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Original Scientific Article

Artificial Intelligence in Serbian Enterprises: Adoption Levels, Obstacles and Sectoral Applications

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Abstract: *This paper examines the adoption of artificial intelligence (AI) among Serbian enterprises, with a focus on adoption levels, obstacles, and sectoral applications. Based on a survey of 499 companies conducted in 2025, the findings show that only 29.1% of firms use AI technologies, with adoption marginally higher in manufacturing (31.1%) than in services (29.2%), although the difference is not statistically significant. The main barrier to adoption is the perception that AI is not useful or relevant for business operations, reported by 66.9% of non-adopters, followed by concerns about legal uncertainty, lack of knowledge, and high costs. Among adopters, the most frequent applications are data analysis and interpretation, customer support, and personalization in marketing. Sectoral differences are evident: services focus on customer support, while manufacturing emphasizes personalization and product development. The results suggest that informational barriers and limited internal capacities outweigh purely technological constraints, highlighting the need for targeted policy measures to foster AI adoption.*

Keywords: *Artificial intelligence, Adoption barriers, Manufacturing, Services, Serbia*

JEL Classification: O33 · L25

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1. INTRODUCTION

Artificial intelligence (AI) has emerged as one of the most transformative technologies of the 21st century, reshaping business models, organisational processes, and competitive dynamics across industries. As AI-driven solutions are increasingly integrated into data analytics, production optimisation, marketing, and customer interaction, enterprises worldwide recognise AI as a strategic asset that enhances innovation, efficiency, and long-term competitiveness (Czarnitzki et al., 2023; Kassa & Worku, 2025; Li et al., 2023; Wang & Liu, 2025). In parallel, governments and international organisations emphasise AI as a key pillar of digital transformation and industrial modernisation, reflecting its growing economic and societal relevance (European Commission, 2020; OECD, 2025; World Economic Forum, 2025).

In line with these global developments, Serbia has positioned artificial intelligence as a national strategic priority. In January 2025, the Government of Serbia adopted a new Strategy for the Development of Artificial Intelligence for the period 2025-2030, defining objectives related to legal and ethical frameworks, infrastructure development, education, and the deployment of AI systems in the public sector. This strategy builds on the earlier 2020-2025 AI framework, under which Serbia became the first country in Southeast Europe to adopt a national AI strategy, and on the establishment of a National AI Platform within the State Data Center in Kragujevac. Together, these initiatives aim to create favourable conditions for AI diffusion across the economy.

These policy developments are particularly relevant for small and medium-sized enterprises (SMEs), which constitute the backbone of the Serbian economy. For SMEs, AI has the potential to support digital transformation, improve operational efficiency, and enhance competitiveness. However, the pace and depth of AI adoption vary considerably across countries, sectors, and firm sizes. While large firms in advanced economies have increasingly embedded AI into core business functions, SMEs in emerging and transition economies often lag due to limited resources, skills, and awareness of AI's potential business value (Cannavale et al., 2025; OECD/BCG/INSEAD, 2025). In such contexts, barriers to adoption are frequently organisational or perceptual rather than purely technological

Despite growing policy attention, systematic firm-level evidence on AI adoption in the Western Balkans, and particularly in Serbia, remains limited. Existing empirical studies primarily address broader digitalisation or innovation activities, without focusing explicitly on AI adoption, perceived barriers, or sectoral patterns of use. This gap is particularly important given the structural significance of manufacturing and service sectors in Serbia and their differing innovation and digitalisation profiles.

This study addresses this gap by providing empirical evidence on AI adoption among Serbian enterprises. The analysis focuses on three interrelated dimensions: (1) the level of AI adoption, (2) perceived barriers to adoption, and (3) areas of AI application. Particular attention is paid to differences between manufacturing and service-sector enterprises, as these sectors represent distinct but comparable contexts for AI adoption within the same institutional environment. By doing so, the paper contributes to the understanding of how firms in a transition economy perceive, adopt, and apply AI technologies, offering insights relevant for both researchers and policymakers.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature on artificial intelligence adoption and firm-level barriers. Section 3 outlines the methodology, including the survey design, sample characteristics, and analytical approach. Section 4 presents and discusses the empirical results. Section 5 outlines directions for future research, and the final section concludes the paper.

