professionals are still not realizing their full potential at their workplace and cross-country empirical studies on their utilization are presently scarce. With the main aim to contribute to the body of knowledge on AI adoption in logistics, this study explored the use of general generative AI tools and generative AI office tools among logistics professionals in Germany, Croatia, and Serbia.

The demographic and organizational profiles of the surveyed logistics professionals provide an important context for understanding the variations in AI adoption. The observed significant differences in company size across the countries, particularly the dominance of large firms in Germany and Serbia compared to Croatia where most of these professional's work in small enterprises, appears to influence their access to and adoption of advanced technologies. Unlike smaller firms, larger organizations tend to have the resources, the structured innovation strategies, and the IT infrastructure needed to facilitate the deployment of generative AI tools, which likely contributes to the higher reported usage rates in Germany and Serbia. Moreover, a high proportion of respondents held managerial roles, especially in Serbia, which could positively affect openness to AI adoption given managers' influence on strategic decision-making. Further, the professional experience levels are relatively high and consistent across the three countries. However, despite this potential leverage, actual usage remains low, highlighting a gap between positional authority and technological integration.

ChatGPT emerged as the most widely adopted general generative AI tool, reflecting its accessibility and versatility. While this is consistent with global trends in AI tool popularity, the high percentage of respondents who do not use any generative AI tools, especially in Serbia (40.43%), indicates a considerable digital divide or lack of awareness within the logistics sector. The limited use of other AI tools revealed by this survey suggests that logistics professionals may still be in the early stages of exploration or lack the specific use cases that would prompt broader tool adoption. Overall, while there is a marked interest in generative AI tools, their usage is modest and varies significantly across the three countries in focus of this study. This finding might also reflect concerns about data security, integration complexity, or lack of training.

The usage of generative AI office tools among the surveyed logistics professionals is even lower than that of general AI tools, which is disconcerting, given their potential to significantly streamline administrative, reporting, and decision-making tasks. Once again, Germany leads in the adoption and satisfaction levels, likely due to its more mature enterprise IT environments. Conversely, participants from Croatia and Serbia reported very low usage as well as satisfaction, highlighting the need for targeted awareness and capacity-building interventions. These results suggest that, while certain tools are being adopted, a substantial portion of logistics professionals remain unengaged with generative AI office tools, highlighting an opportunity for initiatives aimed at increased awareness and adoption. However, despite low current use, the expressed optimism about future adoption across all three countries (nearly 90% of the

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respondents plan to use generative AI office tools) indicates a readiness for change and a potential for rapid growth if organizational and infrastructural support is provided.

The survey results revealed significant differences in the level of use and satisfaction with both general generative AI tools and generative AI office tools among the logistics professionals from Germany, Croatia, and Serbia. According to the one-way ANOVA findings, respondents from Germany reported a statistically significantly greater use of general generative AI tools than their colleagues from Croatia. While no significant differences in the knowledge of these tools were found across the three countries, German logistics professionals reported higher satisfaction levels compared to Croatian professionals. Additionally, one-way ANOVA results indicated that the usage of generative AI office tools was significantly higher in Germany than in both Serbia and Croatia. Similarly, satisfaction levels with generative AI office tools were higher in Germany compared to Croatia. Therefore, national context seems to play a key role in shaping AI adoption behaviours. Professionals in Germany demonstrate significantly higher levels of use and satisfaction with both general and AI office tools compared to their Croatian counterparts. This disparity likely reflects differences in digital maturity, innovation policy, and industrial digitization levels in these countries. Interestingly, although Serbia matches Germany in some usage figures, the lower satisfaction ratings in this country possibly point to a mismatch between expectations and tool performance, or issues related to support and implementation. Overall, as logistics professionals in Germany engage more with generative AI tools and express higher satisfaction levels than their counterparts from Croatia and Serbia, this can be seen as an opportunity for further development in the latter two countries.

When interpreting the findings presented here, some study limitations should be noted. In particular, the survey was self-reported and targeted logistics professionals from only three European countries – Germany, Croatia, and Serbia. Moreover, data was collected from December 2024. to January 2025., which likely contributed to the very low response rate of only 3.72%.

Despite these notable shortcomings, by providing a cross-country comparative analysis of logistics professionals' profiles, workforce demographics, and generative AI tool utilization, this study contributes to the growing body of knowledge on AI adoption in logistics. The obtained findings highlight the importance of digital transformation, strategic AI integration, and workforce upskilling to ensure a more resilient, efficient, and sustainable logistics landscape. Some of the practical recommendations for broader adoption of generative AI tools in logistics include increasing the technological readiness, securing greater organizational support, introducing tools with proven organizational benefits to various processes and workflows, organizing staff training programs, launching pilot projects, etc. Future research efforts should focus on exploring AI adoption through the lens of the TAM (Technology Acceptance Model) and the TOE (Technology-Organization-Environment) frameworks, tracking AI adoption trends, examining the impact of AI on workforce restructuring and job satisfaction, and addressing ethical and regulatory considerations related to AI implementation in logistics.

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References

[1] T. Boone, B. Fahimnia, R. Ganeshan, D. M. Herold, and N. R. Sanders, "Generative AI: Opportunities, challenges, and research directions for supply chain resilience", *Transp. Res. E Logist. Transp. Rev.*, vol. 199, 2025, doi:10.1016/j.tre.2025.104135.

[2] M. J. du Plessis, R. Gerber, L. Goedhals-Gerber, and J. van Eeden, "Revolutionising the future of logistics: The value of Artificial Intelligence", [Online]. Available: https://ssrn.com/abstract=4924294 [Accessed: 26 Jan. 2026].