2. LITERATURE REVIEW

This study builds on the Technology-Organization-Environment (TOE) framework, which is widely used to explain firm-level adoption of new technologies. According to the TOE framework, adoption decisions are shaped by technological characteristics, organisational capabilities, and environmental conditions (Tornatzky & Fleischer, 1990). Recent research applies this framework to artificial intelligence adoption, particularly in the context of SMEs, highlighting the importance of perceived usefulness, internal knowledge and skills, and regulatory uncertainty (Ghani et al., 2022; Sanchez et al., 2025).

At the technological level, AI is widely recognised for its potential to automate processes, enhance data analysis, and improve decision-making. Empirical studies show that AI adoption can reduce errors, optimise workflows, and improve service quality, particularly in data-intensive and digitally mediated business environments (Kuzminov, 2024; Nesterova, 2024). However, perceived relevance and applicability to specific business models remain critical determinants of whether firms adopt AI in practice.

From an organisational perspective, AI adoption is strongly influenced by firm size, internal capabilities, and managerial orientation. Evidence suggests that large enterprises and knowledge-intensive firms lead AI adoption, while SMEs often lag due to limited financial and human resources and the absence of clear strategic frameworks (Enshassi et al., 2024; Gładysz et al., 2023; OECD/BCG/INSEAD, 2025). Organisational culture also plays a central role: leadership awareness and a data-driven mindset are consistently identified as key enablers of successful AI integration (Oyekunle & Boohene, 2024).

Environmental factors further shape AI adoption decisions. Regulatory uncertainty, ethical concerns, data protection requirements, and the availability and quality of data can significantly affect firms' willingness to adopt AI technologies. These constraints are particularly relevant for SMEs operating in less developed or transition economies, where institutional frameworks and support mechanisms are still evolving.

The literature also points to systematic differences between manufacturing and service sectors in AI adoption. Manufacturing firms tend to adopt AI primarily for process optimisation, quality control, predictive maintenance, and product development, reflecting their capital-intensive and process-oriented nature (Chen & Jin, 2023; Pariso et al., 2025). In contrast, service-sector firms more frequently apply AI in customer-facing activities such as customer support, marketing personalisation, and data analytics, where interaction with customers and digital data is central (Wıjayatı et al., 2022; Xue et al., 2022). These differences suggest that sectoral characteristics shape not only adoption rates but also the types of AI applications pursued by firms.

Despite the growing international literature on AI adoption, empirical evidence from smaller and transition economies remains limited. In the case of Serbia, existing studies largely address digitalisation or innovation more broadly, without systematically examining AI-specific adoption, perceived barriers, or sectoral patterns at the firm level. This gap limits understanding of how enterprises in such contexts perceive and integrate AI technologies.

To address this gap, the present study examines AI adoption among Serbian enterprises, with a particular focus on sectoral differences between manufacturing and services. The analysis is guided by the following research questions:

- RQ1: What is the level of artificial intelligence adoption among Serbian enterprises?
- RQ2: Do AI adoption rates differ between manufacturing and service-sector enterprises?
- RQ3: What are the main barriers preventing Serbian enterprises from adopting AI technologies?
- RQ4: In which business functions are AI technologies most commonly applied, and do these patterns differ across sectors?

3. METHODOLOGY

The study relies on primary firm-level survey data collected by the Institute of Economic Sciences in Serbia in May 2025 as part of a broader research initiative examining innovation and innovation-related activities among SMEs. The survey was designed to capture firms' engagement in innovation processes, digital transformation, and the adoption of advanced technologies, including artificial intelligence. The target population consisted exclusively of enterprises with more than nine employees; micro-enterprises were therefore intentionally excluded from the sample. This design choice reflects the analytical focus on firms possessing a minimum level of organisational structure and internal capacity relevant for innovation activities and technology adoption.

The sampling framework was constructed to ensure representativeness at both the sectoral and regional levels. Specifically, the sample reflects the distribution of economic activity across NACE Rev. 2 sectors, as well as the territorial structure of the Serbian economy. Data were collected using a structured questionnaire administered in an online format. Participation in the survey was voluntary, and respondents were assured anonymity in order to promote accurate and unbiased reporting. Within each enterprise, the questionnaire was addressed to respondents occupying managerial or decision-making positions relevant to business strategy, innovation, digitalisation, or technology adoption (such as owners, directors, senior managers, or heads of relevant innovation-related departments).

The total survey sample comprises 499 valid responses from enterprises operating in Serbia. For the purposes of this paper, the analysis focuses exclusively on firms in the manufacturing and services sectors, as these sectors are directly comparable in terms of business processes and digitalisation and are particularly relevant for analysing enterprise-level AI adoption. Manufacturing and service enterprises differ in their core processes and data practices, which are central to the feasibility and use of AI technologies. Excluding firms from other sectors enhances comparability and analytical clarity. As a result, the final analytical sample consists of 440 enterprises, including manufacturing firms (N = 180) and service firms (N = 260).

The questionnaire consisted of several thematic sections addressing firm characteristics, digitalisation practices, and the use of advanced technologies. In this paper, the analysis focuses on three groups of variables related to artificial intelligence. First, AI adoption was measured using a binary indicator capturing whether the enterprise uses artificial intelligence technologies in its business operations (yes/no). Second, firms that reported not using AI were asked to indicate the main reasons for non-adoption, selecting from a predefined list of potential barriers, including perceived irrelevance for business operations, legal uncertainty, lack of knowledge, high costs, data-related constraints, ethical concerns, and organisational limitations. Multiple responses were allowed. Third, firms that reported using AI were asked to identify specific areas of AI application, such as data analysis and interpretation, customer support, marketing personalisation, automation of internal processes, forecasting, product or service development, and risk or problem detection. The questionnaire items used to measure AI adoption, perceived barriers to adoption, and areas of AI application are reported in Appendix A.

Sectoral differences in AI adoption were assessed using a chi-square test of independence with Yates' continuity correction. The analysis was conducted on the analytical sample of manufacturing and service enterprises (N = 440).

4. RESULTS AND DISCUSSION

The results show that the overall level of AI adoption remains limited: only 29.1% of firms report using AI technologies, while the majority (70.9%) have not integrated AI into their business processes. Adoption is slightly higher in manufacturing (31.1%) than in services (29.2%), indicating a modest difference in technology uptake (Table 1). However, this difference is not statistically significant. A chi-square test of independence with Yates' continuity correction indicates no association between sector and AI adoption ($\chi^2(1, N = 440) = 0.16$, $p = 0.68$), suggesting that AI uptake is broadly similar across manufacturing and service firms (Table 2).

Table 1. Adoption of AI among Serbian companies by sector

AI Adoption	Total (N=499)	Manufacturing (N=180)	Services (N=260)
Yes	145 (29.1%)	56 (31.1%)	76 (29.2%)
No	354 (70.9%)	124 (68.9%)	184 (70.8%)

Source: Own research

Table 2. Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.261[a]	1	.609		
Continuity Correction[b]	.164	1	.686		
Likelihood Ratio	.260	1	.610		
Fisher's Exact Test				.672	.342
Linear-by-Linear Association	.260	1	.610		
N of Valid Cases	440				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 53.59.					
b. Computed only for a 2x2 table					

Source: Own research

The main reasons for not using AI are the perception that these technologies are not useful or relevant to business models (66.9% overall), followed by concerns related to legal consequences (10.7%), lack of knowledge (9.6%), and high costs (8.8%). These findings suggest that barriers are not primarily technical but rather linked to awareness of potential benefits and the limited availability of internal expertise. Both manufacturing (61.3%) and services (71.2%) predominantly cite the irrelevance of AI as the key reason for non-adoption, pointing to a widespread perception of limited applicability across sectors (Table 3).

This dominance of perceptual barriers in the Serbian context is consistent with international evidence, which highlights that organizational readiness and managerial perceptions of AI's business value often outweigh purely technical constraints. Sanchez et al. (2025) demonstrate that in SMEs, adoption decisions are frequently shaped by a lack of clarity regarding how AI can create competitive advantage, while Zavodna et al. (2024) similarly find that firms in Central Europe struggle with low levels of knowledge, weak strategic vision, and uncertainty over expected

returns. The Serbian results, therefore, reinforce a recurring pattern observed in comparable economies. AI adoption is constrained less by the absence of technological capacity and more by deficits in managerial awareness, organizational culture, and the strategic framing of AI within business models.