[3] M. Chui, J. Manyika, M. Miremadi, N. Henke, R. Chung, P. Nel, and S. Malhotra, "Notes from the AI frontier: Insights from hundreds of use cases", McKinsey Global Institute, 2018. [Online]. Available: https://www.mckinsey.com/west-

coast/~/media/McKinsey/Featured%20Insights/Artificial%20Intelligence/Notes%20from%20the%20AI%20frontier%20Applications%20and%20value%20of%20deep%20learning/Notes-from-the-AI-frontier-Insights-from-hundreds-of-use-cases-Discussion-paper.pdf [Accessed: 26 Jan. 2026].

[4] World Bank, "Logistics performance index 2020", 2020. [Online]. Available: https://www.worldbank.org [Accessed: 28 Sept. 2025].

[5] B. Axmann, B. Cvetic, V. M. D, Silva, and M. Trstenjak, "AI Office and automation software: Cross country survey on utilization in logistics", *15th International Conference on Advanced Computer Information Technologies (ACIT 2025)*, IEEE, Sibenik, Croatia, pp. 261-266, September 2025, doi: 10.1109/ACIT65614.2025.11185844.

[6] I. K. Dua, and P. G. Patel, *Optimizing generative AI workloads for sustainability: balancing performance and environmental impact in generative AI*. USA: Apress, 2024.

[7] A. Haddud, "ChatGPT in supply chains: exploring potential applications, benefits and challenges", *J. Manuf. Technol. Manag*., vol. 35, no. 7, pp. 1293-1312, 2024, doi: 10.1108/JMTM-02-2024-0075.

[8] I. Jackson, D. Ivanov, A. Dolgui, and J. Namdar, "Generative artificial intelligence in supply chain and operations management: a capability based framework for analysis and implementation", *Int. J. Prod. Res*., vol. 62, no. 17, pp. 6120-6145, 2024, doi: 10.1080/00207543.2024.2309309.

[9] F. S. Wamba, C. Guthrie, M. M. Queiroz, and S. Minner, "ChatGPT and generative artificial intelligence: an exploratory study of key benefits and challenges in operations and supply chain management", *Int. J. Prod. Res.*, vol. 62, no.16, pp. 5676-5696, 2024, doi: 10.1080/00207543.2023.2294116.

[10] Y. Liu, X. Tao, X. Li, A. W. Colombo, and S. Hu, "Artificial intelligence in smart logistics cyber-physical systems: State-of-the-arts and potential applications", *IEEE Trans. Ind. Cyb-Phy. Sys*, vol. 1, pp. 1-20, 2023, doi: 10.1109/TICPS.2023.3283230.

[11] ASCM Association for Supply Chain Management, "ASCM Supply Chain Dictionary", Eds. A. K. Gatewood, and M. J. Drake, 19th edition, 2026. [Online]. Available: https://www.ascm.org/learning-development/certifications-credentials/dictionary/ [Accessed: 26 Jan. 2026].

[12] V. G. Cannas, M. P. Ciano, M. Saltalamacchia, and R. Secchi, "Artificial intelligence in supply chain and operations management: a multiple case study research", *Int. J. Prod. Res.,* vol. 62, no. 9, pp. 3333-3360, 2024, doi: 10.1080/00207543.2023.2232050.

[13] R. Gonçalves, and L. Domingues, "Artificial intelligence driving intelligent logistics: benefits, challenges, and drawbacks", *Procedia Comput. Sci*., vol. 256, pp. 665-672, 2025, doi: 10.1016/j.procs.2025.02.165.

[14] P. Veres, "The opportunities and possibilities of artificial intelligence in logistic systems: principles and techniques", in *Advances in Digital Logistics, Logistics and Sustainability, Selected Contributions to the 5th Central European Conference on Logistics* (Eds. Tamás, P., et al.), 2024.

[15] M. Sohrabi, "Artificial intelligence in logistic industry", in *Implementation of Disruptive Technologies in Supply Chain Management* (Ed. Akkartal, E.). Duvar Publishing, Turkey, 2023.

[16] V. Singh, L. Hughes, M. A. Albashrawi, I. Jeon, and Y. K. Dwivedi, "Generative artificial intelligence (GenAI) in procurement and supply chain management: applications, opportunities and challenges", *J. Syst. Inf. Technol*., vol. 28, no.1, pp. 123-144, 2026, doi: 10.1108/JSIT-03-2025-0139.

[17] K. Y. Lin, "Generative artificial intelligence–driven sustainable supply chain management: a UNISONE framework for smart logistics and predictive analytics under Industry 5.0.", *Int. J. Logist. Res. Appl*., 1-32, 2025, doi: 10.1080/13675567.2025.2540855.

[18] S. İşgüzar, E. Fendoglu, and A. I. Şimşek, "Innovative applications in businesses: An evaluation on generative artificial intelligence", *Amfiteatru Econ*., vol. 26, no. 66, pp. 511-530, 2024, doi: 10.24818/EA/2024/66/511.

[19] Gartner, "Gartner experts answer the top generative AI questions for your enterprise", 2025. [Online]. Available: https://www.gartner.com/en/topics/generative-ai [Acccessed: 6 Apr. 2026]

[20] L. Banh, and G. Strobel, "Generative artificial intelligence", *Electron. Markets*, vol. 33, no. 1, pp. 1-17, 2023, doi: 10.1007/s12525-023-00680-1.

[21] Statista, "Generative AI – worldwide", 2025. [Online] Available: https://www.statista.com/outlook/tmo/artificial-intelligence/ [Accessed: 6 Apr. 2025]

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