Table 3. Reasons why companies do not use AI in business

Reason	Total (N=354)	Manufacturing (N=124)	Services (N=184)
AI not useful/relevant for business	237 (66.9%)	76 (61.3%)	131 (71.2%)
Legal uncertainty	38 (10.7%)	14 (11.3%)	16 (8.7%)
Lack of knowledge	34 (9.6%)	13 (10.5%)	14 (7.6%)
Concerns about data protection & privacy	28 (7.9%)	13 (10.5%)	10 (5.4%)
High costs	31 (8.8%)	12 (9.7%)	15 (8.2%)
Incompatibility with existing equipment/ software	27 (7.6%)	15 (12.1%)	9 (4.9%)
Difficulties with data availability/quality	27 (7.6%)	13 (10.5%)	8 (4.3%)
Don't know	23 (6.5%)	9 (7.3%)	12 (6.5%)
Ethical concerns	18 (5.1%)	12 (9.7%)	5 (2.7%)

Source: Own research

Regarding areas of use, the most common applications are data analysis and interpretation (41.4%), customer support (41.4%), and personalization of offers and marketing (38.6%). The services sector is particularly applying AI to customer support (48.7%), whereas manufacturing mainly uses it in personalization (44.6%) and data analysis and interpretation (41.1%). Other applications, such as automation of internal business processes (26.9%) and demand or customer behaviour prediction (23.4%), represent emerging areas of adoption, but remain below 30%. The least common applications are problem and risk detection (19.3%) and product development (21.4%), despite their significant potential for enhancing competitiveness (Table 4).

These sectoral patterns are consistent with international evidence showing that SMEs tend to adopt AI incrementally, concentrating first on applications that are less complex and offer visible short-term benefits. Customer-facing and data-analytic functions, such as marketing personalization and support services, are typically prioritized because they require fewer resources and generate rapid returns, whereas more transformative applications are often postponed (Proietti & Magnani, 2025; Sanchez et al., 2025). This gradualist approach reflects the cautious strategies of smaller firms operating under resource constraints, which favor low-risk, immediately applicable tools over long-term innovation projects (Schwaeke et al., 2025). In this sense, the Serbian results mirror broader tendencies observed in other SME contexts, yet the lower overall adoption rates compared to EU member states underline the additional structural and institutional limitations faced by enterprises in transition economies.

The results indicate that AI adoption in Serbia is still in an early stage, with sectors recognizing practical benefits but with a large share of enterprises perceiving AI as irrelevant to their operations. Future progress will depend on reducing informational barriers, strengthening employee capacities, and demonstrating concrete benefits through pilot projects and sector-specific use

cases. While the manufacturing sector shows slightly higher technological readiness, it also faces specific integration challenges with existing production systems. These findings contribute to the broader debate on digital transformation by providing evidence from a transition economy, with implications for both policymakers and business leaders.

Table 4. Areas of AI use among companies

Area of AI use	Total (N=145)	Manufacturing (N=56)	Services (N=76)
Data analysis & interpretation	60 (41.4%)	23 (41.1%)	31 (40.8%)
Customer support	60 (41.4%)	20 (35.7%)	37 (48.7%)
Personalization & marketing	56 (38.6%)	25 (44.6%)	26 (34.2%)
Automation of internal processes	39 (26.9%)	16 (28.6%)	18 (23.7%)
Forecasting demand / customer behaviour	34 (23.4%)	17 (30.4%)	16 (21.1%)
New product & service development	31 (21.4%)	18 (32.1%)	11 (14.5%)
Problem / error / risk detection	28 (19.3%)	13 (23.2%)	11 (14.5%)

Source: Own research

5. FUTURE RESEARCH DIRECTIONS

The findings of this study provide an important snapshot of the current state of AI adoption in Serbian enterprises, but they also raise new questions and highlight avenues for further inquiry. Several future research directions can be identified, both from an academic and a policy perspective.

While this study distinguishes between manufacturing and service enterprises, more granular analysis of subsectors is needed to uncover nuanced patterns. For example, within manufacturing, AI adoption in high-tech industries such as electronics or pharmaceuticals may differ significantly from traditional sectors such as food processing or textiles. Similarly, in services, the dynamics of AI adoption in financial services, retail, or logistics may vary depending on competitive pressures, customer demands, and regulatory environments. Future research should therefore explore sector-specific case studies to identify best practices and tailored support mechanisms.

The present study offers a cross-sectional view of AI adoption in 2025. Yet, AI is a fast-evolving technology, and adoption patterns are likely to shift significantly in the coming years as costs decrease, awareness grows, and government initiatives take effect. To fully capture these dynamics, future research should move beyond one-time assessments and instead establish mechanisms for continuous monitoring of firms over time. Such monitoring would make it possible to track how enterprises progress from initial experimentation to more advanced applications, what factors support sustained integration of AI, and under what circumstances firms reduce or abandon AI use. From a policy perspective, this type of evidence is particularly valuable. It would enable policymakers to evaluate the effectiveness of Serbia's national AI strategies (2020–2025; 2025–2030), measure the impact of infrastructure investments, and adjust support measures in response to observed bottlenecks. Systematic tracking of adoption trajectories could also inform the design of targeted interventions, such as awareness-raising campaigns, training programs, and sector-specific pilot projects, ensuring that public policies are responsive to the evolving needs

of enterprises. Embedding this kind of evidence-based monitoring into Serbia's broader digital transformation and innovation strategies would therefore not only enhance the relevance of public initiatives but also help align business adoption trends with national development objectives.

The findings indicate that many of the barriers to AI adoption are perceptual rather than purely technical, as a large share of firms consider AI irrelevant or not useful for their business models. This highlights the importance of organizational and behavioural factors, including managerial attitudes, leadership awareness, and the broader organizational culture, in shaping adoption outcomes. A deeper understanding of these dimensions can be gained by exploring how decision-makers interpret the role of AI in their strategic priorities and how employees perceive its implications for daily work practices. Approaches such as in-depth interviews and focus groups are particularly well suited to reveal these cognitive and cultural dynamics, offering insights that cannot be captured through survey data alone.

The skills gap has emerged as a recurrent theme in the international literature on AI adoption, often highlighted as a major obstacle to effective integration. While the present survey did not identify skills shortages as the most prominent barrier, the finding that nearly one in ten Serbian enterprises reported a lack of knowledge indicates that limited expertise remains a relevant issue. This suggests that workforce preparedness will be critical as AI technologies become more widespread. Understanding how enterprises build internal capacities, what types of training programs prove most effective, and how public policies can support upskilling and reskilling is therefore an important avenue for future investigation. In particular, examining the role of partnerships between firms, universities, and training providers could shed light on strategies for developing AI-related competencies in the Serbian context.

Positioning Serbia within a broader regional and international context is essential for understanding the dynamics of AI adoption. Comparative analyses with other Western Balkan economies can reveal whether Serbia is advancing more rapidly or facing similar challenges as its neighbours, while benchmarking against EU member states can highlight areas of convergence and divergence in adoption patterns. Such cross-country perspectives are valuable for identifying the influence of institutional frameworks, regulatory environments, and innovation ecosystems on technology uptake. At the same time, moving beyond descriptive accounts is crucial to capture the mechanisms through which enterprises perceive, adopt, and integrate AI technologies. Mixed-method approaches that combine survey-based evidence with in-depth case studies can provide richer insights into the interplay of technological, organizational, and institutional factors. In the Serbian context, this type of research would also support the evaluation of national AI strategies, inform the design of targeted sectoral initiatives, and contribute to aligning enterprise-level adoption with broader policy goals of digital transformation and economic modernization.

6. CONCLUSION

This paper has examined the adoption of AI among Serbian enterprises, focusing on adoption levels, barriers, and sectoral applications. Drawing on survey evidence from 499 firms, it provides one of the first systematic analyses of AI uptake in a transition economy.

The study shows that AI adoption in Serbia remains in an early stage, shaped less by technological readiness than by perceptions of relevance, organizational awareness, and managerial capacities. Firms that do adopt AI tend to concentrate on customer-facing and data-analytic applications, while more transformative uses remain limited. These patterns are consistent with findings from

other SME contexts, but adoption levels in Serbia are comparatively lower, reflecting the structural and institutional constraints of a transition economy.

The analysis carries important policy implications. Overcoming informational barriers, strengthening skills, and demonstrating concrete business value will be as critical as investments in infrastructure or financial incentives. Sectoral differences further suggest that tailored support measures are needed to reflect the distinct challenges of manufacturing and services.

By situating Serbia within the broader debate on digital transformation, this study highlights both the universal challenges of AI adoption and the specific obstacles faced by firms in smaller and emerging markets. Its findings are relevant not only for national policymakers but also for regional actors across the Western Balkans, where similar barriers persist. The effective realization of Serbia's AI strategies will depend on aligning policy frameworks with enterprise-level needs, fostering an environment in which AI can serve as a driver of competitiveness, innovation, and sustainable growth.

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References

Cannavale, C., Claudio, L., & Koroleva, D. (2025). Digitalisation and artificial intelligence development: A cross-country analysis. *European Journal of Innovation Management*, *28*(11), 112-130. https://doi.org/10.1108/EJIM-07-2024-0828

Chen, Y., & Jin, S. (2023). Artificial intelligence and carbon emissions in manufacturing firms: the moderating role of green innovation. *Processes*, *11*(9), 2705. https://doi.org/10.3390/pr11092705

Czarnitzki, D., Fernandez, G. P., & Rammer, C. (2023). Artificial intelligence and firm-level productivity. *Journal of Economic Behavior & Organization*, *211*, 188–205. https://doi.org/10.1016/j.jebo.2023.05.008

Enshassi, M., Nathan, R., Soekmawati, S., Al-Mulali, U., & Ismail, H. (2024). Potentials of artificial intelligence in digital marketing and financial technology for small and medium enterprises. *IAES International Journal of Artificial Intelligence (IJ-AI)*, *13*(1), 639-647. https://doi.org/10.11591/ijai.v13.i1.pp639-647

European Commission. (2020). White Paper on Artificial Intelligence - A European approach to excellence and trust. https://commission.europa.eu/system/files/2020-02/commission-white-paper-artificial-intelligence-feb2020_en.pdf

Ghani, E., Ariffin, N., & Sukmadilaga, C. (2022). Factors influencing artificial intelligence adoption in publicly listed manufacturing companies: a technology, organisation, and environment approach. *International Journal of Applied Economics Finance and Accounting*, *14*(2), 108-117. https://doi.org/10.33094/ijaefa.v14i2.667

Gładysz, B., Matteri, D., Ejsmont, K., Corti, D., Bettoni, A., & Haber, R. (2023). Platform-based support for ai uptake by SMEs: guidelines to design service bundles. *Central European Management Journal*, *31*(4), 463-478. https://doi.org/10.1108/cemj-08-2022-0096

Kassa, B. Y., & Worku, E. K. (2025). The impact of artificial intelligence on organizational performance: The mediating role of employee productivity. *Journal of Open Innovation: Technology, Market, and Complexity*, *11*(1), 100474. https://doi.org/10.1016/j.joitmc.2025.100474

Kuzminov, M. (2024). Strategic management and artificial intelligence as tools for effective activity of enterprises. *Economies' Horizons*. 145-152. DOI: 10.31499/2616-5236.4(29).2024.316528.

Li, C., Xu, Y., Zheng, H., Wang, Z., & Li, C. (2023). Artificial intelligence, resource reallocation, and corporate innovation efficiency: Evidence from China's listed companies. *Resources Policy*, *81*, 103045. https://doi.org/10.1016/j.resourpol.2023.103324

Nesterova, K. (2024). Integration of artificial intelligence into strategic business management: development prospects. *Herald UNU International Economic Relations and World Economy*. 10.32782/2413-9971/2024-53-13.

OECD. (2025). Governing with Artificial Intelligence: The State of Play and Way Forward in Core Government Functions, OECD Publishing, Paris, https://doi.org/10.1787/795de142-en.

OECD/BCG/INSEAD. (2025). The Adoption of Artificial Intelligence in Firms: New Evidence for Policymaking, OECD Publishing, Paris. https://doi.org/10.1787/f9ef33c3-en

Oyekunle, D., & Boohene, D. (2024). Digital transformation potential: the role of artificial intelligence in business. *International Journal of Professional Business Review*, *9*(3), e04499. https://doi.org/10.26668/businessreview/2024.v9i3.4499

Pariso, P., Picariello, M., & Marino, A. (2025). How AI can aim and reduce the annual amount of energy consumption in European SMEs. *Macromolecular Symposia*, *414*(3) https://doi.org/10.1002/masy.70045

Proietti, S., & Magnani, R. (2025). Assessing AI Adoption and Digitalization in SMEs: A Framework for Implementation. *arXiv preprint*. https://arxiv.org/abs/2501.08184.

Sanchez, E., Calderon, R., & Herrera, F. (2025). Artificial Intelligence Adoption in SMEs: Survey Based on TOE–DOI Framework, Primary Methodology and Challenges. *Applied Sciences*, *15*(12), https://doi.org/10.3390/app15126465

Schwaeke, J., Peters, A., Kanbach, D. K., Kraus, S., & Jones, P. (2025). The new normal: The status quo of AI adoption in SMEs. *Journal of Small Business Management, 63*(3), 1297-1331. https://doi.org/10.1080/00472778.2024.2379999

Tornatzky, L. G., & Fleischer, M. (1990). The processes of technological innovation. Lexington, MA: Lexington Books.

Wang, Y., & Liu, F. (2025). Impact of artificial intelligence innovation on food company performance. *International Review of Financial Analysis*, 103, 104219. https://doi.org/10.1016/j.irfa.2025.104219

Wıjayatı, D., Rahman, Z., Fahrullah, A., Rahman, M., Arifah, I., & Kautsar, A. (2022). A study of artificial intelligence on employee performance and work engagement: the moderating role of change leadership. *International Journal of Manpower*, 43(2), 486-512. https://doi.org/10.1108/ijm-07-2021-0423

World Economic Forum. (2025). AI in Action: Beyond Experimentation to Transform Industry. https://reports.weforum.org/docs/WEF_AI_in_Action_Beyond_Experimentation_to_Transform_Industry_2025.pdf

Xue, M., Cao, X., Xu, F., Gu, B., & Zhang, Y. (2022). The effect of artificial intelligence (AI) on firm labor structure. Proceedings of the 55th Hawaii International Conference on System Sciences, https://doi.org/10.24251/hicss.2022.853

Zavodna, L. S., Uberwimmer, M., & Frankus, E. (2024). Barriers to the implementation of artificial intelligence in small and medium-sized enterprises: Pilot study. *Journal of Economics and Management*, 46(1), 331-352. https://doi.org/10.22367/jem.2024.46.13

Appendix A. Survey questions on artificial intelligence

Q1. In which areas does your company use artificial intelligence (AI)?
(Multiple answers allowed)

- ☐ Data analysis and interpretation (e.g. use of AI for pattern recognition, data-driven decision-making)
- ☐ Personalisation of offers and marketing activities (e.g. product/service recommendations or targeted marketing campaigns based on customer behaviour)
- ☐ Customer support (e.g. chatbots, automated responses to customer inquiries, virtual assistants)
- ☐ Forecasting demand and/or customer behaviour (e.g. sales forecasting, analysis of customer behaviour or user needs)
- ☐ Automation of internal business processes (e.g. automation of reporting, document processing, procurement processes)
- ☐ Detection of problems, errors, or risks (e.g. AI systems for fraud detection, fault detection, or identification of operational inefficiencies)
- ☐ Development of new products and services (e.g. use of AI for idea generation, prototype testing, or design optimisation)
- ☐ We do not use artificial intelligence
- ☐ Other (please specify): _____

Q2. If your company does not use artificial intelligence, what are the main reasons?
(Multiple answers allowed)

- ☐ High costs
- ☐ Lack of knowledge or expertise
- ☐ Incompatibility with existing equipment, software, or systems
- ☐ Difficulties related to data availability or data quality
- ☐ Concerns about data protection and privacy
- ☐ Uncertainty regarding legal implications
- ☐ Ethical concerns related to the use of AI technologies
- ☐ AI technologies are not useful or relevant for the company
- ☐ Other (please specify): _____
- ☐ Do not know